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STATE OF CALIFORNIA - THE RESOURCES AGENCY

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| Permit Approved: | 06/17/82 |
| Staff Report: | 07/29/98 |
| Staff: | LO, SG |
| Hearing: | 08/13/98 |

# STAFF REPORT
# CONDITION COMPLIANCE

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|---|---|
| APPLICATION NUMBER: | 4-82-300 (and amendments A1 through A4) |
| APPLICANT: | **CALIFORNIA DEPT. OF PARKS AND RECREATION (DPR)** |
| PROJECT LOCATION: | **Oceano Dunes State Vehicular Recreation Area (ODSVRA*),** approx. 1 mile south of Pismo Beach, San Luis Obispo County. |
| PROJECT DESCRIPTION: | Installation and maintenance of various developments required for the operation and management of an off-highway vehicle (OHV) recreation area at ODSVRA. |
| CONDITION TO REVIEW: | Limitation on amount of OHV (Off-Highway Vehicle) use, pursuant to Conditions #3.D and 6. |
| ATTACHMENT: | Submitted Final Draft of *Oceano Dunes State Vehicle Recreation Area Off-Highway Vehicle Day-Use Carrying Capacity Study,* dated June 30, 1998. |

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## SUMMARY OF STAFF RECOMMENDATION

Staff recommends that the Commission **accept** the carrying capacity study prepared by the Department of Parks and Recreation as partial fulfillment of Conditions #3.D and #6; and, establish an *interim* limit on vehicle day use at a non-holiday maximum of 4,300 vehicles per day, including off-highway vehicles (OHV's). This number reflects the maximum amount of OHV day use that the Department believes it can manage without significant degradation of coastal resources. Staff also recommends, however, that further research and monitoring be conducted to better determine actual impact thresholds, particularly with respect to ecosystem carrying capacity. Staff further recommends that this acceptance be conditioned on the Department's agreement to certain measures, including a periodic review process, which are recommended by the County; and establishment of an interagency Technical Review Team.

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* Oceano Dunes SVRA was known as Pismo Dunes SVRA until the mid-1990s; for clarity, references herein are to Oceano Dunes SVRA (ODSVRA), except where Pismo Dunes SVRA is found in direct quotations from previous documents.

The submitted Study describes how, through a combination of management measures (e.g., fencing, ranger patrols, dune restoration, user education) OHV impacts on ODSVRA's ecosystems are now confined to existing bare sand areas. The Study provides strong evidence that the balance between the vegetated and non-vegetated portions of the dune system is being maintained, an acceptable visitor safety trend is evident, sanitation problems have been resolved, traffic congestion within the community of Oceano has been minimized, and non-OHV visitor use is not precluded.

In addition, under the guidance of a resident Resource Ecologist, a Habitat Monitoring System (HMS) for both the bare sand and vegetated portions of ODSVRA would be implemented. The HMS would be implemented concurrently with the USFWS-approved Snowy Plover and Least Tern Habitat Management Plan (1997). An important element of condition compliance will be to establish OHV day use limits for the four peak warm-weather weekends (proposed as exceptions or "bump days" with respect to the interim 4,300 day use vehicle limit). Also, it should be noted that the proposed interim 4,300 day use vehicle limit would not apply to the 500 overnight camp units (up to 1,000 street-legal vehicles allowed), nor the OHV's that they bring into the area. The submitted study does not adequately define the systems which are to be sustained, nor does it contain sufficient evidence to determine if, because of OHV use, adverse impacts are occurring in what would normally be vegetated dune or plover nesting areas. Impacts on some wet beach fauna, such as grunion are not considered Implementation of the HMS, along with the recommended additional conditions of acceptance, is expected to answer these questions and to provide the data needed to finalize an acceptable carrying capacity with respect to both day use and camper-associated OHV's, as well for normal and peak holiday periods.

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## STAFF RECOMMENDATION

Staff recommends that, after public hearing, the Commission adopt the following resolution:

**Motion:** "I move approval of the following resolution."

**Resolution:**

"The Commission hereby finds that the permittee, the California Dept. of Parks and Recreation, has appropriately documented, in the submitted Carry Capacity

Study, its collaborative efforts to establish a limit on off-highway vehicle (OHV) day use pursuant to the requirements of condition #3.D of Coastal Development Permit #4-82-300, as amended. This action includes approval of an interim day use limit of 4,300 vehicles including OHV's (except during the four peak season holidays), subject to the conditions listed below. However, the Commission recognizes the submitted Study's asserted carrying capacity only as a proposal; addition information will be needed to establish ecosystem carrying capacity and to complete compliance with Conditions 3.D and 6 of the permit."

Staff recommends a "YES" vote.

## CONDITIONS

This review of condition compliance and acceptance of the Carrying Capacity Study is subject to the following conditions:

Conditions Derived from Recommendations of the San Luis Obispo County Board of Supervisors:

1. The Department of Parks and Recreation agrees to limit the number of motor vehicles to the established carrying capacity, once such carrying capacity is established as provided in the subsequent conditions below;

2. An interim limit on motor vehicle use on the beaches and dunes of Oceano Dunes SVRA is hereby established at 4,300 day use vehicles, which includes the off-highway vehicles transported into the recreation area (levels to be monitored using valid statistical and sampling methods); this number does not include vehicles attributable to allowed overnight camper use within ODSVRA;

3. The 4,300 day use vehicle limit may be exceeded only during the four major peak season holiday periods of Memorial Day, July 4th, Labor Day and Thanksgiving during an initial three year term, to allow for comprehensive monitoring and comparative analysis of historical levels of visitor uses and impacts during these highest attendance periods (after which time a day use vehicle limit shall also be established for the four peak season holidays, in accordance with the approval process used to establish the 4,300 vehicle limit);

4. The Department of Parks and Recreation shall utilize the day use carrying capacity study recommendations, including the Habitat Monitoring System (HMS), to monitor the impacts of visitor use and annually provide the data and analysis to the County Department of Planning and Building and the California Coastal Commission;

5. Adjustments of the Study's proposed day use carrying capacity shall be made in consultation with and agreement by the County of San Luis Obispo, the Executive Director of the Coastal Commission and the Department of Parks and Recreation at the end of an initial three year monitoring period; and whenever warranted by other circumstances as specified in Conditions 8 and 9 below;

6. Future adjustments to the proposed day use carrying capacity for the Oceano Dunes State Vehicular Recreation Area (ODSVRA) shall be based upon scientific and statistically valid data derived from monitoring and assessment. It is understood that the monitoring system established through the Carrying Capacity Study will require outcome and trend analysis over many years in order to determine the effectiveness of park management in preventing significant adverse impacts on the dune, beach and wetland ecosystems of ODSVRA.

Additional Conditions of Acceptance:

7. Commission Approval of Baseline Carrying Capacity Required. Within one year of completion of the initial three year monitoring period identified in Condition 5 above, permittee shall submit, for review and approval by the Coastal Commission, an updated Carrying Capacity Study for ODSVRA. Such updated study shall include a revised motor vehicle carrying capacity for the beach and dune areas of ODSVRA, including both day use and overnight vehicles, based on scientific evidence that no significant disruption of environmentally sensitive habitat areas will result (including, but not limited to, sensitive native dune plants and Snowy plover nesting sites). This carrying capacity, upon approval by the Commission, will serve as the baseline for subsequent management, subject to all future adjustments in motor vehicle numbers pursuant to the terms of the these conditions. Additionally, seasonal use limitations, adjustments in the size or location of exclosures and/or fencing may be needed to comply with applicable Habitat Management Plan(s), and to reflect the actual extent and needs of sensitive ecosystems.

   The updated study shall document the research components, methodology and results which support the revised day use carrying capacity; shall take into consideration total OHV impacts, including those attributable to the allowed number of camper units; shall include recommended use limits for both the peak season holidays and for periods of normal staffing; shall be submitted with a response letter or similar evidence of consultation with the Calif. Dept. of Fish and Game (CDFG), and the U.S. Fish and Wildlife Service (USFWS); and, shall be accompanied by a Resolution indicating consultation with, and agreement by, the County of San Luis Obispo. Prior to commencement of any new research component, the research design shall be submitted for review and approval by the Executive Director. Also, upon substantiation of good cause, the due date for the updated study may be extended, for not more than one year at a time, by the Executive Director.

8. Specific Monitoring Program Requirements. In order to establish baseline conditions for long-term trend analysis, comparing data sets over a multi-year time series, permittee shall implement the Habitat Monitoring System (HMS) detailed in the submitted draft Study dated June 30, 1998. Further, the HMS shall be augmented with the following supplemental programs and studies, listed below. Some studies may require manipulative investigative measures such as temporary exclosure fencing. Where such temporary measures have been reviewed and approved by the Technical Review Team (Condition 11 below), the Executive Director may authorize installation without additional coastal development permit.

   a. Improve Retrophoto Baseline Archive. Collect all available useful pre-management air photos, and pre-management surface photos with identifiable dune revegetation and background landmarks. Publicize this need widely, via internet, news releases and other means as

appropriate. Offer compensation for particularly useful photos that can be dated and that show pre-OHV or pre-management conditions. Archive in a manner which makes them accessible to researchers and interested public.

b. Establish Wet Beach Resident Fauna Study Program. Such program should include a grid of sample sites at a high intensity OHV site, a moderate intensity OHV site, and a non-OHV control (reference) site. Because sample site inventory will likely require sequential excavation of different sites within the grid in successive years -- which in itself could be considered a development -- such excavation to sample and screen subsurface biota is hereby authorized. The program shall be designed in consultation with the California Department of Fish and Game; shall be submitted for review and approval by the Executive Director within one year of the effective date of these conditions; and shall contain criteria for termination once the impacts, if any, on the Pismo clam and other wet beach resident fauna are determined.

c. Conduct Shorebird Impacts Study. Compare shorebird activity in wet beach areas subject to intense OHV use, vs. an area of less intense OHV use and a non-OHV reference area which is subject to the usual recreational pursuits (like Pismo Beach). Evaluate whether the differences, if statistically significant, result in biologically significant impacts with respect to shorebird populations.

d. Continue Snowy Plover Research. Continuing research projects should investigate the questions of recreational user proximity, vegetative cover and gull (and other predator) attractants as factors in Snowy plover breeding success. Do increased distances of bare sand between dense vegetative cover and plover nesting sites result in better protection from predator species? Do current types of recreational activity result in reduced nesting success, or increased gull or other predator concentrations? Does this have any significant affect on the plover population? If so, are there available measures to modify visitor and/or gull behavior?

e. Establish Study Plot for Research on Successional Events in Dune Stabilization. The successional study program shall focus on a bare sand area that, absent recreational impacts, would be expected to revegetate with native plants. Selection of the research plot, control plot(s), and the design of the research program shall be performed in consultation with the appropriate experts at the California Dept. of Fish and Game, and U.S. Fish and Wildlife Service; shall be submitted for review and approval by the Executive Director within one year of the effective date of these conditions; and shall contain criteria for termination once the relationship of OHV activity to the successional stages of dune revegetation are determined. Particular topics to be investigated include the possible role of microcrust formation (comparable to that previously reported for desert areas); tolerance to vehicle impacts at different stages of the seasonal growth cycle; and,

identification of factors which would predict the extent of vegetated dunes absent the impacts of OHV's and exotic plant species.

f. Assessment of Motor Vehicle Fluids Contamination. Such fluids include, but are not limited to fuels, lubricants, coolants, brake fluids, and additives. Questions to be addressed include: What is the incidence of spills? What measures are employed to prevent, detect and remediate such accidents? What are the cumulative effects? Could they be significant? If so, what mitigating measures could be employed?

1. Mandatory Reduction of Daily Use Limits. The approved interim non-holiday 4,300-vehicle daily OHV limit is dependent on the ability of the existing management measures, including ranger force, to prevent substantial disturbance of the dune ecosystem by allowed recreational activities. Therefore, if the ranger force is reduced, or management budget impacted, in such a way as to impair the ability of DPR to protect visitor safety, Snowy plover populations, or existing areas of native dune vegetation, the 4,300-vehicle daily vehicle limit shall be likewise reduced -- immediately and proportionately.

2. Other Adjustments to Daily Use Limits. The 4,300-vehicle interim daily limit represents a maximum allowable loading for the OHV-accessible parts of the ODSVRA. It does not represent a legal entitlement. Permittee is expected to continue its role of regulating the time, amount and manner of recreational use; and, is further expected to make additional adjustments in response to new information as it becomes available from the research studies identified above. Provided, however, that the daily vehicle limit shall not be increased above 4,300 vehicles without prior agreement by the County of San Luis Obispo and amendment of Coastal Development Permit 4-82-300.

3. Establish Technical Review Team. A Technical Review Team (TRT) shall be established by DPR. The TRT shall meet at least once a year to evaluate the monitoring results and to reevaluate monitoring protocols, shall make recommendations to DPR regarding additional monitoring focuses and management strategies, shall provide oversight review for the various research studies, and shall assist in the development of annual reports. The TRT shall be coordinated by DPR and shall be composed of representatives of the following seven agencies and groups:

   a. San Luis Obispo County
   b. California Coastal Commission
   c. OHV Commission
   d. *Local elected official (i.e., from the "5 Cities")
   e. *Civic community (e.g., Chamber of Commerce, etc.)
   f. *OHV user community (not an OHV manufacturer representative)
   g. *Environmental community

   *DPR shall solicit nominations from the groups represented by 4 through 7 and shall select one from each group.

1. Disposition of Current Carrying Capacity Study. The Final Draft of the ODSVRA OHV Day-Use Carrying Capacity Study dated 30 June, 1998, shall be corrected and finalized. Commission staff shall be consulted for identification of all applicable conditions and findings from past Commission actions; correct characterization of the Study's preparers;

and an accurate representation of the status of the proposed 4,300 day-use vehicle carrying capacity (now recognized by the Commission only as an interim limit, pending further research). A copy of this Commission action shall be included as an appendix.

## FINDINGS AND DECLARATIONS

### A. Background

Vehicles have been driven on the beach at Oceano for at least 70 years. Prior to the 1980s, vehicles were operated on the entire 16 miles of beach from Pismo Beach on the north to Mussel Rock in Santa Barbara County on the south. Now, street-legal vehicles are allowed on approximately five miles of the beach from Grand Avenue south. OHVs are now restricted to about three miles of the beach, from a point one mile south of Pier Avenue to the southerly boundary of allowed OHV use, and on the dunes inland about two miles: the most southern and eastern portions are closed to vehicle use. The vehicular recreation area varies in width from a few hundred yards at the northern end to approximately three miles at the southern end. Its 3590 acres are comprised of sandy beach and sand dunes; about 1500 acres are available for OHV use.

The statute authorizing OHV Recreation Areas (Public Resources Code 5090 et seq.) was added to the code in 1982. Amendments in 1987 included additional provisions for environmental protection, allowed for the temporary or permanent closure of areas that could not be adequately protected from erosion, and placed priority for implementation of the OHV program on a par with other Department of Parks and Recreation (DPR) programs. The enabling legislation also provides for balancing of recreational and environmental factors, mandates a Commission composition of a variety of interest groups, and specifically allocates funding to both recreational and conservation projects. The legislation requires DPR to operate ODSVRA in a manner consistent with adopted erosion control standards and wildlife habitat protection plans and allows facilities or portions of facilities to be closed either temporarily or permanently.

Even though land for off-highway vehicle (OHV) use was acquired in 1974 and a General Development Plan was approved in 1975, the Department of Parks and Recreation (DPR) did not begin active management of Oceano Dunes State Vehicular Recreation Area (ODSVRA) until 1982. That year DPR proposed the construction of entrance kiosks and placement of fencing along portions of the perimeter of ODSVRA and around isolated vegetation "islands" and wetlands in the dunes. On June 17, 1982, prior to certification of San Luis Obispo County's Local Coastal Program, the South Central Regional Coastal Commission approved coastal development permit 4-82-300 to allow DPR to construct entrance kiosks and fencing. This permit, including four subsequent amendments, addressed the number of users to be allowed in ODSVRA (Special Conditions 3.B, 3.D, and 6).

Specifically, the coastal development permit was conditioned to, among other things, require that "OHV day use will be limited to a specified number of users established in consultation with and agreement by the County of San Luis Obispo and the Executive Director of the Coastal Commission and the Department of State Parks." In 1993 and 1994 the Commission reviewed compliance with this condition and found that there was insufficient information to be able to make a determination of what, if any, limits should be placed on the number of OHV

day users. To provide the necessary information, the Commission also required that the Department of Parks and Recreation prepare, in consultation with San Luis Obispo County and Commission staff, a carrying capacity study for submission to and approval by the Commission. The carrying capacity study for Oceano Dunes State Vehicular Recreation Area (ODSVRA) has now been completed as a final draft, to assist the County and the Commission in determining compliance with coastal development permit 4-82-300.

**B. Condition Compliance History**

Three conditions are relevant to this action. Special Condition 3.B, as amended, which applies to camping, states:

> Beginning 4th of July weekend 1983, Beach camping within the Parks units shall be restricted to a maximum of 500 units* with each unit available only through a reservation obtained through the State Parks Reservation system. Thereafter, admittance to the Park for purposes of overnight camping will be denied to individuals without a valid reservation unless vacant unreserved camping spaces are available.
> *One unit equals a campsite for a single camper vehicle.

Special Condition number 3.D, as amended, which applies to OHV day use, states in part:

> On or before January 1983, the following will occur: OHV day use will be limited to a specified number of users established in consultation with and agreement by the County of San Luis Obispo and the Executive Director of the Coastal Commission and the Department of State Parks. OHV day use fees may be collected.

Special Condition 6 of the amended permit, which applies to both camping and OHV use, states in applicable part:

> If, after an annual (or any other) review it is found that the ORV use within the SVRA is not occurring in a manner that protects environmentally sensitive habitats and community values consistent with the conditions of this permit and the County's Local Coastal Plan, then OHV access and the number of camp units allowed may be further limited by the Executive Director with concurrence by resolution of the Board of Supervisors of San Luis Obispo County. If the above reviews find that OHV use in the SVRA is consistent with the protection of environmentally sensitive habitats and community values, and/or that additional staff and management revenues become available to the DPR, levels of OHV access and the allowable number of camp units may be increased not to exceed the enforcement and management capabilities of the DPR by determination of the Executive Director with concurrence by resolution of the Board of Supervisors of San Luis Obispo County.

In 1991, DPR requested that the Executive Director increase the number of allowed camping units from 500 to 1000. On June 14, 1991, the Executive Director approved the increase, subject to concurrence by the San Luis Obispo County Board of Supervisors. On October 1, 1991, the Board of Supervisors concurred with the Executive Director's action and the increase

became effective. On May 18, 1993, the Board of Supervisors by letter to the Executive Director requested a decrease in the number of camper units to 500 with a camper unit to be defined "as a maximum of 2 self-propelled vehicles along with whatever additional vehicles they have towed to the site." This limit would allow 1,000 overnight self-propelled vehicles in the park (500 campsites x 2 self-propelled vehicles per site). The total number of vehicles this limit could allow is unknown because it is unknown how many additional vehicles would be towed into the site. DPR indicated that limits on individual overnight vehicles can be enforced more effectively than trying to identify a "camping unit," since there are no established campsites and it is relatively easy to count vehicles.

The action by San Luis Obispo County requesting a decrease in the number of camper units after several public hearings, along with the controversial nature of this matter, resulted in Coastal Commission review of coastal development permit 4-82-300 for condition compliance.

On March 16, 1994, the Commission held a public hearing on the matter of condition compliance for Coastal Development Permit #4-82-300. DPR's Off-Road Vehicle Division had agreed at that point to perform a capacity study. The Commission formalized this agreement by voting to:

1. Require the California Department of Parks and Recreation to perform and submit a carrying capacity study so that appropriate limits can be determined for day use and overnight use, as required by Coastal Development Permit No. 4-82-300 conditions #3 and #6 ... [The] scope of study ... will cover counting of all day time uses and users ... and type and number of vehicles. In addition, there will include a survey of infrastructure constraints ... and environmental and user conflicts/constraints.

   The study of the park's carrying capacity is needed to achieve full compliance with Special Conditions #3 and #6 of Permit 4-82-300.

2. Approve the 1,000 vehicle limit for overnight camping purposes at Pismo Dunes State Vehicle Recreation Area, consistent with the County's recommendation. This limit will be in effect until the completion of the carrying capacity study.

The Findings adopted in support of this action clarify that this study "...will be used as a guideline to determine the appropriate limits on day use, OHV use, and camper units at a Commission Meeting subsequent to submittal of the final report..." An interim OHV day use limit of 1200 vehicles had been recommended by Commission staff, but was deleted by the Commission at the hearing (letter of April 15, 1994, from David Loomis, Coastal Commission Asst. Dist. Director, to Jerry Johnson, DPR Deputy Director, Off Highway Vehicle Division).

## C. Department of Parks and Recreation Condition Compliance Submittal.

As described by DPR, a primary purpose of the Study is to establish a rational basis for restricting OHV day use "to a specified number of users," as required by Special Condition 3.D. Pursuant to the Commission's 1994 action, OHV day use currently is not limited except in the vegetated dune areas, where no OHV use is allowed. Overnight camping is limited to 1,000

vehicles until the completion of the carrying capacity study. Since 1994, DPR has in consultation with Commission staff prepared and submitted the final draft document *Oceano Dunes State Vehicular Recreation Area Off-Highway Vehicle Day-Use Carrying Capacity Study*, subsequently referenced as the *Study* (provided to the Commission under separate cover). The County of San Luis Obispo has reviewed the Study; their recommendations, along with the Board of Supervisors' Resolution No.98-213, are attached as Exhibit 1. DPR's Executive Summary of the Study is attached as Exhibit 2.

**Proposed Day Use Capacity Identified as 4,300 Vehicles.** Overall, the submitted *Study* recommends that "the OHV day use carrying capacity of Oceano Dunes SVRA be established at those levels that were prescribed in the Park's General Plan (i.e., 4300 Day Use vehicles including OHVs). . . ." The Department of Parks and Recreation (DPR) concluded that the 4300 figure would not have any adverse effects, based on the results of data collection and data interpretation concerning visitor types, interaction and compatibility of uses, visitor safety, sensitive natural resources, air quality, and sanitation and traffic impacts on the local economy.

More specifically, the Carrying Capacity Study investigated six criteria on which its conclusions are based. The six criteria are:

1. Visitor type, interaction and compatibility of uses
2. Visitor safety
3. Sensitive natural resources
4. Sanitation
5. Traffic impacts on the local community
6. Air Quality

**1. Visitor type, interaction and compatibility of uses.** A survey was randomly administered to 1650 participants at four locations selected in order to obtain a mix of visitors. Participants were interviewed either as they entered the SVRA in a vehicle or while they were within the SVRA and on foot rather than in a vehicle. Interviews of entrants were conducted at the Grand and Pier Avenue entrance kiosks. Interviews of those already inside the SVRA were conducted in the "midramps" area between Grand and Pier Avenues or along the beach strand area fronting the OHV open ride area. The survey was conducted on nine separate periods between Memorial Day and Labor Day of 1994, the idea being to obtain representative sampling of users on busy season holiday weekends (including Memorial Day, Fourth of July, and Labor Day), busy season non-holiday weekends, and busy season weekdays.

The following relationships were evaluated:

1. The influence of survey location on principal activity;
2. The influence of survey location on the importance of the use of a vehicle to the visit;
3. The influence of principal activity and the importance of the use of a vehicle to a visit;
4. The origin of the visitor and the principal activity;
5. The origin of the visitor and the importance of a vehicle to the visit;
6. Type of vehicle (i.e. sedan, truck RV, etc.) the visitor arrive in and the number of OHVs brought with them;

7. Type of vehicle (i.e. 2WD vs. 4WD) the visitor arrived in and the number of OHVs brought with them;
8. Primary activity and the number of children under age twelve;
9. Primary activity and the number of people with a physical handicap;

The analysis of the survey indicated that the "typical" visitor to the SVRA got there via a vehicle (89%), lives in the 93xxx zip code (generally, Ventura, Santa Barbara, San Luis Obispo, Monterey, Fresno, Kings, Tulare, and Kern counties) (57%), is part of a group of three with one child under twelve, is not camping (67%), and spends most of the time in the OHV area engaged in several activities (56%). Of the respondents, 72 percent felt that the use of a vehicle was very significant, if not extremely important to their visit. The majority of the day users (53%) planned on using the SVRA for less than three hours. Beach driving or OHV use were the principal reasons for coming to the SVRA for 38 percent of the respondents.

In order to identify relationships which might exist between the various parameters measured, three relationships were examined.

1. The influence of survey location on principal activity;
2. The influence of survey location on the importance of the use of a vehicle to the visit;
3. The influence of principal activity and the importance of the use of a vehicle to the visit;

Over 57 percent of those surveyed at the Pier Avenue kiosk indicated that either beach driving or OHV use was their principal activity. At the Grand Avenue entrance, 31 percent indicated that either beach driving or OHV use was their principal activity. At Grand Avenue, the next greatest activity was sightseeing (17%). Between Grand and Pier Avenues, the "midramps" area, 40 percent of the pedestrians surveyed indicated that walking was their principal activity, with sightseeing next (14%). Along the beach fronting the OHV area, 41 percent indicated that either beach driving or OHV use was their principal activity, with 31 percent indicating their principal activity was camping. These figures suggest that visitors segregate themselves by location according to whether or not beach driving or OHV use was their principal activity.

Seventy-three percent of those visitors entering at Grand Avenue indicated that the use of a vehicle was either very significant or extremely important to their visit. At Pier Avenue, the figure was 82 percent, at the "midramps" area the figure was 31 percent with 58 percent indicating that use of a vehicle was either minimally important or not important at all, and 85 percent of those surveyed at the beach fronting the OHV and camping area felt that use of a vehicle was very significant or extremely important to their visit. These figures suggest that the importance of the use of a vehicle to a visit increased as function of distance downcoast, toward and into the OHV and camping area, that the survey was conducted.

The influence of principal activity and the importance of the use of a vehicle to the visit has a high correlation. Eighty-two percent of the 17 recreational classes (e.g., OHV use, camping, fishing, horseback riding, etc.) of visitors had 50 percent or more of their participants state that the use of their vehicle was either very significant or extremely important to their visit. Only two (horseback riding and walking) of the 17 recreational classes has a majority of respondents who indicated that vehicle use was either minimally or not at all important to their visit. These correlations are not surprising since a majority of visitors got there via a vehicle (89%) and spend most of the time in the OHV area (56%).

A survey done in 1991 from April 22 to April 28 showed that 2601 on-highway vehicles entered the SVRA trailering in a total of 924 OHVs resulting in a weekly average OHV/on-highway vehicle ratio of 0.36. A survey between Memorial Day and Labor Day weekends in 1994 revealed an OHV/on-highway vehicle ratio of 0.81. A third survey was conducted from June 14 to June 20, 1996 which showed and OHV/on-highway vehicle ratio of 0.36. The first and third surveys counted all vehicles entering the SVRA. The Memorial Day - Labor Day survey was randomly administered to approximately one in five vehicles at the entrance kiosks and randomly to pedestrians in the SVRA.

Daily ratios from the 1991 survey for Monday through Thursday ranged from a low of 0.119 on Wednesday to a high of 0.218 on Thursday. The daily Monday through Thursday ratio from the 1996 survey ranged from a low of 0.26 on Wednesday and Thursday to a high of 0.36 on Monday. Ratios increase on Friday and peak on Saturday; however no figures were supplied.

DPR recommends that an interim ratio of 0.5 be utilized in calculating the day use carrying capacity. For long-term purposes, DPR recommends that separate off season (January, March April, December), transition (February, May 1-15, October 15 - November 30), and peak season (May 15 to October 15) ratios be developed over a three year period subject to refinement and update.

In summary, the survey conducted by DPR revealed generally that visitors to the SVRA came for day use activities, drove a motor vehicle to the SVRA and considered use of the vehicle on the beach to be very significant to their visit, and generally engaged in several activities including OHV use, camping, sightseeing, walking, and beach driving. Conflict stemming from interaction among visitors engaged in differing activities was generally low.

**2. Visitor Safety**

Investigation of visitor safety involved comparing criminal activity at the SVRA with that in the nearby city of Pismo Beach and other state parks, beaches and recreation areas and investigating vehicle-related accidents.

**a. Crime:** Crime statistics were evaluated based upon measurements of both peace officer workload and per capita crime rate at the City of Pismo Beach and at ODSVRA. The study revealed that during the years 1992-93, ODSVRA had almost three times greater badged peace officer presence per capita than that of the City. The arrest load per badged officer in the City in 1993 was 5.46 times greater than that of badged peace officers at the SVRA. The number of crime reports per badged officer in the City in 1993 was 4.69 times greater than that experienced at the SVRA.

The rate of arrests per capita in the City in 1993 was 1.86 times greater that that of the SVRA, and the per capita crime rate in the City according to the number of crime reports in 1993 was 1.59 times that of the SVRA.

July Fourth holiday weekends show more nearly equal crime statistic ratios. The number of citizens served by each badged officer per day of the July 4th weekend ranged from 1.06 to 1.44 times greater at the SVRA than at the City. The number of arrests per officer per day of the weekend in 1992 and 1993 was, respectively, 1.15 and 7.39 times greater at the City than

at the SVRA. However, for the July 4th 1994 weekend, the number of arrests at the SVRA was 1.14 times greater than at the City. Crime reports per officer per day for the 1992, 1993, and 1994 July 4th weekends were, respectively, 1.64, 1.28, and 1.32 times greater at the SVRA than at the City. The number of arrests per capita per day of this weekend in 1992 and 1993 was, respectively, 1.66 and 7.99 times greater at the City than at the SVRA. In 1994 the figure was 1.06 times greater at the SVRA than at the City. The number of crime reports per capita per day of the weekend in 1992 was 1.14 times greater at the SVRA than at the City, in 1993 1.22 time greater at the SVRA than at the City, and in 1994 was 1.22 times greater at the SVRA than at the City.

Although on an annualized basis the SVRA is statistically more crime free than the City, on a peak summer holiday weekend, that is not always true. Presumably this is because the July 4th weekend is the busiest time at the SVRA when the number of visitors is at its highest. Overall, the SVRA is statistically a safer place, in terms of crime, than the City of Pismo Beach.

In the comparison of crime at ODSVRA in relation to other state park units in 1994, ODSVRA proved to be safer than most of the other units. The units selected for comparison were all in southern California and included state beaches and state recreation areas (in this case, lakes). Five had greater visitation than ODSVRA and five less. Compared with ten other units of the system with crime rates per 100,000 visitor days ranging from 4.7 to 21.5, ODSVRA ranked third lowest with a rate of 7.4 per 100,000 visitor days. In total reported crimes, ODSVRA ranked fourth highest with 83.

**b. Vehicle-related Accidents:** To gauge visitor safety relative to vehicle accidents, DPR investigated the types of accidents, i.e., single vehicle, multiple vehicle, vehicle vs. pedestrian, bicycles, or animals; causes; rates; response time; and relationship of rate to visitation.

No vehicle accidents involving pedestrians, bicycles, or animals were recorded for 8 of the 10 years from 1987-1996. One vehicle-pedestrian accident occurred in 1993, which involved a fatality, and one in 1996. During 1997, two fatalities occurred in one single-vehicle accident. Multiple vehicle accidents from 1989 to 1996, 10.7 percent of al vehicle accidents at ODSVRA involved two or more vehicles.

The accident rate from January 1, 1994 to October 31, 1994, at ODSVRA was compared to that at five other SVRAs. Although ODSVRA had the highest total number of injury accidents, 191, ODSVRA had the second lowest accident rate, 0.23 accidents per 1000 visitors. For the period 1987 - 1996, vehicle-pedestrian accidents accounted for 0.001 percent of all reported accidents.

Although the total vehicle accident numbers have fluctuated from 387 in 1989 to 144 in 1990 to 242 in 1994 to 187 in 1996, the overall trend is downward. The absolute number of ambulance transports (and therefore the number and percentage of serious injury accidents) has shown a continuing decrease from 1985 to 1993. Likewise, transports per 10,00 visitors has shown a continuing decreases for the same period.

At least seven causes of accidents have been identified. Excessive speed accounted for 58 percent of all accidents in 1996. Driving under the influence of alcohol/drugs accounted for 5 percent of all 1996 accidents.

Similar to the crime statistics, vehicle accident rates are highest in the summer months, when the most vehicles are at the SVRA, although there has been a general downward trend of accidents on the major holiday weekends.

In summary, the analysis of visitor safety by DPR showed that there was generally less criminal activity at the SVRA than at the City of Pismo Beach or most other State Parks. It was concluded that, in terms of motor vehicle accidents, Ocean Dunes SVRA was safer than most other off-highway areas in the state and that the visitor accident rate is declining.

**3. Sensitive Natural Resources**

Several sensitive natural resources exist in the SVRA, including vegetation islands, wetlands, snowy plovers, and least terns. DPR's vegetation efforts began in 1983 under permit 4-82-300 and involved the professional input of Coastal Commission, Fish and Game, San Luis Obispo County, and DPR staffs. Initially, vegetation islands were identified and protective fencing placed around them. Large parts of the eastern and southern portions of the SVRA were fenced to restrict vehicle entry into vegetated areas and wetlands, including Oso Flaco Lake and Creek. Based on aerial photography and on-the-ground inspection, vegetated areas which were fenced off have generally become more densely vegetated and less fragmented. DPR has contracted with academic contractors to assist in on-going monitoring and to establish a Geographic Information System (GIS) database for use is mapping and analysis of habitat changes. The study found that the total vegetative cover in 1994 was 138 percent of that which existed in 1983; when revegetated areas were included, the increase was 308 percent. Density in 1994 was 218 percent of that in 1983; when revegetated areas were included, the increase was 435 percent.

Although numerous wildlife species inhabit the SVRA, the two that have received the most attention are the snowy plover and the least tern, both Federally listed species. In 1978, no plovers were found and human activity or development had destroyed or rendered potential plover habitat unsuitable. DPR's efforts to rehabilitate the habitat and protect the plovers has resulted in 41 plover nests being found in the SVRA in 1994. When nests are found, the area around the nest is fenced to prevent OHVs from physically destroying nests and eggs and from causing abandonment of the nesting site due to vehicle operation too close to the nest. DPR has worked with Fish and Game and the US Fish and Wildlife Service to develop a Habitat Management Plan to formally guide habitat management for plovers and terns.

DPR has undertaken a very large effort to enhance plover and least tern habitat and to protect their nesting sites. There is a clear connection between reducing or removing human activity and enhancing plover and tern habitat and reproductive success.

Overall, DPR's enhancement and management of sensitive resources, according to the *Study*, have met with much success. DPR has involved universities, other government agencies, and private groups in its resource management efforts. Since 1982, when DPR started active management of the SVRA, the sensitive natural areas have become significantly healthier. The Study states that the Snowy Plover/Least Tern monitoring and management program is probably the most successful in the State. DPR has developed a comprehensive Habitat Monitoring System to identify the health of natural communities and trends over time.

Based on the information contained in the *Study*, DPR demonstrates that environmentally sensitive habitats are in much better condition than they were in 1982 and that community values are being protected. The SVRA's General Plan of 1975 identified the carrying capacity to be 4300 vehicles. Given the improvements in enhancement and management of environmentally sensitive habitats and that no adverse effects on community values have been observed, DPR recommends that the day use carrying capacity be 4300 vehicles as identified in the 1975 General Plan (see Exhibit 3, attached).

**4. Sanitation**

From 1991 through October of 1994, no citations were written for illegal discharge of sewage from RV's in the SVRA. There are no records previous to 1991 to review. SVRA staff indicated that such illegal discharge was a problem in the 1970s but is not now. The change is probably due to educational effort of the SVRA staff, larger holding tanks in newer RV's, increased presence of rangers, and the availability of a dump station adjacent to the Grand Avenue entrance kiosk. Further, as many as 119 chemical toilets and six semi-permanent vault toilets are strategically placed throughout the SVRA during the summer. These are pumped on a regular basis. An evaluation of the chemical toilet facilities for the July 4th holiday weekend in 1992, 1993, and 1994 was performed. In 1992 the amount pumped equaled 46 percent of total chemical toilet capacity, in 1993 it was 30 percent of total capacity, and in 1994 it was 24 percent of total capacity. The effluent is discharged into the local sanitation district facilities. The sanitation district analyzed the SVRA's input into their sewer system and concluded that during the highest use month, the effluent was roughly equal to that generated by 24.3 homes. The local sewage treatment plant is just over 50 percent capacity, including the SVRA effluent. The Study substantiates the adequacy of the SVRA's restroom facilities; and, traffic impacts due to vehicles backed up at the entrances is shown to be insignificant.

**5. Traffic impacts on the local community**

Grand Avenue and Pier Avenue are the only access ways into the SVRA that are open to the public. The Grand Avenue entrance kiosk is adjacent to either vacant State Park lands or a parking lot. In contrast, the Pier Avenue entrance, the more heavily used of the two, is adjacent to a small retail business district and residential area. Thus backups of vehicles with associated noise and interference with local traffic has been most acutely experienced at Pier Avenue which, until it was widened to four lanes in 1994, was a two lane street.

A video camera was mounted at both kiosks on a variety of days, including Fourth of July, and times to record traffic levels. Analysis of the film revealed that backups were generally no more than two vehicles. On only one occasion were more than five vehicles backed up. Ironically, greater backups may occur during non-peak use times such as in the spring when Arroyo Grande Creek is running at its highest and may preclude vehicles from crossing it for several hours to travel downcoast. Crossings could be delayed for several days; presumably at those times visitors would leave the area relatively soon after arriving.

**6. Air Quality**

No data was provided for this criteria.

**D. Condition Compliance Analysis.**

**1. Standard of Review.** The applicable standards of review for the submitted OHV day use carrying capacity study, are permit conditions #3.D and #6, as cited in Finding B above and as further clarified by the Commission's 1994 action. The Study states that DPR is also responding to the policies contained in Coastal Act Sections 30210, 30214 and 30240. These policies were the basis for the original conditions placed on 4-82-300. As such, they provide a useful context for understanding the Commission's concern.

Section 30210 provides, in relevant part, that "...maximum access ...and recreational opportunities shall be provided for all people consistent with public safety needs and the need to protect ...natural resource areas from overuse."

Section 30214, anticipating the need for proper management of access, cites "...the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following:

(1) Topographic and geologic site characteristics.

(2) The capacity of the site to sustain use and at what level of intensity.

(3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses. ..."

Section 30240 requires that environmentally sensitive habitat areas (ESHA's) be protected from any significant disruption.

Several additional policies would serve to inform the condition compliance process, but are not cited in the Study. Sections 30230-30232 are relevant because of the presence of OHV's in the wet beach ecosystem and the Arroyo Grande Creek crossing, and because OHV-related motor vehicle fluids (e.g., from blown engines, crankcase drips, refueling activities, etc.) could produce detrimental cumulative impacts. Specifically, Section 30230 calls for protection of marine resources; Section 30231 addresses protection of coastal waters, streams and wetlands; and Section 30232 requires protection "...against the spillage of crude oil, gas, petroleum products, or hazardous substances .... Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur."

And, because dune vegetation plays a significant role in reducing wind erosion (and the subsequent movement of dunes over downwind native vegetation, wetland habitats, agricultural lands and developed areas), the relevant policy language in Section 30253(2) is to "...Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area..." Nonetheless, while these policies provide helpful guidance for determining how to apply the conditions, the permit conditions themselves are the applicable standard.

## 2. What is Carrying Capacity?

As discussed, the Commission's 1994 review of State Parks' compliance with conditions #3 and #6 of permit 4-82-300 required that the Department perform and submit a "carrying capacity" study so that appropriate day use limits could be determined as required by these conditions. As in the original permit, the Commission's primary concern was with the impacts of OHV's to environmentally sensitive habitat; the infrastructure capacity of the ODSVRA; and user group conflicts (e.g. safety).

The term "carrying capacity" generally refers to the size of a population that can be sustained by an environment or system indefinitely.[1] The carrying capacity of a system is a *threshold* number. If surpassed, the healthy functioning of the system will be diminished or the system may even collapse. Although often thought of as an ecological concept, carrying capacity is also relevant to social systems, such as urban infrastructure or recreational systems, including the ODSVRA.

The definition of the environment or system is central to a carrying capacity study. For example, the earth is a system that many argue has a finite human population carrying capacity. In contrast, a pond may also be analyzed as a relatively closed system or habitat that has a finite carrying capacity for particular species, such as red legged frog. Obviously, the carrying capacity of an environment will depend in part on the size and character of the system itself. A large grazing pasture will carry more animal units than a small grazing pasture.

Another difficulty in ecological carrying capacity analysis is that environmental systems are both dynamic, and often comprise multiple and related subsystems. For example, as discussed in more detail below, the Oceano Dunes complex is actually composed of at least four major and distinct ecological systems (habitats) that, over time, have fluctuated depending on various ecological and human disturbances. In other words, the system that is being analyzed for sustainability is a moving target. Are we trying to maintain the dunes as we suppose they existed prior to the introduction of OHV's? Or the dunes as they exist today? Should the baseline for a carrying capacity be pre-OHV, pre-1900, or perhaps pre-European influences?

**The Access/Preservation Equation.** The concept of carrying capacity, as applied to recreational use, can be summarized as: *the level of use a given area or resource can sustain, without significant degradation, over the long run.*

Recreational impacts, in general, can be offset with design and management measures. These measures range from enforcement to visitor education to better signage and facility design. Controlling the numbers of visitors or visitor vehicles is another important component. These concepts can be summarized by the following equation: H/R= Q, where ...

H= Habitat Preservation Effort
R= Recreation Impacts
Q= Environmental Quality

[1] See, for example, Meadows, Donella H., Dennis L. Meadows, Jorgen Randers, *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future* (Chelsea Green Publishing Co., 1992).

What the equation means, is that in order to maintain a defined level of environmental quality, habitat preservation efforts must keep pace with recreational impacts. Alternatively, the recreational impacts of each user must be reduced. Otherwise, environmental quality will be degraded.

### 3. Analysis of State Parks Submittal

***The Submitted Carrying Capacity Study Adequately Documents the Success of OHV Mitigation Measures Undertaken by DPR.***

As described earlier, the State Parks study proposes 4,300 vehicles as the OHV day use carrying capacity of the ODSVRA. Although the submitted study does not include a particular definition of carrying capacity, the 4,300 figure was first derived through a carrying capacity analysis done for the 1975 General Plan. As summarized in Exhibit 3, it was based primarily on *recreational* capacity analyses from other State Park units, with particular focus on the appropriate threshold number of vehicles that would maintain a beneficial visitor experience. It was not based on any ecological analyses of the Oceano dunes environment in relation to the appropriate number of OHVs.

The Study does rely on an analysis of six criteria which, overall, adequately documents the success of OHV mitigation measures undertaken by DPR. First, since the main attraction of the SVRA is the ability to drive on the beach and in the sand dunes, it stands to reason that most people go there for that purpose; that most arrive via motor vehicle; and that use of a motor vehicle is very important to most, especially the farther downcoast, into the OHV and camping area one goes. Second, It has been shown that visitor safety is generally better than in the surrounding community and other State Park units. Third, specific sensitive natural resources, especially vegetation islands and plover and tern habitat, have been targeted for enhancement, with good results. Those vegetated areas protected from OHV use have shown gains in area and density. Snowy plovers have made significant comebacks due to DPR's management. Finally, the Study supports a finding that sanitation is adequately provided for and traffic impacts have been reduced.

On the whole, the submitted carrying capacity study documents the great success of OHV mitigation measures undertaken by DPR and provides valuable information and conclusions that hitherto were not available in one document or were unknown. The *Study* presents evidence that the various management measures such as sensitive area exclusions and fencing prevent significant degradation of sensitive vegetation which stabilizes the dunes and prevents their wind-driven encroachment on adjacent wetland habitats, farmlands, and developed areas. The Study also asserts that DPR's present ranger force, educational program, and facility design is adequate to preserve habitats at their present level of quality, if OHV day use does not exceed 4,300 vehicles per day (other than the occasional high use period on holiday weekends).

However, as elaborated below, this documentation of successful OHV mitigation measures does not ask nor answer other questions that a complete ecosystem "carrying capacity" study must ask and answer. For this reason, and because peak holiday use and camper-associated OHV use are not included in the analysis, it would be premature to settle on the proposed day

use capacity of 4,300 vehicles. In general, revisions to the *Study* are necessary to establish the basic framework for identifying carrying capacity; to define the system(s) we are attempting to sustain; and to establish more clearly the point on the time scale where we want to maintain the dynamic equilibrium, especially with respect to barren and vegetated dunes. Discussion of these points follows.

***Further Study is Required to Define the ODSVRA Carrying Capacity***

To address the question of carrying capacity, the dynamics of the different ecosystems which are present at ODSVRA must be recognized. There are four main categories of natural resource areas (systems) in this case: 1) the ocean, especially the intertidal (wet) beach which is home to the Pismo clam and other species, as well as a feeding area for various shorebirds and a possible breeding area for grunion on certain high tide nights; 2) the barren sand areas, including the dry sand beach and adjacent barren dunes, which are either devoid of vegetation (or nearly so) but are used by the endangered Snowy plover for nesting; 3) the vegetated dunes, generally located further from the shoreline; and, 4) freshwater streams and ponds. Each of these ecosystems interacts with its neighbors.

Dunes which support native vegetation, as well as wetlands, are generally considered environmentally sensitive habitats (ESHA's). Some of the other natural systems may, at least seasonally, have ESHA-type attributes as well. The following is a more detailed consideration of these different natural resource systems found at ODSVRA:

<u>Wet beach -- clams and other infaunal organisms</u>: Although no specific data is cited by the Study, there does not appear to be any evidence that OHV's are directly impacting clams and other subsurface beach dwellers. OHV's do make it easy for clam diggers to access the beach, so it would be logical that there is an indirect impact from increased take of the resource. The allowable take is explicitly regulated by the Calif. Dept. of Fish and Game, and no issue of overuse of this resource has been raised with respect to OHV use levels. Nonetheless, future research with respect to compaction, petrochemical contamination, reproductive success, growth rates, etc., would be appropriate.

<u>Wet beach -- shorebirds</u>: As a feeding area for shorebirds, considerable disruption is possible whenever ORV's cruise along the water's edge close enough to make the birds move away or take flight. The result (we can presume) is similar to what happens when there is intense use by pedestrians, equestrians cantering in the surf run-up, or dogs chasing the birds. That is, less feeding success due to less time on the surface and a greater drain on the bird's energy reserves from having to run away or take flight frequently. Together these effects are said to "stress" the impacted species.

The submitted Study does not have enough data to ascertain a carrying capacity relative to the bird foraging function of the wet beach. To make such a determination, we would need to know:

1. How often does OHV activity stress the resident shorebird population, as compared to similar non-OHV recreational beaches?

2. Are wildlife population balances being upset by the presence of OHV's? Are there particularly skittish species which flee, resulting in overcrowding by another, more tolerant species such as gulls?

3. Are there direct impacts on food supply attributable to OHV's running on the wet beach, such as from vibrations or trace hydrocarbon residues?

4. Are there indirect impacts on food supply attributable to OHV activity, such as competition from crows or gulls which are attracted to left-behind picnic scraps?

5. Is the level of disruption attributable to OHV activity significant? Is there evidence of the local populations of any of the shorebirds naturally occurring at this beach being placed in jeopardy?

6. If there is a significant local disruption, is it also significant in terms of cumulative impacts over the whole system? (Which, in this case, could be considered the entire wet beach from Pismo Beach to Pt. Sal.)

7. If there are significant impacts to the system, are there available mitigation measures which could reduce the impacts to a less than significant level?

8. If the appropriate mitigation measures include testing a reduced OHV use level, what level would be appropriate to test? (Such reduction should be, at a minimum, statistically significant, in the mathematical sense.)

Wet beach -- grunion: According to the Calif. Dept. of Fish and Game, grunion runs occur in the Pismo Beach area. These small fish utilize the wet beach to lay their eggs. Perhaps because the Study concerns only day use carrying capacity, disruption of the fish's night time reproductive activity was not at issue. However, will their nests (if any) be mashed by day-time OHV use? Would this be a significant impact? Can such impacts be mitigated by banning driving on the wet beach after a grunion run? Would this be practical to enforce? This topic is not addressed by the Study.

Wet beach -- Summary. Only generalized concerns have been raised regarding the wet beach ecosystem. No information is available that demonstrate that marine resources or ESHA's are at risk from OHV activity. Nonetheless, further study is warranted because of the possibility of cumulative adverse effects on this portion of the marine environment. Accordingly, the acceptance of condition compliance is conditioned to require wet beach-specific studies regarding clams and other resident fauna; shorebird activities; grunion runs; and an assessment of impacts from motor vehicle fluids.

Barren sand -- Snowy plover habitat: The barren sand ecosystem is comprised of dry sand beach and dunes with sparse or no vegetation. This is a dynamic system which is characterized by a high level of natural disturbance. Here, a small shorebird known as the Western Snowy plover makes its nest on bare sand. Loss of suitable breeding habitat has contributed to the decline of the species, such that it is a Federally-listed endangered species. Accordingly, known Snowy plover breeding habitats are considered to be environmentally sensitive habitat areas (ESHA's). The bare sand portions of the plover's habitat also happen to (otherwise) be the most tolerant and suitable for intensive recreational use.

The problem is not the absence of bare sand areas, but that too many bare sand areas have been made unsuitable. For example, observations on the Monterey Bay shoreline reveal visitors approaching too closely to the difficult-to-see nests (frightening the parent bird off the eggs and exposing the eggs to gull predation); harassment by domestic dogs running unleashed on the beach; and direct predation by introduced red foxes. At Oceano Dunes, an additional element of stress is added by OHV activity, including noise and vibration. Also, young plover chicks have been reported to take shelter in the minimal (but only available) shade offered by the wheel tracks of an OHV. Of course, this places them in jeopardy of being hit by a following OHV. (Despite the apparent hazard, there is no significant evidence of plover chick mortality from this cause).

At both the Monterey Bay dunes and at Oceano Dunes, the Dept. of Parks and Recreation (DPR) has put forth a great deal of effort to mitigate impacts to nesting Snowy plovers. For instance, DPR representatives indicate that, usually within one hour of the sighting of a plover nest, an exclosure is erected around the site. An exclosure amounts to a wire mesh cage that the plovers can freely move through, but is large enough to exclude predators such as dogs, foxes and gulls. The cage also serves to mark the site so that OHV's won't inadvertently run over it.

DPR prepared, and the U.S. Fish & Wildlife Service approved, a Habitat Plan (HMP) for Snowy plover habitat at ODSVRA. The number of Snowy plover nests have increased from none before DPR management to a reported 41 in 1994. Because the plover is holding its own or increasing at ODSVRA, it can be surmised that the current management measures under the HMP are effective. Therefore, the Study concludes that the present levels of OHV activity do not represent a significant disruption of Snowy plover habitat. However, the data presented in the Study does not indicate what the extent of plover habitat or nesting success would be in the absence of OHV activity. More research is needed before a no-impact carrying capacity can be identified.

Barren sand -- other: No significant plant or animal habitats are readily evident on the majority of bare sand areas at ODSVRA. Nonetheless, a closer look will reveal evidence of insect activity, vertebrate and invertebrate insect predators, wind-blown seeds and other evidence of biologic activity. Thin strands of plant life are sporadically present only as native "pioneer" species, or remnants of introduced exotics such as European dune grass and South African iceplant. No ESHA issues have been identified here.

Vegetated dunes: This dynamic ecosystem is characterized by significant levels of natural disturbance (wind, moving sand) such that specially-adapted dune species have a competitive advantage over the typical coastal bluff flora found along the central coast of California. These dune systems along California's central coast which are naturally stabilized by native vegetation are generally recognized as ESHA's. While native dune plants are adapted to (and may actually require) disturbance at some level, they are vulnerable to trampling and crushing during the growing season. A single pass by an OHV can leave tracks -- and a disturbed site susceptible to wind erosion -- that will persist for the rest of the year. Totally precluding disturbance has an impact as well.

Staff has observed that in similar dune areas where disturbance has been completely precluded (as at Salinas River Lagoon National Wildlife Refuge), a thin crust forms on top of the sand. This thin and fragile crust is comprised of sand grains, presumably cemented together with calcium carbonate, kelp algins or other such materials available in the immediate

environment. The presence of such crusts, their environmental importance, and recreational impacts on them, have been reported elsewhere (for example, at Arches National Park in Utah).

It is not clear whether in coastal dune systems microcrust formation is concurrent with -- or follows -- establishment of native "pioneer" plants. It appears that they have a possible stabilizing effect on the dunes, by reducing wind erosion and consequent dune movement. The crust supports small colonies of fungi, moss or lichen, which yield a tiny amount of nutrients in an otherwise relatively sterile sand expanse. The thin but hard crust also appears to inhibit germination or at least rooting of native plant seeds, except where rodent burrows, animal or human footprints have broken the surface. At these broken-through locales, native plant seedlings are often profuse. It can be hypothesized that at these sites, the sandy "soil" is suitable for root penetration, nutrients are available from rodent droppings and/or fungi/moss/lichen remnants, and at least some moisture is to be found under the adjacent intact crust (in what is otherwise a very hostile and xeric environment).

Further stages of dune stabilization follow. As the native (or introduced) dune plants grow, their root systems tend to hold the sand together, providing resistance to wind erosion.

Further plant growth attracts plant eaters, particularly rodents and rabbits. These animals in turn attract predators such as hawks and grey foxes. Animal droppings, and the remains of dead plants and animals provide more nutrients, thus leading in successional stages to increasingly more vegetated and stable dunes.

Dune plants also cause wind velocities at the immediate surface to be reduced, acting as miniature "windbreaks." This causes the wind to drop its load of sand grains; the amount of sand that a given gust of wind can bounce along the dune surface is proportional to the velocity of the wind. Thus, any object which reduces wind energy results in dune building. Put another way, plant cover builds higher dunes.

The Study does not explain current scientific ideas concerning the successional process on dunes, nor does it present data to indicate what the extent of vegetated dunes would likely be in the absence of OHV activity. More research and monitoring is needed before a no-impact carrying capacity can be identified.

Freshwater ponds and streams.

A number of unusual freshwater lakes and marshes occur along the inland side of this dune formation. These include the relatively large Oso Flaco Lake. All of these wetlands have been made off-limits to OHV's. In addition, Arroyo Grande Creek runs through ODSVRA. According to the Study, this stream once supported a run of Steelhead trout, but none have been seen in the last 20-30 years. The stream empties into the ocean across the beach, and must be forded by all OHV's headed south of this point. While the Study does partially address the potential for impacts on the stream ecosystem, a better understanding of potential cumulative effects is needed -- especially with respect to petrochemical contamination.

Summary

The submitted carrying capacity study contains much valuable information, especially regarding steps that have been taken to mitigate for recreational impacts. These mitigations include fencing of vegetated islands, fencing of snowy plover and least tern nests, and revegetation of areas now closed to OHV use. The submitted *Study* does not contain the information needed to adequately assess recreational impacts "from scratch," that is, by describing first a dunes ecosystem without OHV use and then analyzing the impacts of OHV use on the previously OHV-free dunes ecosystem. The submitted *Study* implicitly assumes that there are no recreational impacts from OHV use because of the mitigation measures undertaken by DPR since 1982. In part, this stems from the fencing undertaken pursuant to permit 4-82-300. The location of the fencing, what areas should be fenced, involved input from DPR, Fish and Game, and Commission staff. While the location of the initial fencing did not necessarily mean that there might not be other areas that could be considered sensitive upon review and analyses of additional information, the findings of permit 4-82-300 do not indicate that additional areas beyond those identified at that time were considered "sensitive." Nonetheless, there may be additional sensitive areas, such as the wet sand area that have not been investigated. OHV use on presumably already-barren dune is not treated as an adverse impact.

There can be no doubt that DPR's management policies have enhanced vegetation island habitats by excluding OHVs from those areas. Similarly, by excluding OHVs from plover and tern nesting sites, DPR has enhanced the viability of those species. However, information is lacking regarding impacts to the wet sand area (clams, etc.) and what characteristics the dunes would have without OHVs, for example. In short, recreational impacts to the dunes ecosystem cannot be completely gauged without knowing what the ecosystem looked like and how its parts related to each other and to the whole of the ecosystem. The information provided allows for gauging impacts to the ecosystem since 1982; the conditions of this condition compliance are integral to being able to completely gauge recreational impacts.

***The Existing Equilibrium between Barren and Vegetatively Stabilized Dunes is an Appropriate Measure of Environmental Quality Pending Further Research.***

At ODSVRA, there appears to have historically been areas of both naturally barren and naturally vegetated dunes. The proposed levels of OHV use on the barren dunes will discourage establishment of pioneer plants and eliminate any likelihood of crust formation and other successional events which would lead to loss of bare sand areas. On the other hand, beyond the fences on the vegetated dunes, there is complete protection from OHV disturbance (and only minimal non-OHV recreational use and animal disturbance). The conditions favored by native dune plants will be perpetuated behind the fences, thus no reduction in this ecosystem is expected either.

This situation is dependent on having enough management measures in place to assure that OHV use is confined to the existing barren sand areas. If for example the OHV-user educational program were to fall short, if the fences were to fall into disrepair, or if the ranger patrol forces were cut back, OHV exclusion from the vegetated part of the dune system could no longer be counted on. Even a small number of "outlaw" OHV's could, with continuous activity, threaten the sustainability of this ESHA.

The separation of uses is absolutely critical to the capacity of the barren portion of the dune system to co-exist with the vegetated portion of the dune system. The capacity of the barren dunes to sustain motorized recreational disturbance is very great. The capacity of the (naturally) vegetated dunes to sustain motorized recreational disturbance is very small. The precise historic extent of the bare sand areas is not known, but appears to have been extensive. What is known is that excessive disturbance will increase the proportion of bare sand at the expense of habitat suitable for native dune plants. Formerly vegetated areas which were made barren through excessively concentrated recreational use -- including OHV's, equestrians, pedestrians -- have recovered nicely once they are fenced and restored. On the other hand, through artificial stabilization, especially through planting of (highly undesirable) European dune grass, the area of bare dunes could theoretically be greatly increased. However, in accepting continued substantial OHV use on part of the dune system, we are perpetuating (and probably emphasizing the distinction between) two distinct subsystems.

It is believed that a dynamic equilibrium once existed between the barren dunes and the vegetated dunes. That equilibrium was upset through the introduction of artificial stabilization (planting of European dune grass), and then again in the other direction by extensive OHV activity extending into naturally vegetated areas. The Study provides substantial evidence that an equilibrium has been reestablished.

Therefore, in recognition that the new equilibrium requires an attentive, adaptive management effort in order for it to be sustained, this action is conditioned to require that: 1) the historic photographic record be found, protected and analyzed, in order to better understand long-term trends especially as they concern the equilibrium between barren and vegetated areas; 2) research test plots be established, to better understand actual OHV impacts on the successional process; and, 3) that the interim day use limit of 4,300 OHV's be reduced proportionately in event the carrying capacity is found to be less or that reductions in management capability (e.g., because of a budget reduction) result in a loss of derived carrying capacity.

***A Maximum of 4,300 Day-Use Vehicles is Appropriate as an Interim Capacity Limit***

According to DPR, the 1975 General Development Plan carrying capacity of 4300 day use vehicles has not been reached; the highest number was 4229 on Fourth of July, 1985. No baseline datum had been established at that time with respect to the SVRA's coastal resources, so it is unknown what impacts that that near-1975 carrying capacity number had on the SVRA.

It is difficult to know if there is a better basis for any particular number over another for an interim capacity limit. It is unknown how thorough the analysis was that was used to determine a carrying capacity of 4300 vehicles. Intuitively, it would seem that a lesser number of vehicles would have a lesser impact on the resources of the SVRA and a greater number of vehicles would have a greater impact.

The limit of 4300 day use vehicles has historically been accepted absent any compelling evidence that it should be some other number. The further conditions of this condition compliance are designed to elicit whatever compelling evidence there may be for a long term

capacity limit. An initial long term capacity limit is expected to be determined within the next three years, according to the conditions of this condition compliance. Since any long term capacity limit must be based in part on monitoring of data over time, it is not inappropriate to set an interim capacity limit at 4300 day use vehicles, pending determination of a long term capacity limit.

***Recommended Modifications Submitted by San Luis Obispo County Should Be Incorporated.***

Condition 3.D required that the OHV day use limit be established "in consultation with and agreement by the County of San Luis Obispo..." The Study was in fact submitted to the County; following analysis by County staff and public hearings, the Board of Supervisors adopted Resolution No. 98-213, attached as Exhibit 1. The Resolution contains six specific recommendations, including endorsement of the 4,300 vehicle OHV day use limit and a call for a three year monitoring program to help establish use limits for the peak season holiday weekends. The first six conditions attached to this acceptance are each derived from the respective six County recommendations.

**E. Conclusion: The Submitted Carrying Capacity Study Only Partially Addresses the Requirements of Conditions 3.D and 6 of Coastal Development Permit 4-82-300**

Special Condition number 3.D does not state on what basis a specified number of OHV day users will be established, only that the County, the Executive Director, and the Department of Parks and Recreation (DPR) are to consult and agree to a specified number. As part of its condition compliance review of permit 4-82-300 in 1993-94, the Commission required DPR to determine the carrying capacity of Oceano Dunes SVRA.

The 1975 General Development Plan for the SVRA contained a less-than-one-page discussion of carrying capacity and a one page table listing the carrying capacity of various categories, e.g., number of people, number of vehicles, etc. (See Exhibit *3*) According to the discussion:

> These [carrying capacities] are based on regulated capacities used within other units of the California State Park System, together with currently known use patterns, densities, and problems at Pismo State Beach. The figures are not infallible. This is particularly true as relates to off-highway vehicle use, which is a relatively new activity and one with which most agencies have had little experience.
>
> It is imperative that these recommended carrying capacities be carefully monitored, studied, and adjusted as determined necessary to maintain environmental integrity of the resources and a quality experience for the visitor.

As early as the 1975 General Development Plan, there was a recognition that carrying capacity was dynamic, not static. Permit 4-82-300 also recognized this in Special Condition number 6 which allowed for limiting OHV access if OHV use is determined to be ". . .not occurring in a manner that protects environmentally sensitive habitats and community values. . . ." consistent with the permit's conditions and the County's LCP. Special Condition number 6 also allowed for increases in levels of OHV access if ". . .OHV use in the SVRA is consistent

with the protection of the environmentally sensitive habitat and community values, and/or that additional staff and management revenues become available to the DPR. . . ." Such increases would be approved by the Executive Director with concurrence of the Board of Supervisors, by resolution.

The appropriate way to determine if 4,300, or some other number of vehicles is the carrying capacity of the SVRA is to monitor the use and its impacts on the environmentally sensitive habitats and community values and then analyze the results of the monitoring -- and make adjustments in the allowable use limit. This implies an initial acceptance and approval of the OHV use on the beach and dunes. Sometimes referred to as adaptive management, this approach provides a framework for responding to changing conditions.

The Commission's prior actions relative to the SVRA evidence an initial acceptance and approval of the OHV use on the beach and dunes. The Commission approved the General Development Plan on February 27, 1975. In 1982, the Commission approved permit 4-82-300 (since amended four times) for the construction of fencing to keep OHVs out of the known locations of environmentally sensitive habitats. In 1994, the Commission required the production of a carrying capacity study for use in determining a limit on OHV use. So, while an initial acceptance and approval of OHV use on the beach and dunes is evident from the Commission's actions, Special Condition number 6 of the 1982 permit clearly indicates that OHV use could be reduced if review of OHV use showed it did not protect environmentally sensitive habitats or community values.

A carrying capacity study has now been completed, after a period of four years, which reviews the OHV use relative to protection of environmentally sensitive habitats and community values. It recommends that ". . .the OHV day use carrying capacity of Oceano Dunes SVRA be established at those levels which were prescribed in the Park's initial General Plan (i.e., 4300 Day Use vehicles including OHVs). . . ." San Luis Obispo County recommends " . . that the day use carrying capacity of Ocean Dunes SVRA be established at 4,300 day use vehicles which includes the off-highway vehicles. . . ." Both DPR and the County agree that there should be additional monitoring.

As conditioned, this condition compliance requires monitoring and analysis of environmental issues at Oceano Dunes in addition to those listed in the *Study*. Further, the conditions allow for adjustments of the 4300 figure, either up or down (with decreases required <u>immediately</u> if DPR's ability to protect sensitive resources is impaired). Given that a carrying capacity study has been produced which provides the first review of the resources at the SVRA and the impacts of OHVs, that additional monitoring will occur, and that OHV numbers may be adjusted based on the additional monitoring, an OHV day use level of 4300, as described in this condition compliance report, can be accepted only as an interim limit on use, rather than an established carrying capacity. Accordingly, this action is conditioned to require additional monitoring research, and an updated, complete carrying capacity study in order to satisfy the requirements of Conditions 3.D and 6 of coastal development permit 4-82-300.

# BOARD OF SUPERVISORS

COUNTY GOVERNMENT CENTER, Room 370 • SAN LUIS OBISPO, CALIFORNIA 93408-2040 • 805.781.5450

RECEIVED

JUL 23 1998

CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST AREA

*HARRY L. OVITT, Supervisor District One*
*LAURENCE L. LAURENT, Supervisor District Two*
*PEG PINARD, Supervisor District Three*
*RUTH E. BRACKETT, Supervisor District Four*
*MICHAEL P. "MIKE" RYAN, Supervisor District Five*

July 13, 1998

Mr. Rusty Areias, Chair
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219

Dear Mr. Areias:

SUBJECT: OCEANO DUNES STATE VEHICULAR RECREATION AREA

The Carrying Capacity Study for the Oceano Dunes State Vehicular Recreation Area prepared by the California Department of Parks and Recreation was the result of a collaborative effort by the Department of Parks, the County of San Luis Obispo and the California Coastal Commission and an inter-agency working committee. The Department of Parks has worked extensively to address outstanding concerns and to incorporate these items into the current Carrying Capacity Study. After fully considering the revised Carrying Capacity Study, the Board of Supervisors recommends that it be approved as submitted.

Access to the dunes is also a critical issue which has been raised by many area residents and recreationalists who are interested in creating an alternative entrance to the recreation area for off-highway vehicles to facilitate a more diverse use of the beach and address Arroyo Grande Creek impacts and safety. The review of alternative access routes to serve the ODSVRA will be addressed during the update of the South County Coastal and San Luis Bay Area Plans. In addition, the County has requested a grant from the Unocal Guadalupe Oil Spill mitigation fund for an alternate access evaluation and the funding for acquisition and improvements should an alternate route be identified.

In closing, the Oceano Dunes State Vehicular Recreation Area provides unique recreational opportunities for the residents of San Luis Obispo County and contributes to the economic well being of the surrounding communities. The ODSVRA is a valuable asset, and the Board of Supervisors supports the efforts taken to both protect and provide recreational opportunities at the park. The San Luis Obispo County Board of Supervisors would like to express their sincere appreciation for the opportunity to participate in the preparation and review of the Carrying Capacity Study.

Sincerely, Michael P. Ryan

**MICHAEL P. RYAN**
Chairman
Board of Supervisors

Exhibit 1
Board of Supervisors Letter and Resolution

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CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST AREA

# IN THE BOARD OF SUPERVISORS

COUNTY OF SAN LUIS OBISPO, STATE OF CALIFORNIA

Tues day July 7, 19 98

PRESENT: Supervisors Harry L. Ovitt, Ruth E. Brackett and Chairperson Michael P. Ryan

ABSENT: Supervisors Laurence L. Laurent and Peg Pinard

RESOLUTION NO. 98-213

**RESOLUTION SUPERSEDING RESOLUTION NO. 96-404 RECOMMENDING THE EXECUTIVE DIRECTOR OF THE CALIFORNIA COASTAL COMMISSION ACCEPT THE CONCLUSIONS OF THE DEPARTMENT OF PARKS AND RECREATION CARRYING CAPACITY STUDY**

The following resolution is hereby offered and read:

**WHEREAS**, the California Coastal Commission approved Coastal Development Permit 4-82-300 to the California Department of Parks and Recreation on June 17, 1982 for the operation of Oceano (formerly "Pismo") Dunes State Vehicular Recreation Area, and amendments to such permit on August 26, 1982, and August 22, 1984; and

**WHEREAS**, Condition 3(b) of the Coastal Development Permit states, "OHV day use will be limited to a specific number of users established in consultation with and agreement by the County of San Luis Obispo, Executive Director of the Coastal Commission and the Department of State Parks. OHV day use fees may be collected."; and

**WHEREAS**, on October 22, 1996, the Board of Supervisors adopted Resolution 96-404 which contained the following recommendations:

1. The California Coastal Commission accept the conclusions of the Department of Parks and Recreations' Carrying Capacity Study; and

2. The established day use carrying capacity of Oceano Dunes State Vehicle Recreation Area be set at 4,300 day use vehicles, including off-highway vehicles, and 1,000 camping vehicles; and

3. The Department of Parks and Recreation monitor this level of use for the four major holiday periods and the normal summer usage and reevaluate this day use limit every three years; and,

4. The California Coastal Commission direct an independent consultant to prepare a new study, under direct contract with the California Coastal Commission.

number has been determined; and

CD-34

Exhibit 1 (con't.)

**WHEREAS**, the staff of the California Coastal Commission, County of San Luis Obispo Planning and Building Department and the Department of Parks and Recreation have diligently worked together to develop a carrying capacity study in which the permitted carrying capacity number has been determined; and

**WHEREAS,** the day use carrying capacity study provides for ongoing review and monitoring by the County of San Luis Obispo, Department of Parks and Recreation and the California Coastal Commission; and

**WHEREAS**, the day use carrying capacity study is consistent with state and local coastal plans; and

**WHEREAS**, the carying capacity study provides for State Park management actions based upon the detailed assessment of social and environmental impacts associated with visitor use; and

**WHEREAS**, Oceano Dunes State Vehicular Recreation Area is highly valued and utilized for coastal access by a wide variety of recreationalists, including campers, hikers, picnickers, anglers, equestrians, and off-highway vehicle operators: and implementation of the day use carrying capacity study at this time will be in the public interest.

**NOW, THEREFORE, BE IT RESOLVED AND ORDERED** by the Board of Supervisors of the County of San Luis Obispo, State of California, as follows:

1. The Board supports the recommendations and conclusion of the Oceano Dunes Day Use Carrying Capacity Study, and recommends that the Coastal Commission accept the conclusions of the Carrying Capacity Study.

2. The Board recommends that the day use carrying capacity of Oceano Dunes SVRA be established at 4,300 day use vehicles which includes the off-highway vehicles transported into the recreation area.

3. The Board recommends that day use vehicle limits may be exceeded only during the four major holiday periods of Memorial Day, July 4th, Labor Day and Thanksgiving during an initial three year period to allow for comprehensive monitoring and comparative analysis of historical levels of visitor uses and impacts during these highest attendance periods.

4. The Board recommends that the Department of Parks and Recreation utilize the day use carrying capacity study recommendations to monitor the impacts of visitor use and annually provide the data and analysis to the County Department of Planning and Building and the California Coastal Commission.

5. The Board recommends that adjustments to the day use carrying capacity are to be made in consultation with and agreement by the County of San Luis Obispo, the Executive Director of the Coastal Commission and the Department of Parks and Recreation at the end of an initial three year monitoring period.

6. The Board recommends that any future modifications to the day use carrying capacity for the Oceano Dunes State Vehicular Recreation Area shall be based upon scientific and statistically valid data derived from monitoring and assessment.

Upon motion of Supervisor Brackett, seconded by Supervisor Ovitt, and on the following roll call votes, to-wit:

AYES: Supervisors Brackett, Ovitt, Chairperson Ryan

NOES: None

ABSENT: Supervisors Laurent, Pinard

ABSTAINING: None

the foregoing resolution is hereby adopted.

Michael P. Ryan
Chairman of the Board of Supervisors

ATTEST:

Julie L. Rodewald
County Clerk and Ex-Officio Clerk
of the Board of Supervisors, County
of San Luis Obispo, State of California
BY: CHERIE AISPURO Deputy Clerk

APPROVED AS TO FORM AND LEGAL EFFECT:

JAMES B. LINDHOLM, JR.
County Counsel

By: _____
Deputy County Counsel

Dated: 6·26·98

STATE OF CALIFORNIA )
COUNTY OF SAN LUIS OBISPO ) ss

I, JULIE L. RODEWALD, County Clerk of the above entitled County, and Ex-Officio Clerk of the Board of Supervisors thereof, do hereby certify the foregoing to be a full, true and correct copy of an order entered in the minutes of said Board of Supervisors, and now remaining of record in my office.

Witness, my hand and seal of said Board of Supervisors this 8 day of July 19 98.

JULIE L. RODEWALD
County Clerk and Ex-Officio Clerk
of the Board of Supervisors

By _____
Deputy Clerk

Exhibit 1 (con't.)

DRAFT

# Oceano Dunes State Vehicular Recreation Area

# Off- Highway Vehicle Day- Use Carrying Capacity Study

## *Executive Summary*

This study was performed cooperatively by the staffs of the Department of Parks & Recreation, the County of San Luis Obispo and the California Coastal Commission. It was completed in order to meet Condition 3. (b) Of Coastal Development Permit # 4-82-300 for Oceano Dunes State Vehicular Recreation Area (State Vehicular Recreation Area; formerly named Pismo Dunes SVRA). This condition reads "*OHV day use will be limited to a specified number of users established in consultation with and agreement by the County of San Luis Obispo and the Executive Director of the Coastal Commission and Department of State Parks. OHV day use fees may be collected.*" The findings and conclusions of this study are the result of significant effort over the past five years. A summary of this report follows.

The collective staffs developed the methodologies used in this research effort with the assistance of scientific experts and specialists from the academic, government and private sectors. These efforts were routinely shared with the representatives of the County of San Luis Obispo and the California Coastal Commission. These steps were taken in order to derive a mutually agreeable protocol which would not only generate the types of information which were needed for this assessment but which would also be repeatable and therefore scientifically valid.

The data collected in this study were carefully analyzed in the context of the Permit condition in question. Specifically, this information was reviewed and examined in order to assess the OHV day use carrying capacity of the Oceano Dunes SVRA. The



Exhibit 2

Executive Summary From ODSVRA Carrying Capacity Study

following criteria were determined to be important in making that evaluation. They included: visitor type, interaction and compatibility of uses, visitor safety, sensitive natural resources, air quality, sanitation and traffic impacts on the local community.

The results of an extensive visitor survey, which was conducted during the summer months of 1994, revealed a number of findings. Generally visitors were found to be: day users who resided either locally or were from the California Central Valley; had accessed the Park via a vehicle; viewed the importance of the use of their vehicle on the beach as being very significant to their visit; and generally engaged in several recreational activities while at the Park. These most popular of these activities included off- highway vehicle use, camping, sightseeing, walking and beach driving. The survey also found that the level of conflict from visitor interaction was generally low and that visitors with different and potentially conflicting recreational preferences naturally segregated themselves according to the different use zones designated by the General Plan.

An analysis of the safety of visitors to Oceano Dunes SVRA with regards to both criminal activity and vehicular related accidents was performed. The findings of this analysis revealed that the average visitor to the Park was generally safer from criminal activity than a visitor to the nearby City of Pismo Beach or most other State Parks. The results of the vehicular accident analysis revealed that Oceano Dunes SVRA was significantly safer than most other California off- highway vehicle areas, and that in fact the SVRA has experienced a steady downward trend in visitor accident rate for the past ten years.

An analysis of the information available regarding the Park's efforts to monitor, enhance and manage its natural resources found that both the magnitude of effort and success to be very significant. The OHMVR Division of DPR has engaged in a continuous succession of projects and studies since the Park's inception which has allowed the staff to fine tune a resource enhancement program which has met with much success.

Exhibit 2 (con't.)

In most cases, these projects have been developed through the collaborative effort of many academic institutions, government agencies and private groups whom are either specialized or interested in resource management issues. Many of these projects have been proactive and /or "cutting edge" and reflect a very positive attitude by the Park's management and staff towards the success of its resource management programs. The success of these efforts, and the positive attitudes driving them can be best exemplified by: 1). The Park's sensitive natural areas are significantly healthier than they were in 1982; 2). The Park's Snowy Plover/Least Tern monitoring and management program is viewed by most experts as the most advanced and successful in California; 3). That program and the knowledge gathered therein will soon serve as the template for other similar programs at the balance of California's State Beaches and Parks where these species are found and; 4). Development and use of a comprehensive Habitat Monitoring System which measures the health of the plant and animal communities and identifies trends or changes over time.

A review of the information gathered to analyze the criteria of sanitation showed that the capacity of the Park's restroom facilities to meet the needs of its visitors is far from being exceeded, even on the busiest of Holiday weekends. Additionally, the issue of dumping waste from holding tanks onto the beach no longer exists.

The traffic impacts of visitors to Oceano Dunes SVRA on the local community were found to be insignificant. A review of videotapes filmed on Holiday weekends revealed that at the Park entrances traffic was seldom backed up more than two cars deep. Certain Park improvements and protocol changes, as well as the one million-dollar Pier Avenue widening project (funded through a grant from the OHMVR Division of DPR) have been successful in mitigating this historic issue.

The establishment of data driven thresholds for carrying capacity evaluation factors is considered essential for triggering management actions in the SVRA. Monitoring programs described in this document will provide the data for analysis.

Exhibit 2 (con't.)

A range of management actions that may be implemented when thresholds are met or exceeded are described in the discussion sections for each factor elsewhere in this document.

Thresholds are established in this Day Use Carrying Capacity Study for the following monitored factors: Vehicular Accident Rate, Accident Response Time, and Natural Resource Habitat Conditions.

Oceano Dunes SVRA and the surrounding environs are a much different place today than they were in the 1970's or even in 1982 when Coastal Development Permit # 4-82-300 was first issued. Today, off- highway vehicle recreation is confined to an area within the Park, which represents less than 10% of the former area once used by OHVs. OHV use is restricted to approximately 3 miles of coastline where formerly 16 miles were once available. Activities within the Park are closely regulated in order to provide the visitor with a safe recreational experience and to protect the sensitive resources located within the SVRA. Through a number of controls and carefully orchestrated projects and programs the Park today has successfully addressed those issues which were once the center of controversy. In this study, the mutually agreed upon criteria of visitor compatibility, safety, air quality, sanitation, environmental protection and traffic impacts have been carefully analyzed with respect to assessing the OHV day- use carrying capacity of Oceano Dunes SVRA. The results of this assessment clearly show that the carrying capacity of Oceano Dunes SVRA as prescribed by the Park's General Plan is not being reached except two or three days each year on the busiest of holiday weekends.

The San Luis Obispo Board of Supervisors, County Planning Department staff, and the staff of the Central Coast Office of the California Coastal Commission have recommended and support the establishment and allowance of "bump days" during the four major holiday periods (Memorial Day, July Fourth, Labor Day and Thanksgiving). Bump days will allow the daily day use capacity to exceed the 4,300-vehicle limit specified in the SVRA General Plan and in San Luis Obispo County's Local Coastal Plan. This policy will take place for at least a three-year initial monitoring period, during

Exhibit 2 (con't.)

which time any impacts generated by increased visitation during the holiday periods will be identified, analyzed and measured. At the conclusion of the initial three year monitoring period the data from monitored factors will be analyzed and evaluated jointly by State Park, County and Coastal Commission staff and adjustments if any, including the raising of day use limits, will be mutually agreed upon.

Based upon the findings and conclusions of this extensive research effort, it is recommended that the OHV day use carrying capacity of Oceano Dunes SVRA be established at those levels which were prescribed in the Park's General Plan, (i.e., 4300 Day Use vehicles including OHVs), with provision for greater numbers during major holiday periods. Additionally, any future adjustments to that figure shall be based upon the outcome of specific monitoring and subject to the mutual agreement of the three principal parties named in the original permit.

Exhibit 2 (con't.)

## Carrying Capacity

The recreational carrying capacity is the amount of recreation use that an area can support without causing excessive damage to the physical environment and without lessening the recreational experience of the visitor. The design of sanitary facilities, parking, and other support facilities is based on the carrying capacity.

The determination of the recreational carrying capacity is a very complex process. This is particularly true in areas that are involved in the plan. Consider some of the variables at Pismo Beach, such as the changing space available on the flat beach at different tide levels. Or consider some of the variables involved in determining carrying capacity of off-highway vehicles in the Pismo Dunes State Vehicular Recreation Area, such as:

1. Number of vehicles operating at any given time (Some operators estimate that only 25 percent of sand vehicles are operating at one time.)

2. Range of vehicles (Some vehicles are confined to the harder sand because of tires, motor, and the like.)

3. Condition of dunes (soft or hard sand)

4. Relief of dunes (Some areas are rarely used while others are heavily used.)

5. Type of activity (hill climbing, touring, and so on)

Each of these elements must be considered in determining how many vehicles a given area of dunes can support at any given time.

The carrying capacities for Pismo State Beach and Pismo Dunes State Vehicular Recreation Area are recommended in Figure 9. These are based on regulated capacities used within other units of the California State Park System, together with currently known use patterns, densities, and problems at Pismo State Beach. The figures are not infallible. This is particularly true as relates to off-highway vehicle use, which is a relatively new activity and one with which most agencies have had little experience.

It is imperative that these recommended carrying capacities be carefully monitored, studied, and adjusted as determined necessary to maintain environmental integrity of the resources and a quality experience for the visitor.

Exhibit 3

Excerpt from approved 1975 General Development Plan
Re: Basis for Proposed 4300 Vehicle Carrying Capacity

FIGURE 9

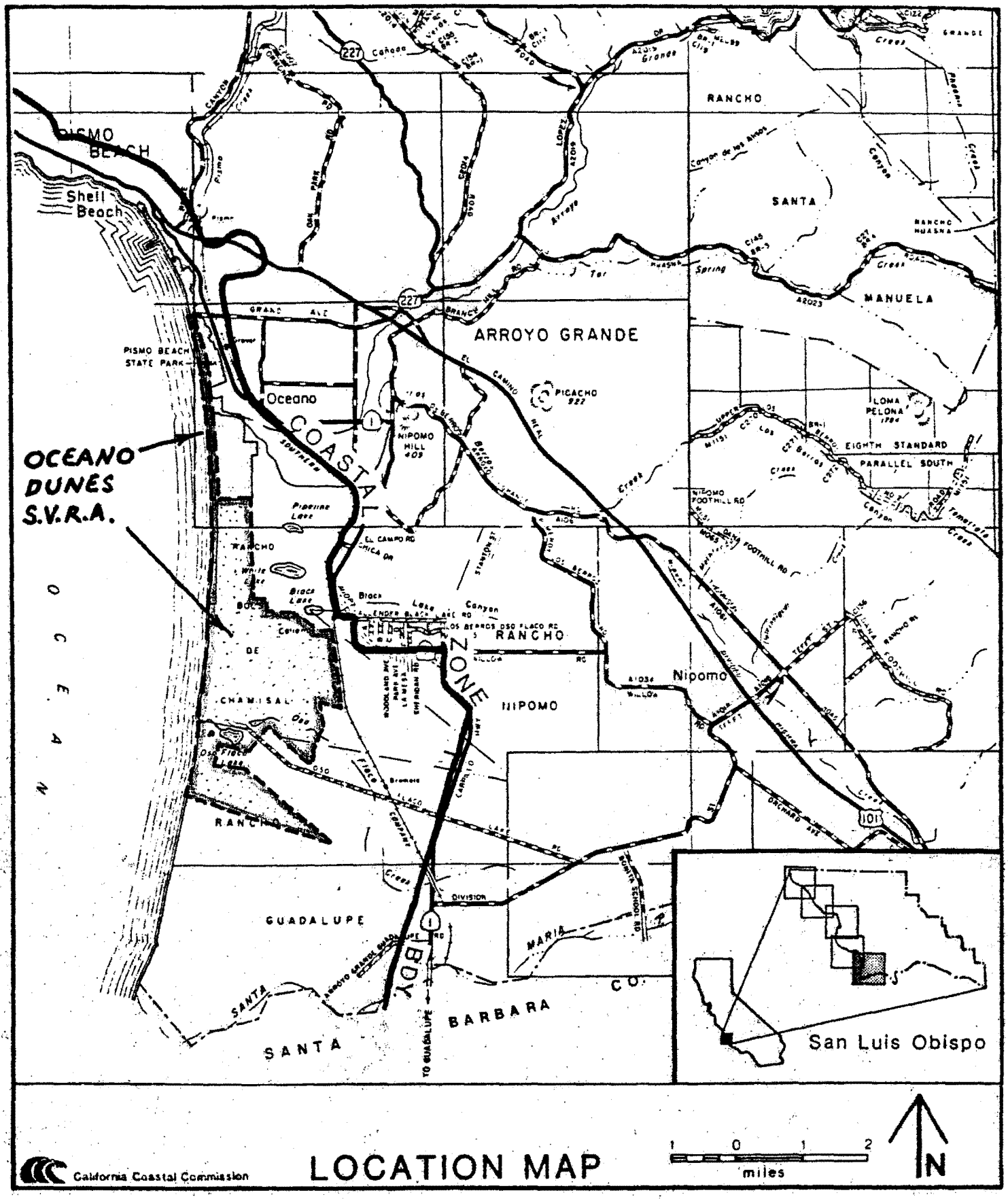
## CARRYING CAPACITY OF INDIVIDUAL AREAS

| TYPE OF USE AND AREA | | LINEAR FEET OF BEACH FRONTAGE | LIN. FT. BEACH PER PERSON | NUMBER OF SITES | EST. NO. OF PEOPLE PER CAR* | NUMBER OF VEHICLES | INSTANTANEOUS CAPACITY (PEOPLE) | X | TURNOVER FACTOR | DAILY CAPACITY (PEOPLE) |
|---|---|---|---|---|---|---|---|---|---|---|
| OVERNIGHT USE | SB BEACH | 8,000 | 8 | 200 | 5 | 200+ | 1,000 | X | 1.0 | 1,000 |
| | SB INLAND | --- | – | 185 | 5 | 185+ | 920 | X | 1.0 | 920 |
| | SVRA HIKE-IN | --- | – | --- | – | --- | 80 | X | 1.0 | 80 |
| | SVRA DUNE-PRIMITIVE | --- | – | 120 | 5 | 120+ | 600 | X | 1.0 | 600 |
| | SVRA BACK DUNES | --- | – | 300 | 5 | 300+ | 1,500 | X | 1.0 | 1,500 |
| | SVRA BACK DUNES OVERFLOW | --- | – | 380 | 5 | 380+ | 1,900 | X | 1.0 | 1,900 |
| | TOTAL | | | | | 1,185+ | 6,000 | | | 6,000 |
| DAY USE | SB BEACH-NON VEHICLE | 10,000 | 1 | --- | 4 | ** 1,280 | 10,000 | X | 1.5 | 15,000 |
| | SB BEACH VEHICLE | 28,000 | 5 | --- | 4 | 1,400 | 5,600 | X | 2.0 | 11,200 |
| | SB INLAND PICNIC AND OTHER | --- | – | 80 Picnic | 4 | *** 200 | 800 | X | 1.5 | 1,200 |
| | SVRA OHV STAGING AND DUNES | --- | – | 50 Picnic | 2 | 1,200 | 2,400 | X | 1.25 | 3,000 |
| | SVRA NATURAL AREAS AND OTHER Non-OHV AREAS | --- | – | 30 Picnic | 4 | 100 | 700 | X | 1.5 | 1,050 |
| | TOTAL | | | | | 4,280 | 26,800 | | | 31,450 |

LEGEND: SB = State Beach
SVRA = State Vehicular Recreation Area

* Maximum of 8 persons per unit for overnight use
** 50 percent off-beach parking provided
*** Not including off-beach parking

Exhibit 3 (con't.)




California Coastal Commission

# LOCATION MAP

County of San Luis Obispo

Sheet 5 of 5

EXHIBIT 4

DRAFT

RECORD PACKET COPY

# Oceano Dunes State Vehicular Recreation Area

# Off-Highway Vehicle Day-Use Carrying Capacity Study

*Prepared in partial fulfillment of*

*California Coastal Development Permit No. 4-82-300*

***Prepared by the Staffs of:***

**California Department of Parks & Recreation**

**California Coastal Commission**

**County of San Luis Obispo, Planning Department**

**FINAL DRAFT**
**30 June, 1998**

# Oceano Dunes State Vehicular Recreation Area

# Off- Highway Vehicle Day- Use Carrying Capacity Study

## *Executive Summary*

This study was performed cooperatively by the staffs of the Department of Parks & Recreation, the County of San Luis Obispo and the California Coastal Commission. It was completed in order to meet Condition 3. (b) Of Coastal Development Permit # 4-82-300 for Oceano Dunes State Vehicular Recreation Area (State Vehicular Recreation Area; formerly named Pismo Dunes SVRA). This condition reads "*OHV day use will be limited to a specified number of users established in consultation with and agreement by the County of San Luis Obispo and the Executive Director of the Coastal Commission and Department of State Parks. OHV day use fees may be collected.*" The findings and conclusions of this study are the result of significant effort over the past five years. A summary of this report follows.

The collective staffs developed the methodologies used in this research effort with the assistance of scientific experts and specialists from the academic, government and private sectors. These efforts were routinely shared with the representatives of the County of San Luis Obispo and the California Coastal Commission. These steps were taken in order to derive a mutually agreeable protocol which would not only generate the types of information which were needed for this assessment but which would also be repeatable and therefore scientifically valid.

The data collected in this study were carefully analyzed in the context of the Permit condition in question. Specifically, this information was reviewed and examined in order to assess the OHV day use carrying capacity of the Oceano Dunes SVRA. The

following criteria were determined to be important in making that evaluation. They included: visitor type, interaction and compatibility of uses, visitor safety, sensitive natural resources, air quality, sanitation and traffic impacts on the local community.

The results of an extensive visitor survey, which was conducted during the summer months of 1994, revealed a number of findings. Generally visitors were found to be: day users who resided either locally or were from the California Central Valley; had accessed the Park via a vehicle; viewed the importance of the use of their vehicle on the beach as being very significant to their visit; and generally engaged in several recreational activities while at the Park. These most popular of these activities included off- highway vehicle use, camping, sightseeing, walking and beach driving. The survey also found that the level of conflict from visitor interaction was generally low and that visitors with different and potentially conflicting recreational preferences naturally segregated themselves according to the different use zones designated by the General Plan.

An analysis of the safety of visitors to Oceano Dunes SVRA with regards to both criminal activity and vehicular related accidents was performed. The findings of this analysis revealed that the average visitor to the Park was generally safer from criminal activity than a visitor to the nearby City of Pismo Beach or most other State Parks. The results of the vehicular accident analysis revealed that Oceano Dunes SVRA was significantly safer than most other California off- highway vehicle areas, and that in fact the SVRA has experienced a steady downward trend in visitor accident rate for the past ten years.

An analysis of the information available regarding the Park's efforts to monitor, enhance and manage its natural resources found that both the magnitude of effort and success to be very significant. The OHMVR Division of DPR has engaged in a continuous succession of projects and studies since the Park's inception which has allowed the staff to fine tune a resource enhancement program which has met with much success.

In most cases, these projects have been developed through the collaborative effort of many academic institutions, government agencies and private groups whom are either specialized or interested in resource management issues. Many of these projects have been proactive and /or "cutting edge" and reflect a very positive attitude by the Park's management and staff towards the success of its resource management programs. The success of these efforts, and the positive attitudes driving them can be best exemplified by: 1). The Park's sensitive natural areas are significantly healthier than they were in 1982; 2). The Park's Snowy Plover/Least Tern monitoring and management program is viewed by most experts as the most advanced and successful in California; 3). That program and the knowledge gathered therein will soon serve as the template for other similar programs at the balance of California's State Beaches and Parks where these species are found and; 4). Development and use of a comprehensive Habitat Monitoring System which measures the health of the plant and animal communities and identifies trends or changes over time.

A review of the information gathered to analyze the criteria of sanitation showed that the capacity of the Park's restroom facilities to meet the needs of its visitors is far from being exceeded, even on the busiest of Holiday weekends. Additionally, the issue of dumping waste from holding tanks onto the beach no longer exists.

The traffic impacts of visitors to Oceano Dunes SVRA on the local community were found to be insignificant. A review of videotapes filmed on Holiday weekends revealed that at the Park entrances traffic was seldom backed up more than two cars deep. Certain Park improvements and protocol changes, as well as the one million-dollar Pier Avenue widening project (funded through a grant from the OHMVR Division of DPR) have been successful in mitigating this historic issue.

The establishment of data driven thresholds for carrying capacity evaluation factors is considered essential for triggering management actions in the SVRA. Monitoring programs described in this document will provide the data for analysis.

A range of management actions that may be implemented when thresholds are met or exceeded are described in the discussion sections for each factor elsewhere in this document.

Thresholds are established in this Day Use Carrying Capacity Study for the following monitored factors: Vehicular Accident Rate, Accident Response Time, and Natural Resource Habitat Conditions.

Oceano Dunes SVRA and the surrounding environs are a much different place today than they were in the 1970's or even in 1982 when Coastal Development Permit # 4-82-300 was first issued. Today, off- highway vehicle recreation is confined to an area within the Park, which represents less than 10% of the former area once used by OHVs. OHV use is restricted to approximately 3 miles of coastline where formerly 16 miles were once available. Activities within the Park are closely regulated in order to provide the visitor with a safe recreational experience and to protect the sensitive resources located within the SVRA. Through a number of controls and carefully orchestrated projects and programs the Park today has successfully addressed those issues which were once the center of controversy. In this study, the mutually agreed upon criteria of visitor compatibility, safety, air quality, sanitation, environmental protection and traffic impacts have been carefully analyzed with respect to assessing the OHV day- use carrying capacity of Oceano Dunes SVRA. The results of this assessment clearly show that the carrying capacity of Oceano Dunes SVRA as prescribed by the Park's General Plan is not being reached except two or three days each year on the busiest of holiday weekends.

The San Luis Obispo Board of Supervisors, County Planning Department staff, and the staff of the Central Coast Office of the California Coastal Commission have recommended and support the establishment and allowance of "bump days" during the four major holiday periods (Memorial Day, July Fourth, Labor Day and Thanksgiving). Bump days will allow the daily day use capacity to exceed the 4,300-vehicle limit specified in the SVRA General Plan and in San Luis Obispo County's Local Coastal Plan. This policy will take place for at least a three-year initial monitoring period, during

which time any impacts generated by increased visitation during the holiday periods will be identified, analyzed and measured. At the conclusion of the initial three year monitoring period the data from monitored factors will be analyzed and evaluated jointly by State Park, County and Coastal Commission staff and adjustments if any, including the raising of day use limits, will be mutually agreed upon.

Based upon the findings and conclusions of this extensive research effort, it is recommended that the OHV day use carrying capacity of Oceano Dunes SVRA be established at those levels which were prescribed in the Park's General Plan, (i.e., 4300 Day Use vehicles including OHVs), with provision for greater numbers during major holiday periods. Additionally, any future adjustments to that figure shall be based upon the outcome of specific monitoring and subject to the mutual agreement of the three principal parties named in the original permit.

## *Acknowledgements*

This study was completed with the assistance of many individuals. Most notably it represents the combined efforts of the staffs of the California Coastal Commission, California Department of Parks and Recreation and the County of San Luis Obispo. These staffs collaborated to establish the protocol for this study,.and then reviewed and edited this document. Special thanks goes to the following staff members for their involvement in this part of the study: Laura Lee Briggs, Tami Grove, Steve Guiney, Dave Loomis, Les Sternandt from the California Coastal Commission; David Amme, Michael Boyd, Jim Bramham, Michael Brown, William Dall, Dennis Doberneck, Nancy Dreher, Kathryn Foley, Clifford Glidden, Larry Helm, Phil Jenkins, Gerald Johnson, Rodger Kellogg, John Knott, Lester Maddox, Marilyn Murphy, Donald Patton, and Shana Watkins from The California Department of Parks & Recreation ; Pat Beck, John Butler, Alex Hinds and Lauren LaJoie from the San Luis Obispo County Planning Department, and Ruth Brackett, Chairperson, San Luis Obispo County Board of Supervisors.

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Les Weeks
Project Manager

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# Oceano Dunes State Vehicular Recreation Area

# Off- Highway Vehicle Day- Use Carrying Capacity Study

## I. Introduction

This report was prepared in response to Condition 3 (d) of California Coastal Permit 4-82-300. That text reads as follows "*OHV day use will be limited to a specified number of users established in consultation with and agreement by the County of San Luis Obispo and the Executive Director of the Coastal Commission and Department of State Parks. OHV day use fees may be collected.*" In accordance with the language and intent of that condition the staffs of the California Coastal Commission (CCC), the County of San Luis Obispo (SLO) and the Department of Parks & Recreation (DPR) have collaborated diligently over the last three years to both develop and carry out a protocol for meeting that condition. The results of that effort follow.

## *A. Background*

### 1. Local Geography

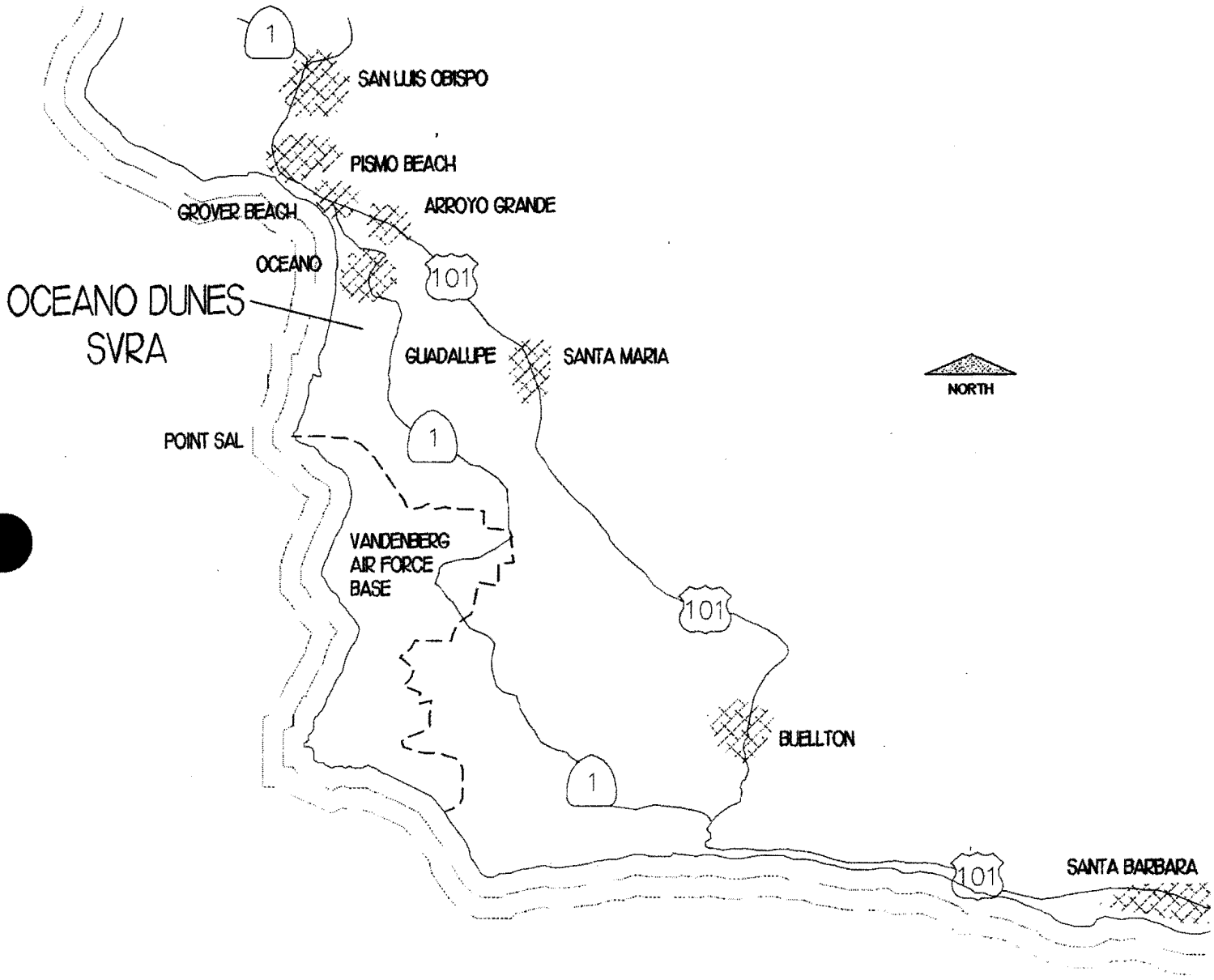
Oceano Dunes State Vehicular Recreation Area (ODSVRA), formerly Pismo Dunes State Vehicular Recreation Area (PDSVRA) is located on the central California coast along the southern coastal region of San Luis Obispo County. Primary access to this area is via US Highway 101 and California State Highway 1. The study area (i.e. ODSVRA) is bordered on the north by the non-vehicular section of Pismo State Beach, on the west by the Pacific Ocean and on the south by Oso Flaco Road and along its eastern and southeastern boundaries by Grover City and Oceano **(Figure 1)**.

ODSVRA encompasses 3590 acres and includes approximately six miles of sandy beach. It varies in width from a few hundred yards along its northerly two miles to up to three miles wide along its southerly portion **(Figure 2)**. ODSVRA itself is divided into different regions based upon allowable activities and include areas set aside strictly for resource protection, street legal vehicle use and a combination of street legal / off highway vehicle use **(Figure 2)**. The separation and delineation of these specific areas was developed through the past cooperative planning efforts of the staffs of the California Coastal Commission (CCC) and County of San Luis Obispo Board of Supervisors (SLO), the California Department of Fish & Game (CFG) and the California Department of Parks & Recreation (DPR).

Land use patterns of the lands adjoining the study area are characterized (from north to south), as ranging from urban commercial and residential to semi-urban agricultural and industrial, and eventually shifting to rural agricultural and industrial. Specifically, along Oceano Dunes SVRA's narrow northern end urban retail establishments, commercial campgrounds and urban residential land uses characterize

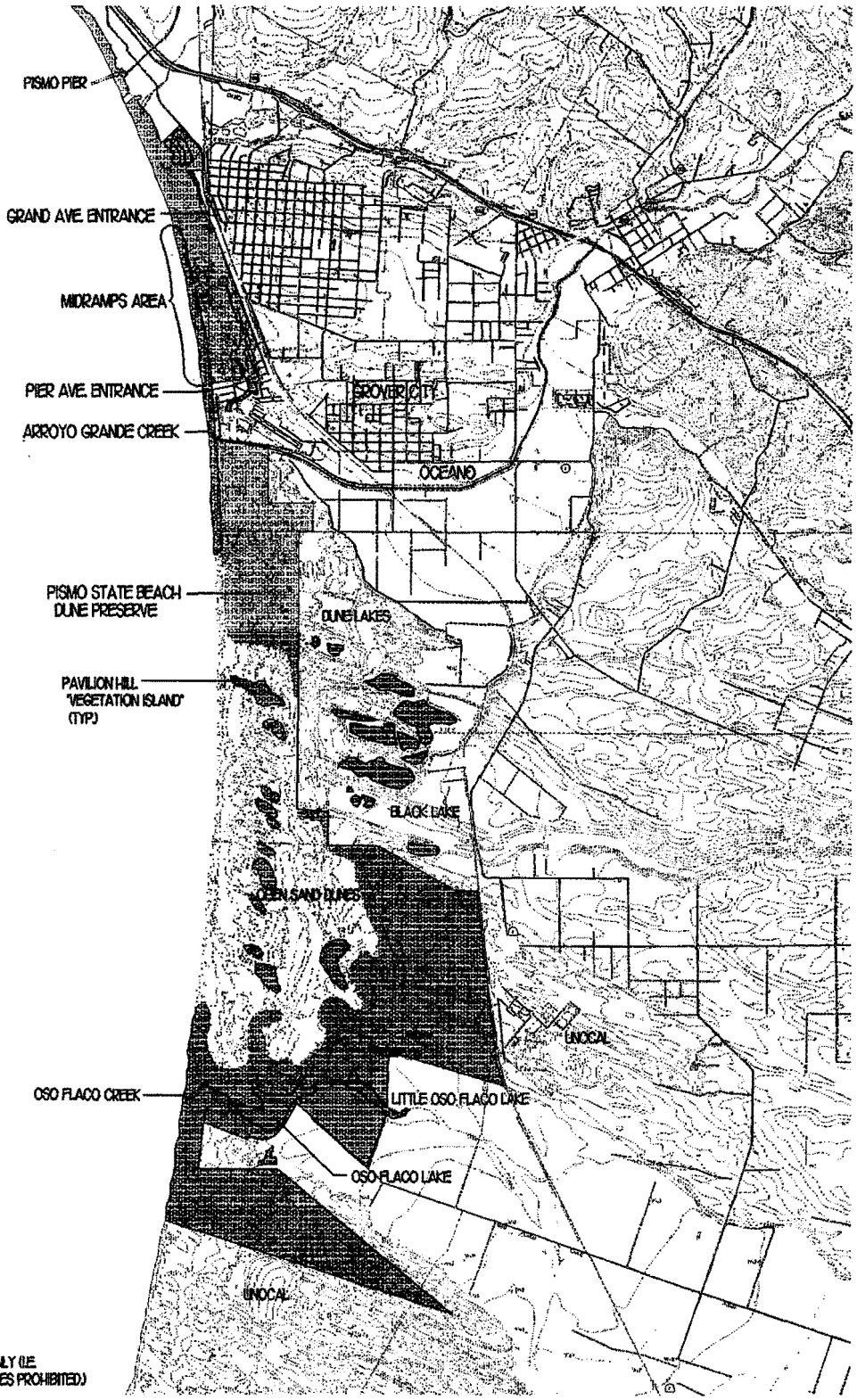
# FIGURE 1

***Vicinity Map***



# FIGURE 2

## *Oceano Dunes SVRA Within Nipomo Dunes Complex*




LEGEND

- STREET LEGAL VEHICLES ONLY (I.E. NON-STREET LEGAL VEHICLES PROHIBITED)
- OFF-HIGHWAY VEHICLE AREA
- SVRA RESOURCE MANAGED LANDS (VEHICLE USE PROHIBITED)
- PISMO STATE BEACH (INCLUDING PRESERVE)

NORTH

the eastern border. Progressing south, land use is characterized by a small rural airport, a State Park dune preserve, a large private duck hunting club, agricultural fields, an oil refinery and its associated oil fields, and open ranch lands. For a more detailed discussion refer to the Draft EIR on the PDSVRA Access Corridor Project (1991).

## 2. Geology and Geomorphology

Lying within or near the structural influence of both the Coast and Transverse ranges, the regional geologic structure in the Pismo Beach area is extremely complex. Investigations into the geologic record predating the Miocene Epoch are inconclusive. However since that epoch, records indicate several significant eustatic changes interlaced with periods of horizontal uplift. These events resulted in numerous separate marine and fluvial deposits, which by the middle Pleistocene were subject to major deformation and intense folding. During the glacial ages (e.g. Wisconsin ice age, latter Pleistocene) the sea level dropped considerably, causing streams and rivers to further undercut their stream beds thereby increasing the sediment load deposited offshore.

In California it is estimated that rivers have historically contributed more than 70% of the sand on beaches and the balance is typically derived from the material eroded via wave action against coastal cliffs (Meisenbach, 1974). Longshore currents, which are caused by waves striking the shore at a non-perpendicular angle, then typically transport this sand along the coastline. However, because the waves along Oceano Dunes SVRA move in a direction that is nearly perpendicular to the shore a longshore current is almost non-existent. This is very significant in that the sand, which is held in suspension due to wave action, is eventually driven onshore. Once there, it is blown inland to create relatively straight beaches backed by sand dunes.

The damming of streams and the general urbanization of watersheds has significantly reduced the amount of sediment which would have otherwise been transported downstream (Norris, 1964). The effect of various projects, which have altered the hydrologic characteristics of streams and watersheds, is much greater than might be initially expected. This is due to the fact that most of these projects have the net effect of reducing the peak flow levels with their high sediment carrying capacity.

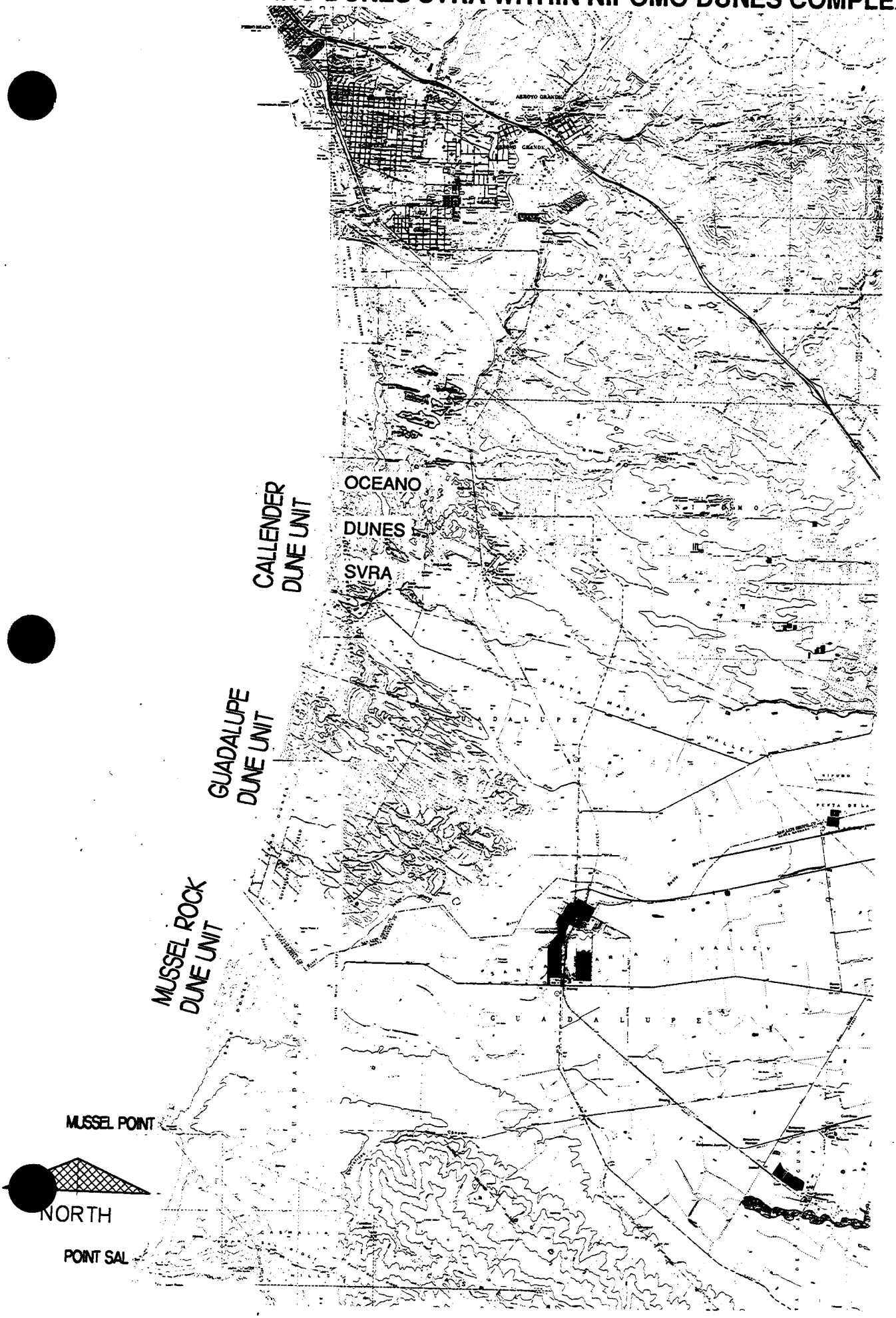
The California Department of Water Resources (1969) has studied the effect of these activities in the area of Oceano Dunes SVRA. Their studies have found that the construction of Twitchell Dam on the Santa Maria River has reduced total sediment loads by 75%. Similar projects (i.e. dams) which supply sand for the Nipomo Dunes have produced similar results. This study (which evaluated the region from Cape San Martin to the Ventura River) concluded that this coastal region now receives less than 50% of its historic sediment production levels.

Another study performed by the U.S. Army Corps of Engineers found that during the period of 1933 to 1964 there was a significant net loss of beach sands from the shelf areas of Oceano Dunes SVRA Beach. This loss was found to have resulted in a diminished supply of sand for onshore transport and a possible concomitant long-term reduction in the relief of the dunes. The ramifications of this are not fully understood. However, a review of aerial photographs since 1930 by the California Department of Parks & Recreation (1978, Pismo Dunes SVRA Acquisition: Final EIR) found that total vegetation cover had increased over many portions of the dunes. The only exception to this pattern was in those areas where there had been intensive ORV use. Given the evidence at hand, that report concluded that *"it is possible that reduced sediment input and onshore transport are accelerating the process of dune stabilization in other areas"*.

The dune complex in and around the study area has been discussed extensively by numerous authors (see Cooper, 1967). The entire complex has been referred to as the Santa Maria Dunes / the Nipomo Dunes / the Oceano Dunes and has been further delineated into three sub units: the Callendar, the Guadalupe and the Mussel Rock units **(Figure 3A)**. The Callendar is located between Arroyo Grande and Oso Flaco creeks and primarily rests on the Nipomo mesa and the coastal strip between this mesa and the ocean. The study area (i.e. ODSVRA) is located within this unit. The Guadalupe unit extends south from Oso Flaco creek to the Santa Maria River and rests on the broad Santa Maria River plain. The Mussel Rock unit is located furthest south, extending from the Santa Maria River south to Point Sal and rests both on the

# FIGURE 3A

## OCEANO DUNES SVRA WITHIN NIPOMO DUNES COMPLEX



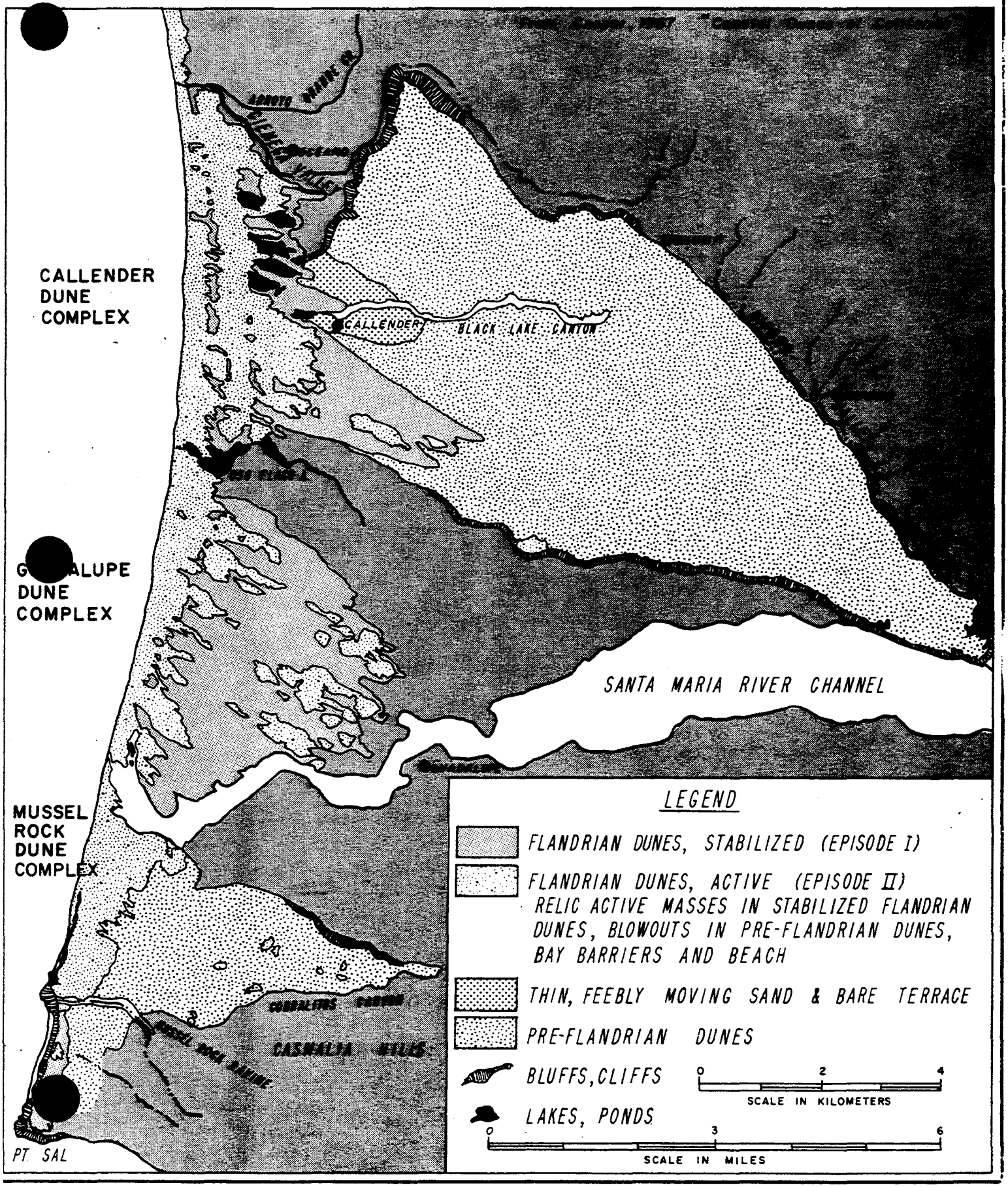
Orcutt Mesa and a portion of the Santa Maria River plain.

The formation of the entire dune complex has been dated as occurring either during the pre- Flandrian or Flandrian transgressions. The dunes formed during the pre-Flandrian are known to be very old and are believed to pre- date at least one glacio-eustatic cycle. These highly stabilized vegetated ancient dunes cover approximately 18,000 acres, extend up to eleven miles inland and cover most of Nipomo Mesa. The dunes formed during the Flandrian occurred during two major episodes of advance. Episode I is the older and represents those stabilized and vegetated dunes located just east of the dune preserve and ODSVRA **(Figure 3B)**. Dunes of this episode are generally found occurring no closer than 500 to 1500 feet from the ocean shore. The stabilized vegetated dunes around the dune lakes located adjacent to the study area represent dunes of this older episode. The dunes that were formed more recently are those of Episode II and are characterized as primarily as being active, unstable, generally unvegetated and reach all the way to the ocean shore. Representative examples of dunes of this episode are those found within the ODSVRA off-highway vehicle open ride area. Occasionally discontinuous fragments of the older stabilized vegetated Episode I dunes do penetrate the active non - vegetated Episode II dunes as far seaward as the foredune area. The vegetated dune ridge known as Pavilion Hill represents an example of this phenomenon. This dune appears to be a remnant of an older Episode I lateral dune ridge, which runs in a northwesterly to southeasterly direction to become part of the parabolic dune ridge that entraps and separates Big Twin Lake and White Lake.

FIGURE 3B

PLATE 2

# DUNE COMPLEXES OF THE NIPOMO REGION



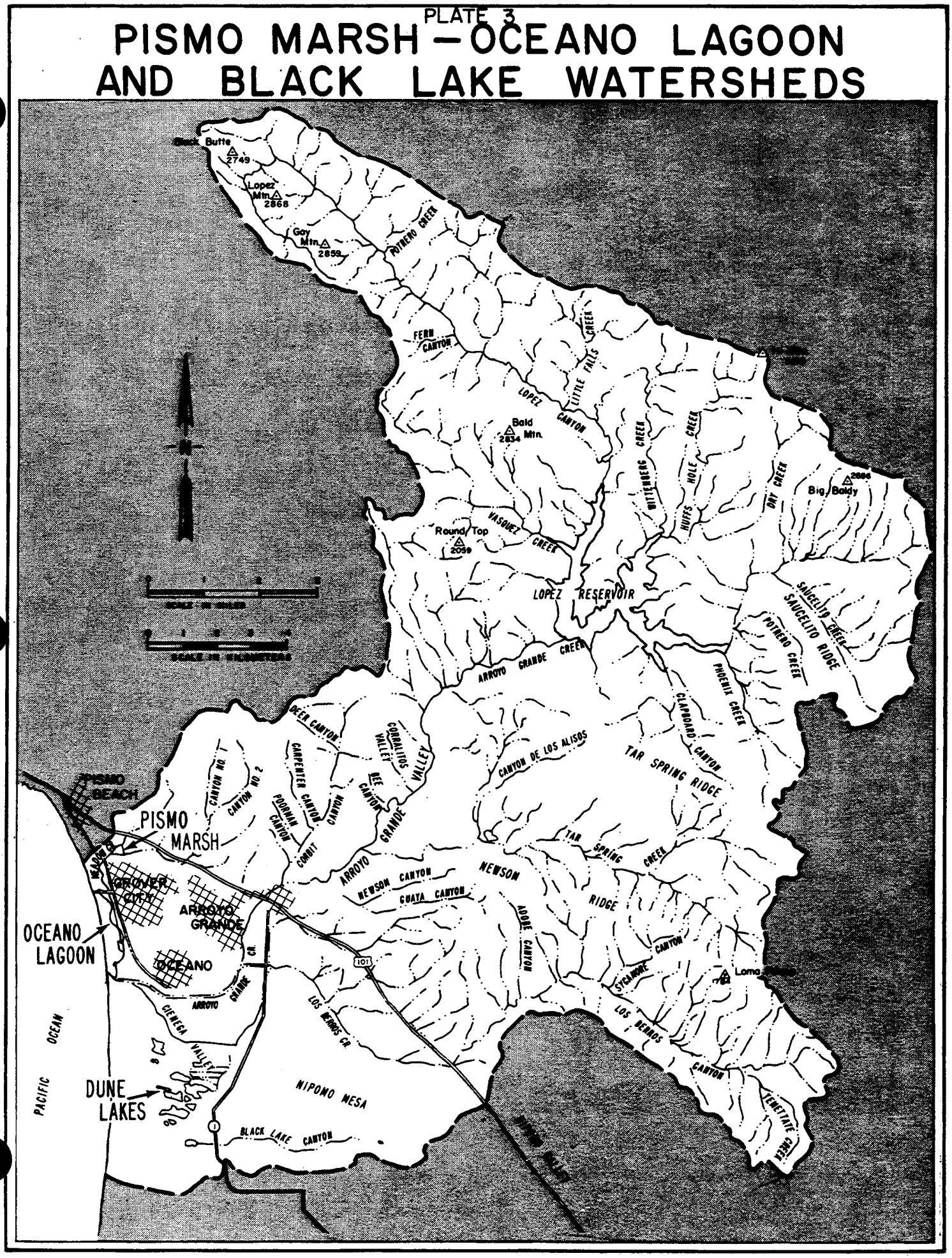

Source: *The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976, California Department of Fish and Game, U.S. Fish and Wildlife Service.

## 3. Hydrology

Arroyo Grande and Oso Flaco creeks today primarily influence the hydrologic regime of the study area. The flow within the former is controlled by Lopez reservoir, which typically only releases enough water to recharge the groundwater for local agricultural and residential use. As a result of this water management policy, Arroyo Grande Creek often only reaches the ocean during periods of high precipitation runoff **(Figure 4)**. Groundwater aquifers and agricultural runoff feed present day Oso Flaco creek. Historically though, the Oso Flaco creek drainage was that of the Santa Maria river, which in the 1850's was redirected via a system of levees to its present course **(Figure 5)**.

Despite such alterations to the natural hydrologic regime, the groundwater within ODSVRA is still often found within a few meters and commonly within a meter of the surface of low spots within the dunes **(Figure 6)**. The effect of such a high groundwater table is usually reflected in the wetland vegetation, which opportunistically inhabits such areas. In addition to the net reduction of sand into the dune complex (as discussed in the previous section), these alterations to the natural hydrologic regime have had other significant effects. One such example has been the loss of the effects of significant storm events, specifically the flushing and/or creation of new freshwater dune lakes. Analysis of historical aerial photos in and around Oceano Dunes SVRA show that previous to these hydrologic alterations, the routes of the local watercourses (e.g. Arroyo Grande, Oso Flaco Creek, Santa Maria River) were variable and led to the creation, scouring and destruction of numerous lagoons, lakes and their adjoining wetlands. The loss of this natural process can be expected to result in the eventual loss of some, if not all, of the freshwater dune lakes as they succumb to the natural processes of sedimentation and siltation.

**FIGURE 4**




Source: *The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976, California Department of Fish and Game, U.S. Fish and Wildlife Service.

PLATE 4

# OSO FLACO & SANTA MARIA RIVER WATERSHEDS

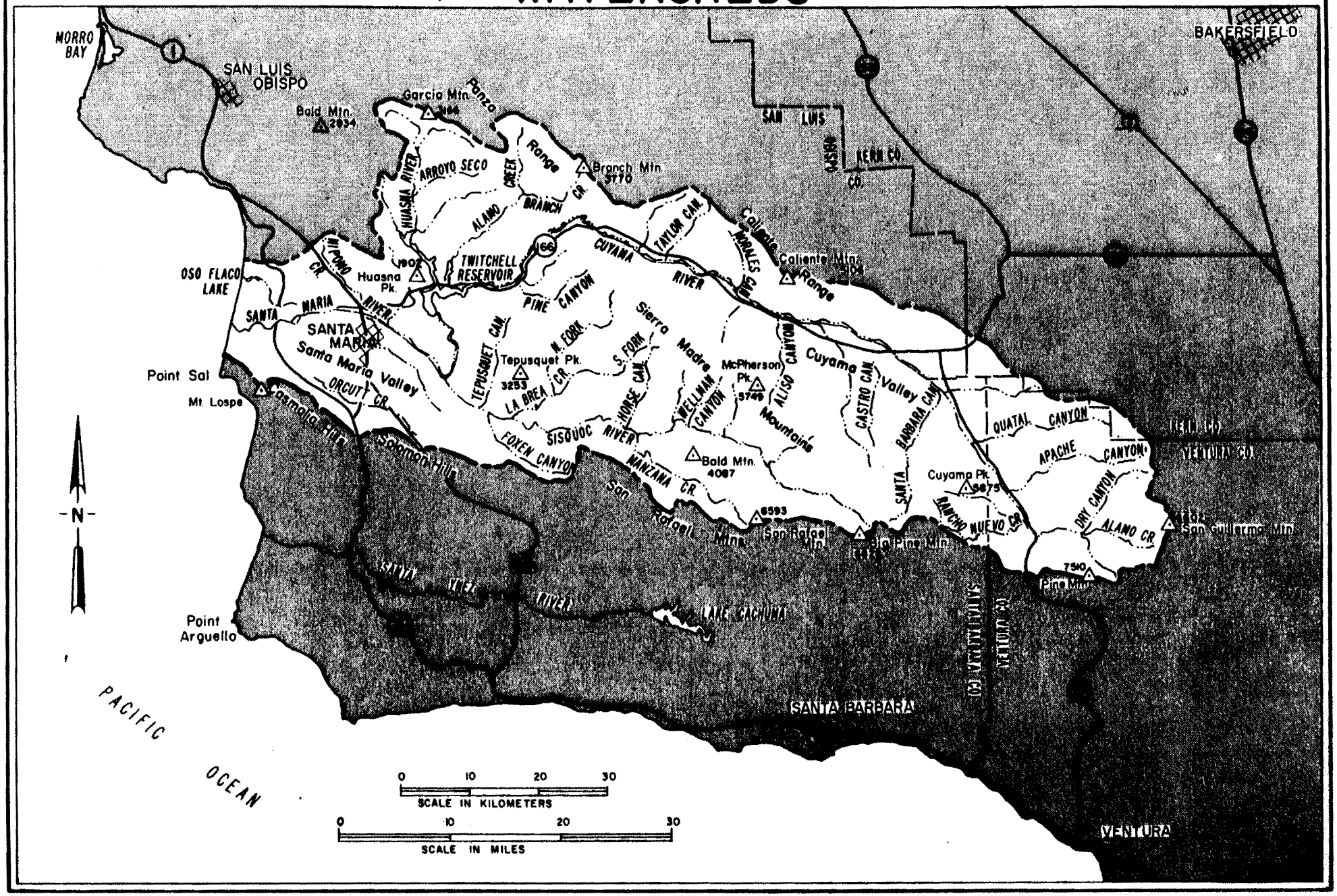



FIGURE 5

Source: *The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976, California Department of Fish and Game, U.S. Fish and Wildlife Service.

# FIGURE 6

PLATE 3a

## HISTORICAL WETLANDS – 1897

Source: *The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976, California Department of Fish and Game, U.S. Fish and Wildlife Service.

## 4. Meteorology

Oceano Dunes SVRA and the surrounding region are located within the California coastal fog belt and is characterized by a Mediterranean climate. Summers are typically warm and dry; winters are cool and moist. Average annual temperatures for the area range from 50° to 65° F (11 to 18 degrees Centigrade). Frost is not common and the growing season is approximately 360 days. The average annual precipitation for the region is slightly less than 15 inches; approximately 90% of which occurs during the months of November through April. Fog occurs throughout the year, but is particularly prevalent during the summer months when it may not burn off until late afternoon or not at all. A diurnal wind cycle moves air onshore by day and offshore by night. During the summer months this region is often subject to a strong onshore breeze which begins in the late morning and reaches its maximum strength in the late afternoon. The nighttime offshore or land breeze is not as strong and reaches its maximum in the early morning hours. During the late spring and early summer months afternoon onshore winds from the northwest are persistent in direction and velocity (typically 12-16 miles per hour). Prevailing winds are from the northwest. However, severe winter storms often produce strong gusty southerly winds. These same strong storm events erode the sandy beaches and their shore dunes re-depositing these sands offshore. This whole process is reversed during the calmer summer months allowing for the accretion of sand onshore in the form of beaches and/or dunes.

Oceano Dunes SVRA and its surrounding environs are also distinguished by a number of microclimates, which are particularly noticeable during the summer. These microclimates arise via the blockage of the cool marine air by the hillocks or dunes and can often result in temperature differences of up to 5 degrees C in as little as one-half mile from the shoreline. Not surprisingly, these microclimates have been found to play an extremely important role in the distribution of the different plants and animals within this ecosystem.

# 5. Ecology

## *a. Flora*

### 1. Plant Communities

Several plant communities have been described for the Nipomo dunes complex (Munz and Keck 1973, DPR 1975, Holland 1986, Kutilek *et al* 1991, Howald 1993, Holland and Keil 1993). Holland and Keil (1993) performed one of the most detailed studies of the dune plant communities in this area. In that study they identified six native plant communities within the Nipomo dunes. In addition to these native plant communities two other plant associations were identified: one primarily consisting of exotic or non-native species and another consisting of active coastal sand dunes (i.e. where no vegetation exists).

The California Coastal Commission in its staff report for Coastal Development Permit No. 4-82-300 filed on May 10, 1982 described a number of distinct habitats within the Nipomo Dunes complex. That report identified the Nipomo Dune complex as that area which extends south from the City of Pismo Beach approximately nine miles to the mouth of the Santa Maria River. That report further identified that complex as generally occurring west of Highway One and varying in width from one and one-half miles to several hundred yards. The extent of the complex was identified as approximately 12,150 acres or eighteen square miles. That report identified the following habitats and their respective acreage's as follows:

- Dune formations (9,400 acres; 77%); (i.e. unvegetated; see vegetated dunes below);

- Tidal flats (435 acres; 4%);
- Freshwater lakes (600 acres; 5%);
- Riparian vegetation (300 acres; 2.5%);
- Coastal salt marsh (35 acres; 0.3%);
- Mud flats (100 acres; 0.8%);
- Dune vegetation (200 acres; 0.16%);
- Coastal sage scrub (300 acres; 2.5%);
- Oak woodland (40 acres; 0.3%);
- NOT identified (possible arithmetic error) (740 acres; 6.1%);

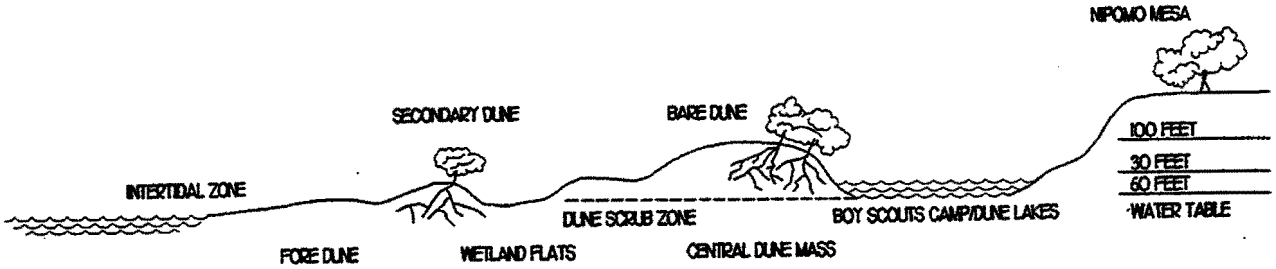
The following discussion will review nine plant associations or habitat types that have been identified as occurring within the Nipomo dunes. These plant associations are found in relatively discreet zones that are based upon their geographical proximity to the ocean shore and their exposure to offshore winds **(Figure 7)**. These associations are as follows:

- Coastal Strand
- Central Coastal Foredunes
- Active Coastal Dunes
- Central Coast Dune Scrub
- Coastal Willow/Wax Myrtle Thicket
- Coastal Dune Swale
- Coastal Freshwater Marsh and Ponds
- Coastal Dune Riparian Woodland
- Urban/Woodland Landscape

It should be noted that the designated OHV open-riding areas were generally assigned to those habitat types or areas that naturally lacked vegetation, (i.e. in the "active coastal dune" association). Less frequently, some OHV open-riding areas were located in areas similar in geographical location to the "coastal strand" and "central coastal foredune" associations. The establishment of OHV open-riding areas within these latter two

# FIGURE 7

***Dune Profile***




DUNE PROFILE
OCEANO DUNES STATE VEHICULAR RECREATION AREA

associations was undertaken only after careful evaluation and agreement by resource specialists from the California Coastal Commission, the California Department of Fish and Game, the California Department of Parks and Recreation and the County of San Luis Obispo. That evaluation concluded that the environmental effects of OHV open-riding designation in those areas would either be non-existent or not significant. This conclusion was in large part due to the fact that the open ride designations in these habitat types or areas was generally only allowed in those areas which were already characterized by non-vegetated bare sand.

### *a. Coastal Strand*

The coastal strand vegetation occupies the primary foredune area just above the high tide/storm tide line. This zone is characterized by shifting, unstable sand that originates along the adjacent coastline. The native vegetation found within this zone is principally low-growing, mat-forming, succulent perennials with deep and extensive root systems. Characteristic plants in this vegetation type include: beach saltbush (*Atriplex leucophylla*), coastal saltbush (*A. californica*), beach sand verbena (*Abronia maritima*), sea rocket (*Cakile maritima*), beach evening primrose (*Camissonia cheiranthifolia*), and beach-bur (*Ambrosia chamissonis*). These plants are primarily pioneer native plant species that often do not become permanently established and are washed or blown away during storms. Species diversity is very low and is generally limited to the seven plants listed.

### *b. Central Coast Foredunes*

The central coast foredune plant community occurs just inland from the beach and coastal strand habitat. This community type is identified as being located where dune succession has resulted in well-established dune hummocks or foredunes. These

vegetated foredunes form a corridor just inland from the beach and gradually grade into backdune communities (central coast dune scrub, dune swales, etc.) and non-vegetated active coastal dune habitat. This community is characterized by higher species diversity and greater continuity in total vegetative cover than that found in the coastal strand community. Common plants include: European beachgrass (*Ammophila arenaria;* non-native), beach sand-verbena, yellow sand-verbena (*Abronia latifolia*), beach-bur, sea rocket, African ice plant (*Carpobrotus edulis;* non-native), dune morning glory (*Calystegia soldanella*), dune evening primrose, cryptantha (*Cryptantha clevelandii*), dune poppy (*Eschscholzia californica maritima*), California aster (*Lessingia filaginifolia*) and coastal silver lupine (*Lupinus chamissonis*). Three rare plants are found in this plant community: beach spectacle pod (*Dithyrea maritima*), dune dandelion (*Malacothrix incana*), and surf thistle (*Cirsium thothophilum*).

### *c. Active Coastal Dunes*

Active coastal dunes are a natural phenomenon in the Nipomo dunes. This community/habitat type is characterized by a lack of vegetation. It is principally within this habitat type that OHV open ride areas have been designated. The dunes which constitute this habitat type form along the coastal strand and extend inland until they are eventually stabilized by the vegetation of the central coastal dune scrub. This habitat type constitutes the overwhelming majority of acreage found within the Nipomo Dunes complex (refer to the above Coastal Commission staff statistics). Active dunes of this habitat type can be located well removed from the coast and often cover older stabilized dunes, engulfing coastal dune scrub, dune swale, marsh, and riparian plant associations. The Nipomo dune area north of Oso Flaco Lake, which includes both the Department of Parks & Recreation Dune Preserve and Oceano Dunes SVRA, is a good representative example of this natural habitat type. Within this area of unvegetated moving sand, higher secondary dunes form in places a massive dune ridge reaching 100 feet above sea level. Both in the hollows windward of this ridge (i.e. foredune areas) and leeward of this ridge

are "islands" of coastal dune scrub, willow thickets, and dune swales. In areas more proximate to the ocean parallel ridges, mounds, and occasional hummocks of central coast foredune vegetation break up the active coastal dune habitat type. It is in those areas of active unvegetated dunes within the central coast foredune vegetation that one finds the nesting habitat for the endangered Least tern and threatened Western Snowy plover.

### *d. Central Coast Dune Scrub*

This community type occupies the inter-dune and secondary dune area inland of the central coast foredune vegetation on dunes which offer more protection from wind and salt spray and which are more stable (i.e. not subject to movement). Coastal dune scrub is a successionally older and more diverse native plant community than that of the previously described communities. The most common native plant species that occupies (and hence stabilizes) the sides and tops of the sand dunes located within this community type is mock heather (*Ericameria ericoides*). A number of other native perennial herbaceous and woody plant species occupy those sandy openings not dominated by mock heather. Principal amongst these are silver beach lupine, beach strawberry (*Fragaria chiloensis*), telegraph weed (*Heterotheca grandifolia*), Blochman's leafy daisy (*Erigeron blochmaniae*), dune lotus (*Lotus heermannii*), crisp dune mint (*Monardella crispa*), coyote bush (*Baccharis pilularis*), shrubby phacelia (*Phacelia ramosissima austrolittoralis*), wallflower (*Erysimum insulare suffrutescens*), locoweed (*Astragalus curtipes*), yarrow (*Achillea millefolium*), deerweed (*Lotus scoparius*), and coastal buckwheat (*Eriogonum parvifolium*).

### *e. Coastal Willow/Wax Myrtle Thicket*

This unique plant association is often found mixed with the coast dune scrub community. Arroyo willow (*Salix lasiolepis*) and wax myrtle (*Myrica californica*) are sub-trees and the vegetation appears as a thicket. Coastal willow/wax myrtle thicket is typically found in moist dune hollows that lack standing water or are found bordering marshes and ponds. This vegetation type is also successional to open ponds and the dune swale community (described below). Eventually active dunes often engulf these areas. The arroyo willow has adapted to this dynamic environment through the evolution of an extensive root system which is able to access moisture located in deep water tables. Pure willow thickets found at the crest of sand dunes are often viewed as an indicator of this process (i.e. an active sand dune having engulfed a hollow that at one time may have been a pond or dune swale). More precisely, as the sand shifts via wind erosion the willow is able to survive by continuously rooting from the buried branches.

This plant association is characterized by low species diversity, which in turn is due to the sparse understory found beneath the willows/wax myrtle growing there. The native wax myrtle grows with the willow primarily in moist flats and hollows behind the main dune ridge summit. Other native plants associated with the coast willow/wax myrtle thicket include poison oak (*Toxicodendron diversilobum*), gooseberry (*Ribes divaricatum*), blue elderberry (*Sambucus mexicana*), twinberry (*Lonicera involucrata ledebourii*), blackberry (*Rubus ursinus*), and coyote bush.

### *f. Coastal Dune Swale*

The coastal dune swale plant community exists in small valleys and swales found between stabilized and active dunes where small to large depressions are near the water table. This plant association is transitional (ecotonal) in nature and also represents latter

stages of hydrosere succession. It should be considered part of the dry end of the wetland vegetation mosaic that occurs in these valleys. The vegetation is a mixture of wetland and coastal dune scrub species. The willow/wax myrtle plant association is often found adjacent to this plant community. The primary ground cover in this community type consists of the creeping rush, *Juncus leseurii*. This plant often extends upward several feet onto the sides of adjacent sand dunes. The native sedges, *Carex pansa* and *C. praegracilis* tend to dominate the more mesic flats in the coastal dune swale. Other native plants associated with the coastal dune swale include: saltgrass (*Distichlis spicata*), creeping wild rye (*Leymus triticoides*), goldenrod (*Solidago californica*), California groundsel (*Senecio californica*), wire lettuce (*Stephanomeria virgata*), fiddleneck (*Amsinckia spectabilis microcarpa*), evening primrose (*Oenotheria hookeri*), wedgeleaved horkelia (*Horkelia cuneata sericea*), cinquefoil (Potentilla egedii), and spike rush (*Eleocharis macrostachya*).

### *g. Coastal Freshwater Marsh and Ponds*

This plant community is found in aquatic areas that develop in and around ponds, lakes, and slow moving water. Standing water, which is persistent for much of the year, is a characteristic of this habitat type. The vegetation is made up of shore plants, floating and emergent hydrophytes. Common plants associated with this community: saltgrass, rushes (*Juncus* spp.), monkeyflower (*Mimulus guttatus*), smartweed (*Polygonum punctatum leptostachyum*), marsh goldenrod (*Solidago confinis*), and stinging nettle (*Urtica holosericea*). Plant species located in the open water along pond shores (emergent macrophytes) include common tule (*Scirpus acutus*), common reed (*Phragmites communis*), bullrush (*S. cernuus*, *S. microcarpus*, & *S. pungens*), and cattail (*Typha latifolia*). Floating and creeping emergent aquatic species include: Ludwigia (*Ludwigia palustris*), marsh pennywort (*Hydrocotyle verticillata*), watercress (*Rorippa nasturtium-officinale*), mosquito fern (Azolla filiculoides), duck weed (*Lemna minor* and *L. minuta*), pondweed (*Potamogeton pectinatus*), and water mote (*Wolffia punctata*).

### *h. Coastal Dune Riparian Woodland*

This plant community consists of semi-aquatic vegetation found adjacent to freshwater marshes, ponds, and creeks. Black cottonwood (*Populous trichocarpa*), arroyo willow, yellow willow (S. *lasiandra*), velvet willow (*S. sitchensis*) are part of the riparian woodland type. Coast live oak (Quercus agrifolia) and wax myrtle are also found in scattered locations in successionally older portions of this community. Additional native plants include: marsh baccharis (*Baccharis douglasii*), coyote bush, mugwort (*Artemisia douglasiana*), poison oak, virgin's bower (*Clematis* sp.), hedge-nettle (*Stachys pycnantha*), blackberry, and giant wild rye (*Leymus condensatus*).

### *i. Urban/Woodland Landscape*

The introduction of exotic trees to coastal regions of California has had a major impact on the native plant communities. In many instances it has transformed the native plant associations into a completely new woodland habitat type. This is especially true with the introduction of pines native to other parts of California (*Pinus radiata* and *P. torreyana*), as well as with other exotic species (e.g. Allepo pine (*P. halapensis*), golden wattle (*Acacia pycnantha*), blue gum (*Eucalyptus globulus*), and myoporum (*Myoporum laetum*)). When taken together, these species have in effect created a completely new woodland-type landscape where none had previously existed (particularly so close to the beach). This landscape is well developed along the coast from Pismo Beach to Arroyo Grande Creek and along the outer fringes of the Nipomo Dune Complex. Native vegetation is generally somewhat compatible with these foreign tree species, existing in the understory and in clearings of this woodland. However, wherever the exotic Kikuyu grass (*Pennisetum clandestinum*) has been introduced, the native understory species have been completely eliminated. Where it exists, this grass often completely dominates the landscape. Other areas dominated by this community type often consist solely of a *Pinus/Pennisetum* association with very few other native or exotic plants.

## 2. Exotic Species

There are four introduced plants that can be considered major weeds and constitute a major threat to the plant communities and habitats of the Nipomo dunes. These are European beachgrass, African ice plant, pampasgrass (*Cortaderia jubata*), and veldtgrass (*Ehrharta calycina*).

a. *European beachgrass* has been extensively planted in this plant community in the past for the distinct purpose of sand dune stabilization **(Figure 8)**. The earliest recorded plantings in California were in 1869 in the San Francisco Bay area. Anecdotal evidence indicates that the introduction to this area may have been as early as the mid-1890's. Beachgrass spreads primarily by underground rhizomes or "runners". In those locales where it has been planted it usually overwhelms the native vegetation to form a monoculture. Beach grass can be considered a vegetation type unto itself because of its competitiveness and dominance. Beachgrass dominates the native coastal strand in the Nipomo dune area principally on the north end, near the town of Pismo Beach and in Pismo Dunes Natural Preserve. The southern portion of Pismo Dunes Natural Preserve immediately adjacent to Oceano Dunes SVRA has less beachgrass and instead is characterized by a native dune habitat that is naturally less vegetated. It is within this area of sparser vegetation that the Western Snowy Plover prefers to nest. Only a few clumps of beachgrass are present within the main off- highway vehicle riding area. Beachgrass is present, though not dominant within the fenced coastal strand north of the mouth of Oso Flaco Creek. South of Oso Flaco Creek in The Nature Conservancy Nipomo Dunes Preserve and further southward to the mouth of the Santa Maria River beachgrass is present intermittently in the coastal strand and is unfortunately expanding its range downwind into the secondary dune system. South of the mouth of the Santa Maria River beachgrass has never been introduced and as a result is almost completely absent from the central coast foredune vegetation. This locale, (i.e. south of the Santa Maria River), consists of hummocks of native foredune vegetation mixed with open

# FIGURE 8

***Photo of Dunes inhabited by European Beach Dune Grass.***

*Beachgrass has been employed in the stabilization of coastal dunes and is well established throughout the Nipomo region.*

active sand dunes. This area, which is presently relatively free of beachgrass, represents optimal nesting habitat for both the Least tern and Western Snowy plover and not surprisingly is also the largest nesting area in the Nipomo dunes for these species. In spite of extensive research by both academic and commercial interests (e.g. Dow Chemical, Monsanto) efforts to control this species via chemical or mechanical (e.g. backhoe) means have often been less than optimal. Ironically, in those areas to which this exotic pest species has been introduced, one of the most effective mechanisms of control, (i.e. in terms of cost and labor requirements), has been controlled off- highway vehicle activity.

*b. African ice plant*: The coastal foredune vegetation is also heavily invaded by African ice plant. Like European beachgrass, African ice plant is often viewed as a vegetation type unto itself. Wherever it has been introduced it has eventually dominated the native foredune vegetation. Unlike European beachgrass, African ice plant spreads vigorously by seed and has spread extensively throughout the Nipomo foredune area (i.e. from Pismo Beach to Point Sal). Pismo Dunes Natural Preserve has located within it an abundance of African ice plant intermixed with extensive stands of European beachgrass. African ice plant is very common within the foredune and secondary dune habitats of The Nature Conservancy Nipomo Dunes Preserve south of the mouth of Oso Flaco Creek. Another exotic ice plant common within the Nipomo Dunes complex is *Carpobrotus chilensis*. *C. chilensis* is most common in the secondary dune and back dune areas. Unlike *C. edulis*, *C. chilensis* does not dominate the native plant community. For example, on top of big Coreopsis Hill *C. chilensis* is completely compatible with this rich, diverse native plant community, growing in long single lines or spider-like tendrils, dying at its originating center while remaining vital along its many long tendrils or runners. Because of this fact, many ecologists tend to believe *C. chilensis* is actually native to California. Between the foredune and backdune areas both ice plant species hybridize. In this locale they are found to exist in a cline with the *C. edulis* types dominant closer to the ocean and *C. chilensis* types more common in the backdune areas.

*c. Pampasgrass* is a large bunchgrass native to southern Argentina that has become extremely weedy in moist sandy sites of the Nipomo dunes. If left unchecked, pampas grass can completely dominate a site and exclude all native vegetation. Individuals of this species often get quite large and are difficult to remove by hand. This species is often found mixed in the central coast foredune vegetation as well as in the central coast dune scrub and the coastal dune swale vegetation. Eradication efforts orchestrated by the OHMVR Division of State Parks and other organizations (e.g. The Nature Conservancy The California Native Plant Society, the Sierra Club, the Santa Maria 4-Wheelers, People for Nipomo Dunes, etc.) have been quite effective in their efforts to bring this pest species under control. Unfortunately this species is extremely prolific in its production of seed and as a result seedlings are constantly germinating in those areas either downwind or previously occupied. Continual vigilance will be necessary to completely remove this plant from the Nipomo dunes.

*d. Veldtgrass* is another exotic pest grass species. It was introduced in the early 1900's from South Africa as a perennial forage grass for livestock grazing. It is extremely well adapted to sandy soils and has naturalized in the region primarily on the Nipomo Mesa and is common in California coastal areas from San Luis Obispo County south to San Diego County. Veldtgrass has completely changed the vegetation composition of the more inland sites (backdunes) of the central coast dune scrub along the back of the Nipomo dunes. It is so dominant that the possibility of restoring this community may not exist and veldtgrass can now be considered a naturalized component of this central coast dune scrub. Because of this, eradication and restoration activities related to veldtgrass should concentrate in preventing this noxious grass from invading foredune vegetation and impacting those areas inhabited by rare and endangered plant species.

### 3. Rare, Endangered and Threatened Plant Species

The U. S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (DFG) are charged with listing and protecting rare plants at the federal and state level (Federal Endangered Species Act 1973, California Endangered Species Act 1984). In addition, the California Native Plant Society (CNPS) lists and monitors the status of all rare, endangered, and threatened plants in the *Inventory of Rare and Endangered Vascular Plants of California* (1988). A total of seventeen rare, threatened, endangered, or otherwise sensitive plant taxa have been recorded or may be expected to be found within the Nipomo Dunes complex. Two plants have recently been classified as endangered by the USFWS. Seven species are listed by that same agency as "candidate" species (Category 1 and Category 2). Category 1 (C1) are taxa which the Service has on file enough information on biological vulnerability and threats to support proposals to list them as endangered or threatened species. Category 2 (C2) includes taxa that the Service does not have enough data on file to support federal listing. The DFG lists one endangered plant (CE) and four threatened plants (CT). The CNPS lists eleven plants as rare and endangered in California (List 1B) and five plants on a "watch list" as having limited distribution (List 4). CNPS also gives each plant a R-E-D Code (Rarity, Endangerment, and Distribution with numbers ranging from 1-3 in each category; a higher number is an indication of greater sensitivity). This classification system is described below:

**R = Rarity:**

1. Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is presently low;
2. Occurrence is confined to several populations or to one extended population;

3. Occurrence is limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported;

**E = Endangerment:**

1. Not endangered;
2. Endangered in a portion of its range;
3. Endangered throughout its range;

**D = Distribution:**

1. Generally widespread outside California;
2. Rare outside California;
3. Endemic only to California;

Lastly, one other native plant, giant Coreopsis (*Coreopsis gigantea*), though not sensitive, merits monitoring and protection. Giant Coreopsis is common in its overall range, but the Nipomo Dunes represents the extreme northern extent of its range. **Figure 9** lists the rare, threatened, and sensitive plant species found or expected to be found on the Nipomo dunes along with their status with CNPS, USFWS and DFG. These sensitive plants exist in protected areas in and around Oceano Dunes State Vehicular Recreation Area. A few of the more common plants like crisped monardella and Blochman's fleabane daisy are found inside the enclosed vegetation islands within the Pismo Dunes State Vehicular Recreation Area. None of these plant species are located within the designated open off-road vehicle areas. This situation exists because the areas designated for open off-road vehicle use were specifically selected for their lack of sensitive vegetation and more often for their complete lack of vegetation.

# FIGURE 9

**Rare, threatened and endangered plant species of the Nipomo Dunes Complex**

| Scientific Name | Common Name | CNPS (R-E-D) | USFWS | California DFG |
|---|---|---|---|---|
| *Arenaria paludicola* | Marsh sandwort | List 1B; 3,3,2 | Endangered | Endangered |
| *Rorippa gambelii* | Gambel's watercress | List 1B; 3,3,2 | Endangered | Threatened |
| *Cirsium loncholepis* | La Graciosa thistle | List 1B; 3,2,3 | C1 | Threatened |
| *C. Rhothphilum* | Surf thistle | List 1B; 2,2,3 | C1 | Threatened |
| *Dithyrea maritima* | Beach spectacle-pod | List 1B; 3,3,2 | C2 | Threatened |
| *Delphinium parryi* | Dune larkspur | List 1B; 3,2,3 | C2 | None |
| *Monardella crispa* | Crisped monardella | List 1B; 2,2,3 | C2 | None |
| *M. frutescens* | San Luis Obispo monardella | List 1B; 2,2,3 | C2 | None |
| *Orobanche parishii* ssp. *brachyloba* | Short-lobed broomrape | List 1B; 2,2,2 | C2 | None |
| *Horkelia cuneata* ssp. *sericea* | Wedge-leafed horkelia | List 1B; 3,3,3 | None | None |
| *Erigeron blochmaniae* | Blochman's fleabane daisy | List 1B; 1,2,3 | None | None |
| *Erysimum insular* var. *suffrutescens* | Suffrutescent wallflower | List 4; 1,2,3 | None | None |
| *Juncus acutus* var. *sphaerocarpus* | Giant spiny rush | List 4; 1,2,2 | None | None |
| *Malacothrix incana* | Dunedelion | List 4; 1,1,3 | None | None |
| *Prunus fasciculata* var. *punctata* | Desert almond | List 4; 1,1,3 | None | None |
| *Ribes divaricatum* var. *pubiflorum* | Straggly gooseberry | List 4; 1,1,2 | None | None |
| *Coreopsis gigantea* | Giant coreopsis | None | None | None |

4. Historic Vegetation Changes

European beachgrass was introduced on the northern dune area near Pismo Beach and in front of Pavilion Hill) early in the century (circa 1900; **Figure 10**). Beachgrass was well established in the vicinity of Grand Avenue by 1950. After this time, beachgrass was planted extensively in order to stabilize the open sand dune area just north of Pier Avenue (west of the State Beach campground). Analysis of aerial photographs taken in 1949 show the region in front of Pavilion Hill to be dominated by beach grass. While there is no direct confirmation of beachgrass plantings having occurred south of Pier Avenue after 1950, by 1961 beachgrass was well established in the foredune areas where the Pismo Dunes Natural Preserve is located today and along the foredunes south of Oso Flaco Lake.

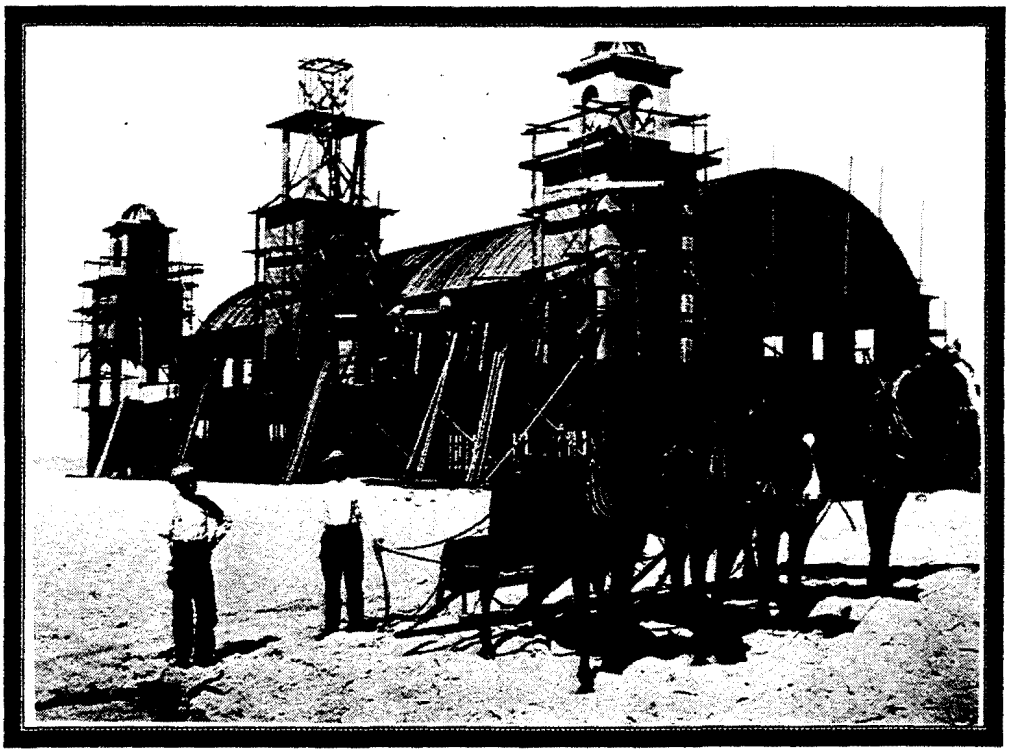
African ice plant was also introduced along the Nipomo dunes early in the century. Unlike European beach grass, which tends to spread slowly from sites of introduction, ice plant spreads rapidly via wind, water, and wildlife.

Not surprisingly the structure of a dune system dominated by native plant species is very different from that of one dominated by the exotic beachgrass and ice plant **(Figures 8, 11)**. Specifically beachgrass and ice plant cover the foredunes with dense vegetation, smother the native vegetation and rapidly build the foredunes in both height, and mass. These resultant changes to both dune structure and ecology have been determined by USFWS experts to have a significant deleterious effect on the nesting success and survival of the Federally Threatened Western Snowy Plover. On the other hand, foredunes dominated with native plant species tend to be less densely vegetated, if at all, and do not build to heights above 10 to 15 feet. Native foredunes are relatively low and run parallel to the wind direction whereas foredunes dominated by beachgrass and ice plant are steeper, higher and wider and often build perpendicular to the prevailing winds.

During the period 1949 through 1961 the mouth of Arroyo Grande Creek changed

# FIGURE 10

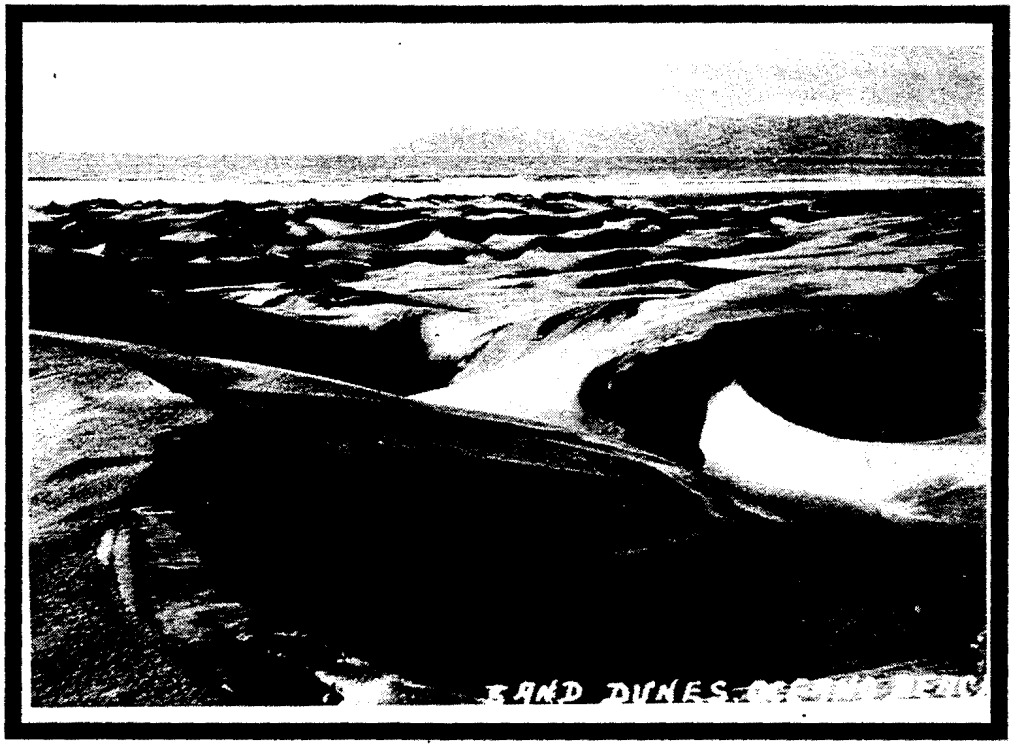
***Photo showing planting activity in front of Pavilion Hill (circa 1900).***



*Historic photographs courtesy of the Bennett-Loomis collection of Arroyo Grande..*

# FIGURE 11

***Photos showing natural foredunes with an apparent lack of beach grass (circa 1905).***



***Historic photographs courtesy of the Bennett-Loomis collection of Arroyo Grande.***

dramatically. This change was principally due to the establishment of beachgrass and ice plant. In 1949 a portion of this creek backed up and proceeded to extend south behind the foredunes to form what eventually became a small lake. This lake formed in the area that we now refer to as halfway between posts 1 and 2. The 1949 aerial photos that show this also reveal that dunes were just beginning to cut off this lake from its source (i.e. Arroyo Grande creek). Subsequent aerial photos taken in 1961 show that this arm of the creek (or lake) was completely cut off and had actually filled in to become a wet meadow. Additionally, where the creek channel that had fed the lake once existed, there now appeared small thickets of willows. Also by this time, beachgrass had become well established in front of the lake/meadow area and was actually spreading further south to where milepost 3 stands today. Today (i.e. 1995) the wet meadow area is a large willow thicket surrounded by beach grass.

The Oso Flaco Creek mouth has also changed dramatically. Aerial photos taken in 1949 reveal the existence of a small lake in the main channel area west of Oso Flaco Lake. By the time an aerial photo was taken in 1961 this area had become a wet meadow. Today this area is a willow thicket and the creek has turned to the south.

### *b. Fauna*

1. Mammals:

Within Oceano Dunes State Vehicular Recreation Area the "vegetation islands" and environs of Oso Flaco Lake have the greatest diversity of wildlife, whereas the unstable dunes and open sand sheets have the lowest (Kutilek, et al 1991). The population of small mammals within the islands is abundant. In order of abundance, the common small mammal species include: deer mouse *(Peromyscus maniculatus)*, Heermann kangaroo rat (*Dipodomys heermanni*), California mouse (*Peromyscus californicus*), California meadow mouse (*Microtus californicus*), Dusky-footed wood rat (*Neotoma fuscipes*), Western harvest mouse (*Reithrodontomys megalotis*), California pocket mouse (*Perognathus californicus*), and the black rat (*Rattus rattus*).

Eight large mammals have been found on the Nipomo dunes on or adjacent to Oceano Dunes State Vehicular Recreation Area. Coyote (*Canis latrans*) was most abundant in terms of both visual sighting, (by both night and day) and via tracks. Track sightings include gray fox (*Urocyon cinereoargenteus*), Raccoon (*Procyon lotor*), Audobon cottontail (*Sylvilagus audoboni*) and the striped skunk (*Mephitis mephitis*). Black-tailed deer (*Ococoileus hemionus columbianus*) and black-tailed jackrabbit (*Lepus californicus*) were sighted only in the night.

## 2. Reptiles and Amphibians:

Several native reptiles and amphibians have been found on the Nipomo dunes in recent surveys. The western fence lizard (Sceloporus occidentalis) inhabits small and medium-sized islands of vegetation. Both the western fence lizard and the Pacific Tree frog (Hyla regilla) inhabit larger vegetation islands. Most of the reptiles and amphibians were found on the largest vegetation islands adjacent to or connected to the back-dune upland vegetation. These species include bullfrogs (*Rana catesbeiana*), western pond turtle (*Clemmys marmorata*), and the coast horned lizard (*Phrynosoma coronatum*). In addition to these more common species, incidental sightings of the California legless lizard (*Anniella pulchra*) and the western toad (*Bufo boreas*) have been recorded in the Nipomo dunes area. Both the western pond turtle and the California legless lizard are listed by the California Natural Diversity Database as species of special concern in the state and candidates for federal listing (Category 2).

The California Red-legged frog (*Rana aurora draytonii)*, a Federally listed threatened species, was confirmed in a field survey as being present in the Oso Flaco Lake area in 1990. No sightings have been recorded since that time. Field survey work will be undertaken in 1998 to determine the presence, if any, of California Red-legged frogs in the SVRA.

### 3. Birds:

Over 90 species of water-associated birds are present in the Nipomo dunes at various times of the year. Forty-three species of birds have been sighted along the shoreline of Oceano Dunes State Vehicular Recreation Area (Kutilek et al. 1991). Not all of these species are classified as shorebirds. Brewer's blackbird (*Euphagus cyanocephalus*) and the American crow (*Corvus brachyrhynchos*) are often seen feeding on organic material along the shoreline. Other non-shorebird species such as swallows are observed flying overhead. The most significant shore or water-associated birds found within the environs of Oceano Dunes State Vehicular Recreation Area are the western snowy plover (*Charadrius alexandrinus nivosus*) and the least tern (*Sterna albifrons*). The western snowy plover is state classified as a species of special concern and is a federally threatened species. The least tern is both a state and federally endangered species. During the last five years, the management at Oceano Dunes has engaged in an extensive program of both monitoring and protection for these species. The nearest tern-nesting colony is south of the Park at the mouth of the Santa Maria River. Least terns are occasionally observed feeding in the freshwater lakes within the Nipomo dunes. Successful nesting pairs of the snowy plover are regularly observed at several locations within the State Vehicular Recreation Area. Both species are attracted to open sand sites for nesting and rely on their cryptic camouflage to avoid predators (i.e. coyote, raccoon, skunk).

More than one hundred species of terrestrial birds have been seen in the greater Nipomo dunes region. In their studies, Kutilek and associates made observations of 46 different species of terrestrial birds within the Pismo Dunes State Vehicular Recreation Area (Kutilek et al. 1991). Fifteen species were found to comprise 90% of all those species detected. The small vegetation islands were found to have the lowest number of terrestrial bird sightings. Raptors including red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*), barn owl (*Tyto alba*), black-shouldered kite (*Elanus*

*caeruleus*), common nighthawk (*Chordeiles minor*) and sharp-shinned hawk (*Accipiter striatus*) are attracted to the dunes by the abundant population of small rodents, reptiles and small birds. Songbirds, upland game birds and miscellaneous other bird species are especially plentiful in the areas of riparian growth and freshwater marshlands which exist around the dune lakes and within the larger vegetation islands. Valley quail (*Callipepla californica*), scrub jays (*Aphelocoma coerulescens*), mourning doves (*Zenaida macroura*), and many other species use the vegetated areas not associated with the wetlands for food, cover, and nesting sites.

Detailed descriptions of the fauna (and flora) of the Nipomo Dunes are found in several reports and publications. This report has utilized the following as its principal sources of information and encourages the interested reader to access these reports for further detailed information. Lastly refer to the "Results": Flora and Fauna section for a discussion of the most recent research and studies that have been undertaken at Oceano Dunes SVRA.

- *Pismo State Beach and Pismo Dunes State Vehicular Recreation Area: General Development Plan and Resource Management Plan.* State of California- The Resources Agency. Department of Parks & Recreation. April 1975.

- *The Natural Resources of the Nipomo Dunes and Wetlands.* California Department of Fish and Game / U.S. Fish and Wildlife Service. June 1976.

- *Final Environmental Impact Report: Pismo State Beach and Pismo Dunes State Vehicular Recreation Area Land Acquisition and Development.* California Department of Parks and Recreation. May 1978.

- *Draft Environmental Impact Report on the Pismo Dunes State Vehicular Recreation Area Access Corridor Project.* California Department of General Services. Office of Project Development and Management. August 1991.

- *Inventory of Birds, Amphibians and Reptiles at Oso Flaco Lake, Pismo Dunes State Vehicular Area, California.* Kutilek and Burton. Department of Biological Sciences. San Jose State University. San Jose, California. August 1991.

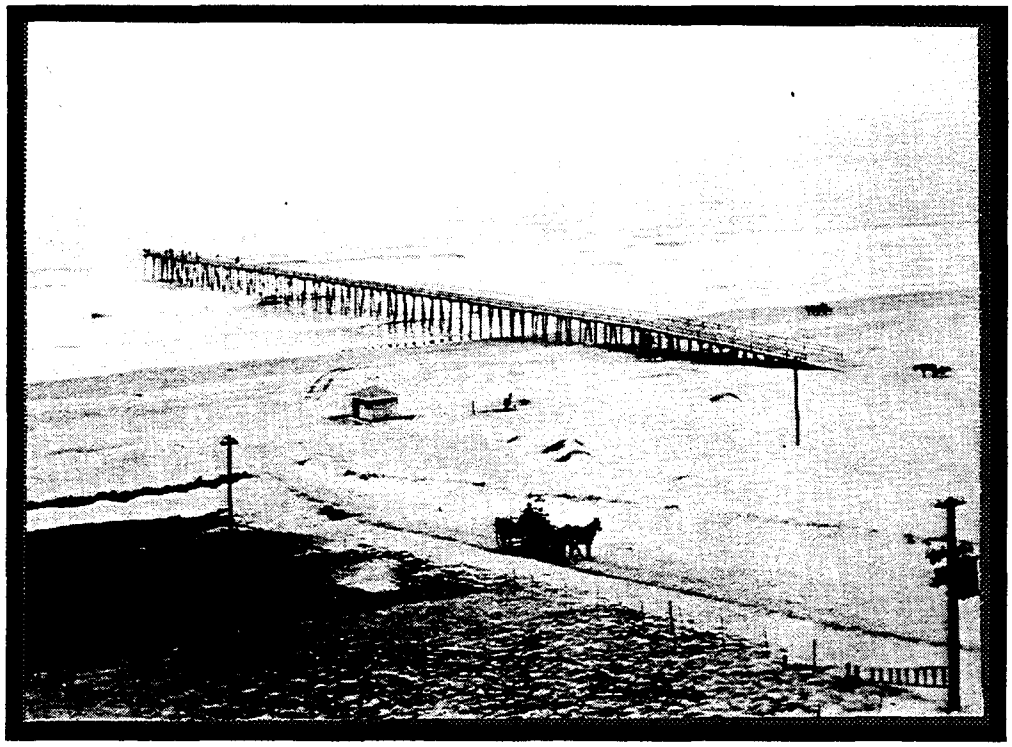
## *B. Recreational and Acquisition History of Oceano Dunes SVRA*

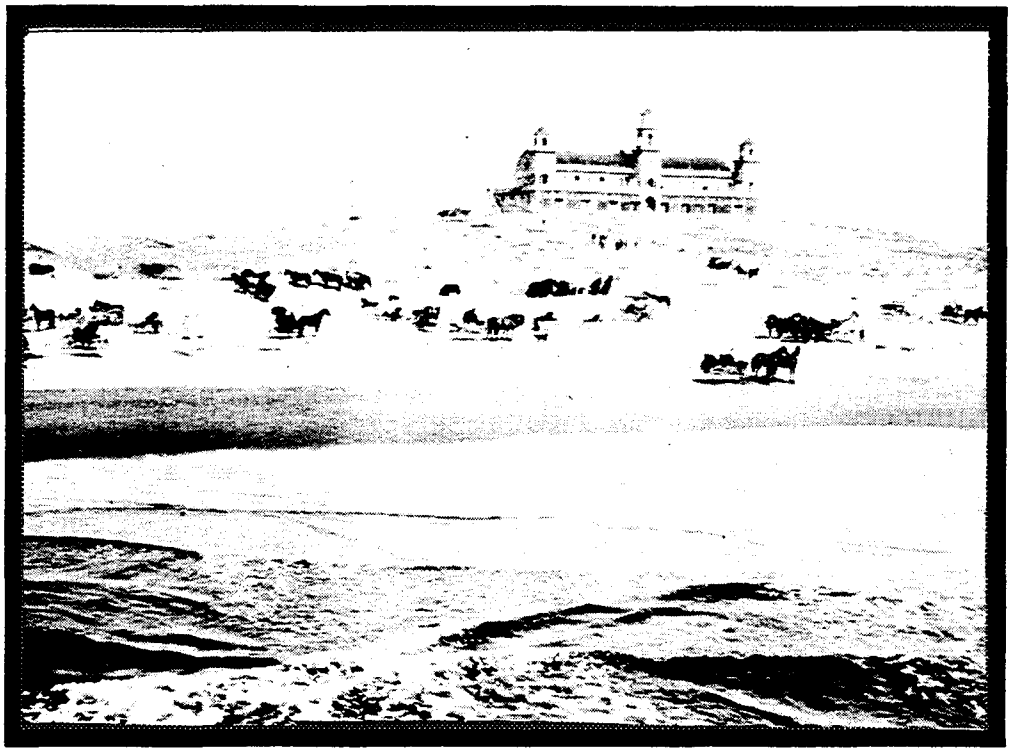
### 1. Pre- World War II

Numerous historic journals and photographs document the fact that the public has utilized the Pismo/Oceano Beach area recreationally since at least the 1890's. At that early date the beaches in this area were recognized as being unique in their ability to support wheeled vehicles. Early photographs indicate that even before the advent of the automobile, horse-drawn buggies were a common sight along the beach **(Figure 12)**. In the early 1900's these were replaced with the earliest motorcycles and automobiles (including the Model T) and later, even by bi-planes **(Figure 13)**. The unique virtues of Pismo's flat hard - packed beaches were so well recognized that organized automobile races were held along the wet beach strand. Historic photographs of vehicular beach use reveal the occasional presence of hundreds of vehicles **(Figure 14)**. During this period vehicle use was limited to the hard wet beach strand. These limitations were due to the hard thin tires that were characteristic of these vehicles and which afforded little in the way of floatation on the soft sand **(Figure 15)**. In spite of the Great Depression, the popularity of this beach continued and in 1934 a portion of this area was established as Pismo State Beach.

# FIGURE 12

***Photos showing the use of horse and wagons at "Oceano Beach" (circa 1905).***

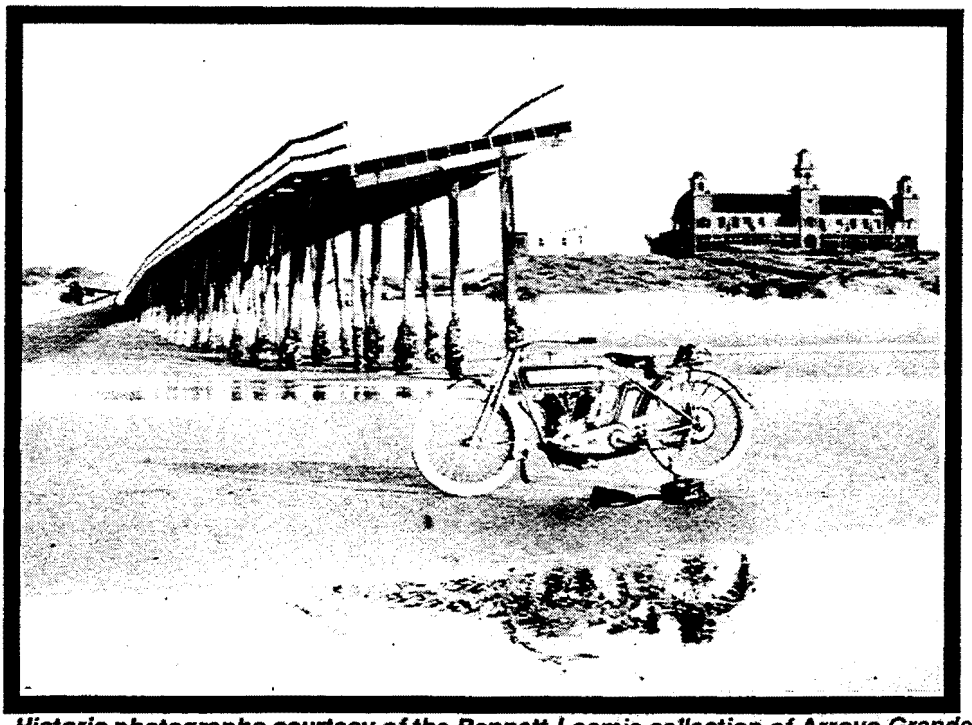




*Historic photographs courtesy of the Bennett-Loomis collection of Arroyo Grande.*

# FIGURE 13

***Early photo of a 1900's era motorcycle on the beaches of Oceano.***



***Historic photographs courtesy of the Bennett-Loomis collection of Arroyo Grande.***

# FIGURE 14

***Early photo showing vehicular use of Pismo beach by scores of Model T era vehicles.***

*Historic photograph courtesy of the Bennett-Loomis collection of Arroyo Grande.*

# FIGURE 15

***Early photo showing the limitations of early vehicles in the soft sand of Oceano.***

***Historic photographs courtesy of the Bennett-Loomis collection of Arroyo Grande.***

## 2. Post World War II

### *a. 1945-1970*

The first true off road vehicles did not become available to the general public until after WW II. Initially, surplus military jeeps were used and later the commercially available CJ2 jeep followed these. Jeeps remained as the primary vehicle of dune use until the early 1960's when the public began to build and popularize their own specialty dune vehicles, e.g. VW dune buggies, "water pumpers" and sand rails. These specialty sand dune vehicles remained popular in the back dunes throughout the 1960's and into the early 1970's. The use of these vehicles took place both along the entire 16 miles of beach shoreline that stretched from Shell Beach on the north to Mussel Rock on the south and in the dune complexes which extended inland of the beach. . Estimates of the total acreage available to OHV enthusiast at that time range upwards of 20,000 acres. Given the special ability of these vehicles to travel on soft sand, forays into the back dunes were common. Additionally, the area around Oso Flaco lake became popular, not only as an inland access point into the dunes, but also as a significant destination spot for those who came to camp amongst the dunes.

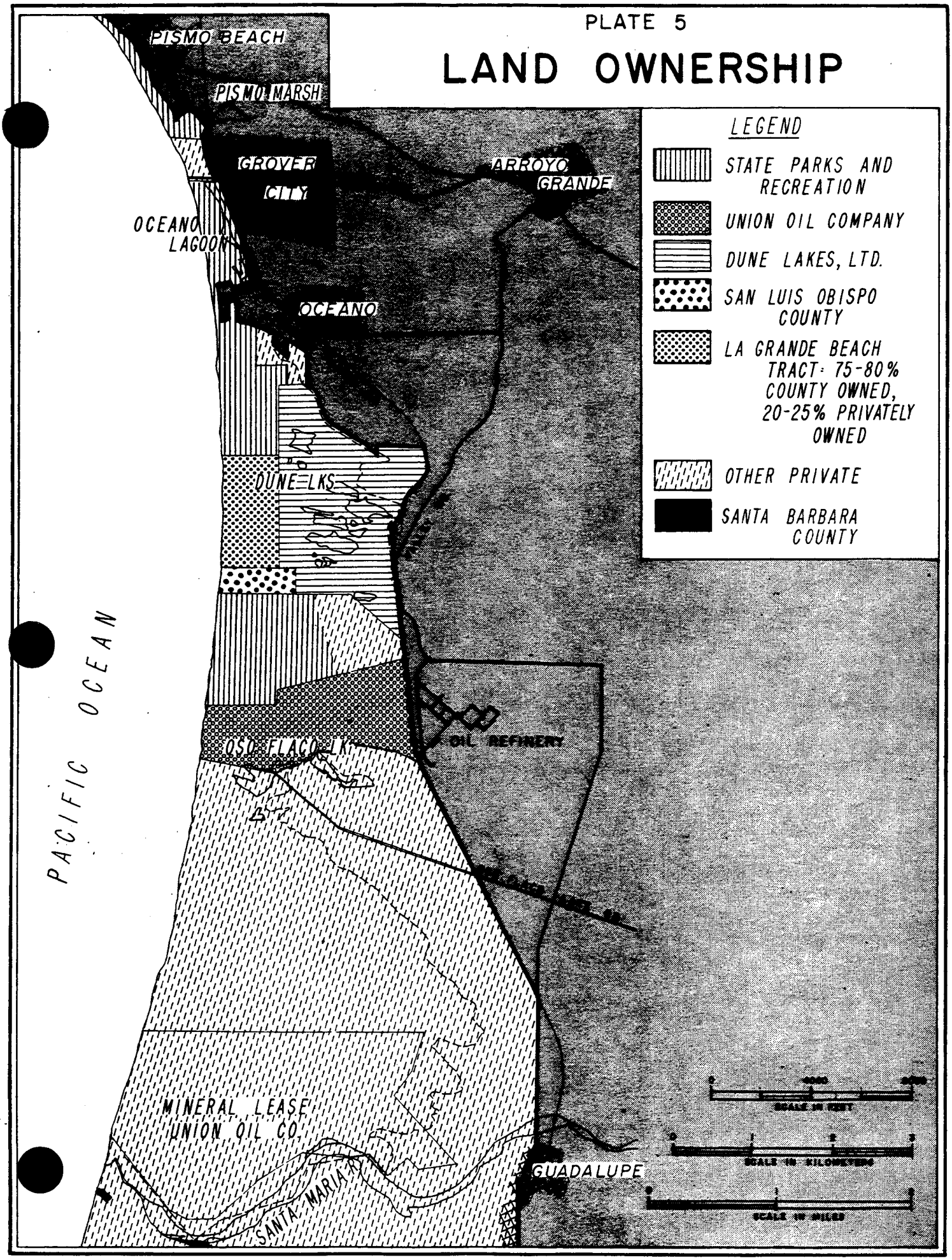
### *b. 1970 to 1982*

The 1970's are noteworthy on at least two points: 1). they represent the period in which the commercial vehicle manufacturers made a significant entry into the off-highway market and 2), this represents the period in which most of the Park as we know it today was acquired. During this period, off-road motorcycles, four-wheel drive vehicles and all-terrain vehicles were introduced. Together these vehicles gave the off-road enthusiast much greater access to terrain of all types. This advancement in technology occurred concurrently with an increase in the popularity of the sport. This period of growth in the popularity of the sport did not go without notice by the

State Legislature. In 1971 it led to the establishment of the State Vehicular Recreation Area (SVRA) designation within the California Department of Parks & Recreation and on July 12, 1974 Pismo Dunes State Vehicular Recreation Area was established with an initial acquisition of 810 acres. The specific intent of the acquisition and creation of this Park unit was to provide for the recreational use of dune buggies and similar off-road vehicles in an area where such use had been occurring for decades. This inclusion of the area as a SVRA led to the compilation of a General Plan, which enumerated for the Park staff guidelines on how to best manage the area for its long-term use. This General Plan (i.e. General Development Plan) for Pismo State Beach and Pismo Dunes SVRA was completed in 1974 and was prepared by the technical staff of DPR. As a part of that process, consultations were held with: the SLO County Board of Supervisors, the South Central Coast Regional Command, the Department of Fish and Game, the U.S. Department of Agriculture and the Santa Maria Soil Conservation Service. The Department also involved local citizen participation by establishing a Technical Planning Committee and a Citizens Advisory Committee. One subject discussed in great detail were the suggested lands for future acquisition and how they together with the existing 810 acres could be effectively managed **(Figures 16 -17)**. Those principal properties suggested for future acquisition were acquired as follows **(Figure 18)**:

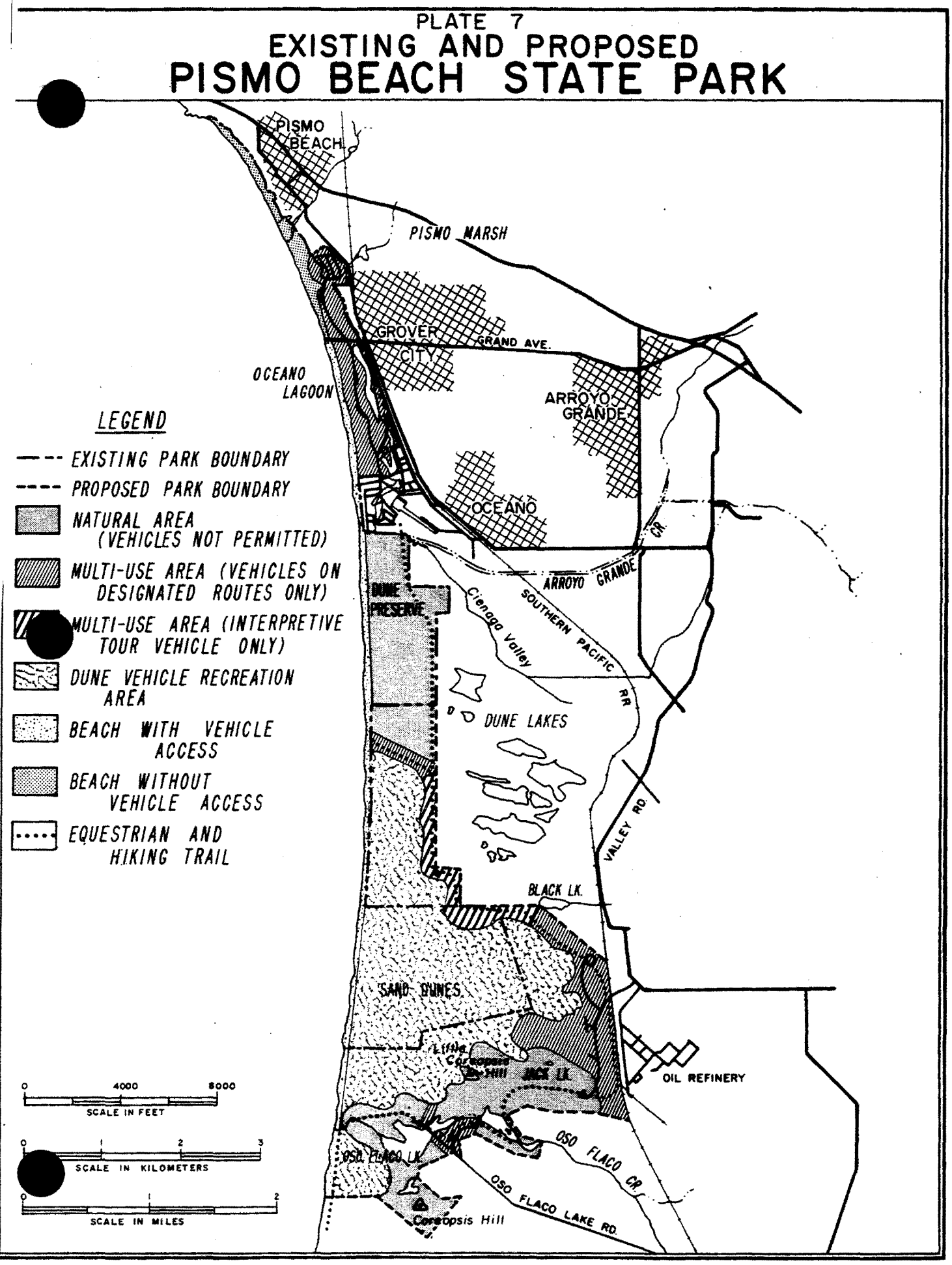
- Area 1 (Real Estate Parcel 4): formerly owned by Pacific Gas & Electric, this parcel represented the original acquisition which established Pismo Dunes SVRA; (this parcel was acquired via a complicated process which involved the change in the location of Diablo Canyon Nuclear Power Plant and the removal of vehicles from the beaches and dunes of Moro Bay and Montana de Oro State Parks).
- Area 2 (Real Estate Parcel 5): formerly owned by the Santa Maria Valley Association, this parcel was acquired in 1977 and;
- Area 4 (Real Estate Parcel 7): formerly owned by Union Oil, this property was acquired in 1980.
- Area 7 (Real Estate Parcel 10): The County of San Luis Obispo owns approximately 400 acres within the Le Grande Tract which is leased to the State Department of

FIGURE 16




Source: *The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976, California Department of Fish and Game, U.S. Fish and Wildlife Service.

# FIGURE 17




Source: *The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976, California Department of Fish and Game, U.S. Fish and Wildlife Service.

Parks and Recreation. The State holds title to approximately 8% of the tract and a small portion is privately held. The lease agreement between the County and State was entered into in 1983 providing for State management of the parcel as part of the OHV area. In return, the State agreed to assume all liability for the property, including indemnifying and holding the County harmless. The lease can be canceled after a one-year notice. Currently, the county and state are negotiating several park issues in San Luis Obispo County. As a part of that process, State Parks has offered to purchase the County's interest in the Le Grande tract. The County is evaluating other options for the property, including the sale to other non-profits. A new carrying capacity study, based on the criteria defined in the amendment, will be conducted if ownership and intended use of the property changes due to the termination of the lease agreement.

With respect to Park management issues, areas 2 and 4 (i.e. real estate parcels 5 and 7) are critical in that they include the primary sensitive habitat area (i.e. Oso Flaco Lake) and the then- proposed southern access corridor (i.e. via Oso Flaco Lake). Although area 2 (i.e. real estate parcel 5) was acquired by the State in 1977, it was not until May 1982 that the Department of General Services transferred it to the Department of Parks & Recreation. Similarly delayed, area 4 (i.e. real estate parcel 7) was acquired in 1980 but not transferred from the jurisdiction of the Department of General Services to the Department of Parks & Recreation until June 1982. These delays in the transfer of jurisdiction ended when they did most probably due to the passage of legislation in 1982 (Government Code Section 15-863.5). This legislation required the Department of General Services (i.e. that State agency charged with the responsibility of purchasing property for all other State agencies) to transfer all property purchased prior to April 1 of each year to the Department of Parks & Recreation by July 1. Prior to the passage of this legislation the restrictions governing the transfer of jurisdiction were obviously considerably less restrictive. In light of the timeline for the above scenario the Department of Parks & Recreation moved very rapidly to have applied for a Coastal Development Permit which would allow for perimeter fencing and controlled entry points by Spring 1982.

Citations from the General Plan and the Final Acquisition EIR (1978; cited above) and statistics collected by Park staff indicate that it was probably during the mid- to late 1970's that the attendance of off-highway vehicle enthusiasts at Pismo reached its peak. For example the Final EIR for acquisition done in 1978 cites attendance for the July 4th weekend of 60,000 visitors on the beach and dunes and 9,000 off-road vehicles being present within the dune complex.

*c. 1982 to Present*

At PDSVRA the 1980's were most significant in that they represented a period of increased awareness of the need to recognize off-highway vehicle use as a legitimate recreation which could be allowed and encouraged with the implementation of appropriate environmental safeguards. The State Legislature embraced this concept in 1982 by establishing the Division of Off Highway Vehicle Recreation (Public Resources Code 5090 et seq.). That action was a result of their finding ***"that off-highway vehicles are enjoying an ever-increasing popularity in California and that the indiscriminate and uncontrolled use of those vehicles may have a deleterious impact on the environment, wildlife habitats, native wildlife, and native flora"*** (PRC 5090.02). They also declared ***"that effectively managed areas and adequate facilities for the use of off-highway vehicles and conservation and enforcement are essential for ecologically balanced recreation."*** As a part of that landmark legislation Pismo Dunes SVRA was once again specifically enumerated as a place for the activity of off-highway vehicle use. Also noteworthy in the 1980's was the fact that the growth in popularity of off-highway vehicle use was closely rivaled by that of the environmental movement and it was during this time period that the two movements clashed. This situation led to increased environmental safeguards, which led to the closure and protection of vast tracts of the dunes. Specifically, in 1982 the application for a Coastal Development Permit from the California Coastal Commission (CCC) resulted in the restriction of off-road vehicle activity to the public

lands of PDSVRA, (now ODSVRA). The net result of this action was the closure of approximately ninety percent of acreage formerly used by OHV enthusiasts and the reduction of available coastline down to approximately 3 miles. Advancements in off-highway vehicle technology in the 1980's primarily occurred in the areas of performance and safety. The 1990's have thus far witnessed resurgence in the popularity of the family oriented four-wheel drive vehicle.

Uses today within the ODSVRA takes place in separate zones, which have been established, to both enhance the overall experience of the visitor while also protecting sensitive resources. These zones principally include (all values are approximate, **Figure 19**):

**1).** Areas closed to OHV use (i.e. areas either restricted to street legal vehicles only or closed to all vehicles): 2100 acres or 58% of the total Park acreage; and

**2).** OHV open-riding areas: 1500 acres or 42% of the total Park acreage. (The total acreage now available to off- highway vehicle use probably represents no more than 7.5% of the area that was formerly used.)

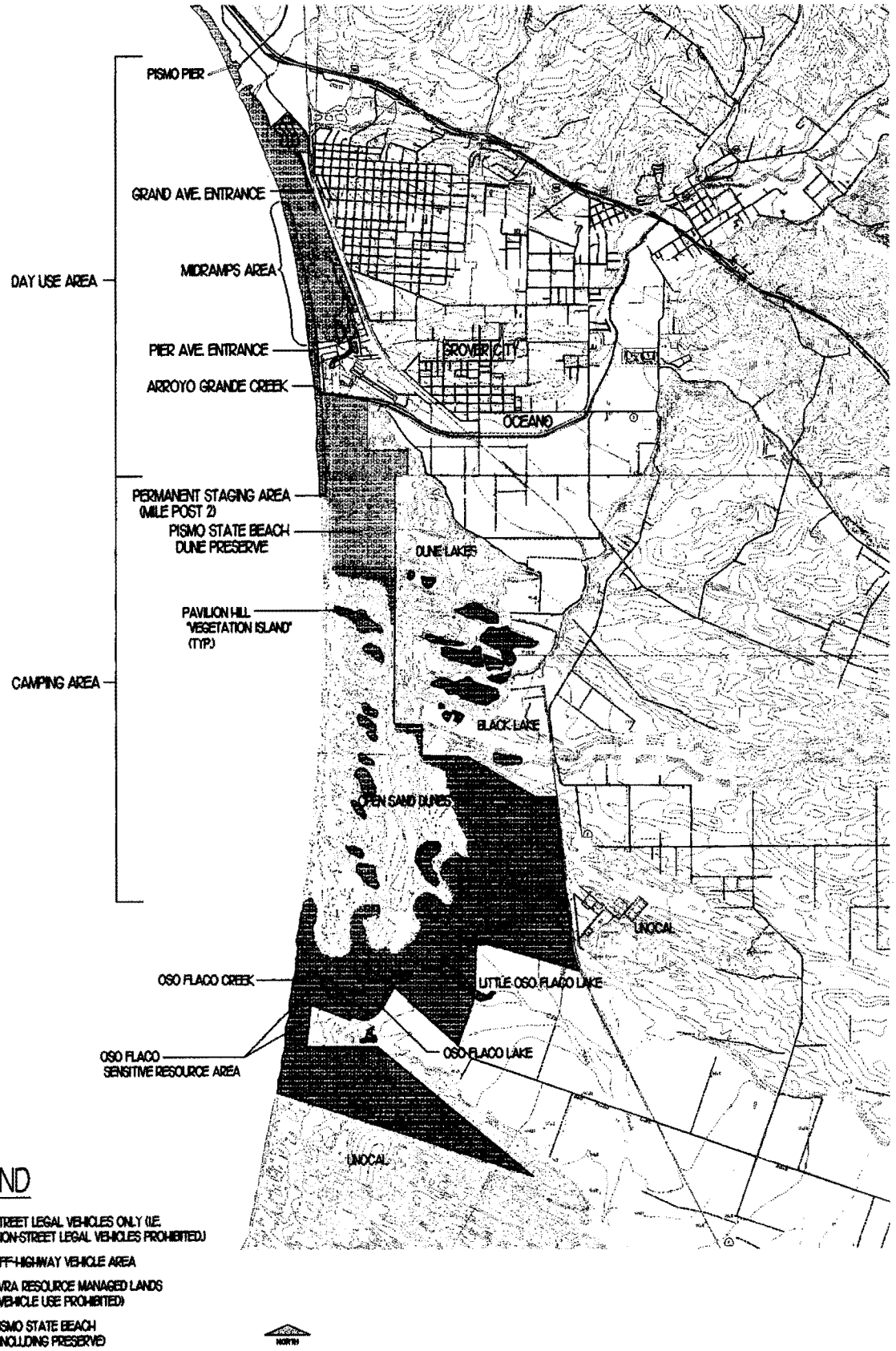
Within these two principal use zones are sub- zones that are characterized by additional restrictive criteria. These sub-zones include:

- Areas that are permanently closed to vehicular traffic for the enhancement and protection of sensitive resources: 2000 acres or 56% of the Park. It is within these areas that the visitor can enjoy the Park through non-vehicular recreation, (e.g. picnicking, birding, walking, botanizing, hiking, etc.)

- Areas reserved for day use only; This area is set aside for those visitors to the Park who prefer to drive on the beach in an area free of OHV activity and to provide a buffer to the adjacent communities of Grover Beach and Oceano from OHV activity. The 1994 visitor survey found that this area was particularly popular with families who were driving in non-4 WD vehicle and were visiting the Park as a one-day

# FIGURE 19

## *SVRA Management Lands*



family outing. (approximately 2 miles of coastline totaling 100 acres);

These zones and their sub- zones were initially established principally through the General Plan process, which included direct input from the staff of the Coastal Commission. The California Coastal Zone Conservation commission, South Central Coast Region in a public hearing on February 27, 1975, approved this Plan. These restricted use areas were then further refined and approved via the Local Coastal Plan (LCP) process and later again by the California Coastal Commission via Coastal Development Permit 4-82-300 in 1982.

Unlike the period before Oceano Dunes was managed as a SVRA, visitor use to the area is now carefully monitored to provide for balanced and appropriate levels of recreational opportunity, visitor safety and environmental management. Although completely accurate attendance figures are not available for the 1970's, it is generally acknowledged that Park attendance exceeded the capacities established by the 1975 General Plan on many holiday weekends; (the day use carrying capacity as determined by the 1975 General Development Plan is 4300 vehicles). Since 1983, Oceano Dunes SVRA has not reached its official (i.e. General Plan) day use carrying capacity except on 13 days during particularly busy holiday periods. Please refer to the following tables which note statistics on the "Highest Recorded Day Use Attendance" **(Figure 20)** and "Annual Attendance" **(Figure 21)** for Pismo Dunes State Vehicular Recreation Area.

# FIGURE 20

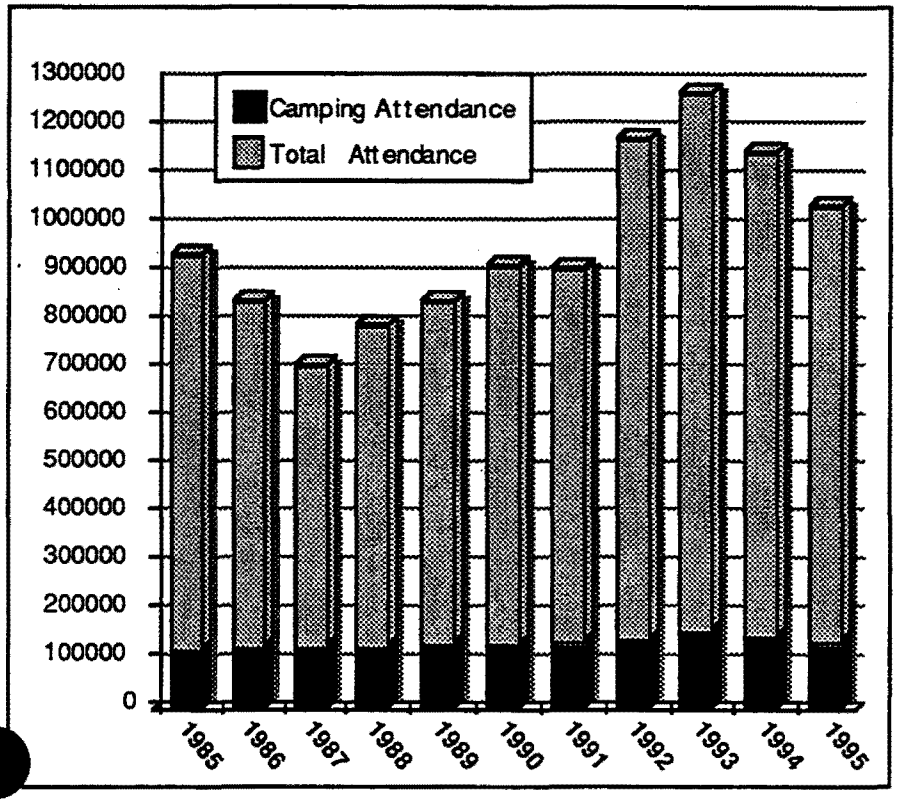
## *Highest Day Use Attendance Figures*

| Time Period Surveyed | Memorial Day | 4th of July | Labor Day |
|---|---|---|---|
| Last Holiday (1994) | 1,396 | 2,182 | 1,557 |
| Last 5 Years | 2,018 (1993) | 3,024 (1992) | 2,061 (1990) |
| Last 11 Years | 2,875 (1985) | 4,229* (1985) | 3,164 (1985) |

**Next busiest day after 4,229 is 3,488 on July 4th, 1987.*

# FIGURE 21

## *Annual Attendance*




| Year | Total Attendance | Camping Attendance |
|---|---|---|
| 1985 | 816,570 | 123,109 |
| 1986 | 715,503 | 129,156 |
| 1987 | 587,148 | 126,560 |
| 1988 | 667,808 | 128,660 |
| 1989 | 708,984 | 134,687 |
| 1990 | 786,246 | 132,920 |
| 1991 | 769,752 | 139,245 |
| 1992 | 1,036,114 | 144,181 |
| 1993 | 1,111,327 | 161,192 |
| 1994 | 1,001,065 | 150,044 |
| 1995 | *900,000 | *140,000 |

## C. Review of Coastal Development Permit

In 1975 the original General Plan for Pismo State Beach and PDSVRA was completed. That Plan served as a template for the future direction of the SVRA. Utilizing its guidelines, the land for ODSVRA as it exists today was acquired between 1974 - 1982. In addition, during the period of 1975 -1982 the Department of Parks and Recreation (DPR) made major efforts in cooperation with both the CCC and the County of San Luis Obispo to preserve significant environmentally sensitive habitat areas and provide quality outdoor recreation by gaining jurisdiction of those areas through State Park acquisition. Such efforts led to the application for a California Coastal Commission Coastal Development Permit in 1982. This permit (CDP #4-82-300) was issued on June 17, 1982 by the CCC for the construction of visitor entry kiosks at both Grand and Pier Avenues and for the fencing of environmentally sensitive areas. This permit in its final form imposed a number of conditions on the Department of Parks & Recreation regarding:

- The establishment of off-highway vehicle staging areas;
- The means of visitor access to PDSVRA;
- Limits on the number and type of visitor;
- The control and separation of visitor activities;
- The restoration of sensitive natural resources and;
- The placement of protective fencing for archaeological and sensitive natural resource areas.

The concept of these conditions, (particularly as it related to the protection of sensitive natural resources), was a product of the input of the Coastal Commission and its staff, the County of San Luis Obispo and its staff, representatives of the Department of Parks and Recreation and the California Department of Fish & Game. These conditions were viewed by the CCC as establishing the direction of DPR's longer term program to manage OHV use within the park unit, and was deemed by the Coastal Commission and

its staff to be ***"consistent with the access, recreation and resource protection policies of the Coastal Act PRC sections 30210, 30240 30231"*** (CCC Staff Report 6/2/82; Application No. 4-82-300). It is of particular significance that the specific sensitive natural areas that were delineated by this program for protection by fencing were identified through the collaborative efforts of the above- named agencies. Since the issuance of that original permit four amendments have been made to the Permit. None of those amendments are relevant to condition 3. (D) Of the original permit (i.e. the subject matter of this study).

Of the conditions imposed by the original permit and its amendments, DPR has been found to be in compliance with all but condition 3. (D). This condition was intended to place limits on OHV day use, and reads ***"OHV day use will be limited to a specified number of users established in consultation with and agreement by the County of San Luis Obispo and the Executive Director of the Coastal Commission and the Department of State Parks. OHV day use fees may be collected."*** Although DPR is not yet in compliance with this condition, the history of correspondence (or the opportunities for same) between DPR and the CCC is replete with interaction which would have allowed concern to be raised if it did in fact exist; instead the evidence seems to indicate the contrary. On at least four occasions DPR has expressed to the CCC the view that the unit was operating well within its carrying capacity. These observations were made in the format of requests to increase the allowed overnight use. On numerous other occasions the staff of ODSVRA have either conducted or participated in public hearings with other relevant public agencies (e.g. the San Luis Obispo County Board of Supervisors, the Oceano Community Services District Board of Directors, the OHMVR Commission, etc.) which have dealt directly with the issues covered in the CCC permit. Additionally the written correspondence from the CCC to DPR has generally indicated satisfaction with the level of compliance being observed at ODSVRA. For example:

- On October 31, 1989 James Johnson, Area Manager of the South Central Coast Area of the CCC wrote to Leon J. Chauvet, then Deputy Director of the Off - Highway Motor Vehicle Recreation Division of DPR. In that letter he stated ***"State Parks has***

***done an excellent job in controlling the access and uses within the park to effectively protect both public safety and the fragile dune environment***."

- On June 14, 1991 Peter M. Douglas, then Executive Director of the California Coastal Commission wrote to Henry R. Agonia, then Director of the Department of Parks & Recreation and stated, "***Based upon a review of the reports and our staff site tour, I have determined that OHV use in the SVRA is being managed and carried out in a manner that is protective of environmentally sensitive habitat areas and community values.***" Based upon these facts he went on to state his approval for a two- fold increase in the number of camp units allowed within the Park.

Although Oceano Dunes SVRA generally enjoys widespread support from the local community, there are some local residents who oppose the presence of the Park. In the latter half of 1993 a few of these individuals raised concerns about the operation of then Pismo Dunes SVRA, (now ODSVRA), to the staff of the California Coastal Commission. As a result of those concerns, the CCC in December 1993 requested that DPR proceed with the complying with condition 3. (D). This study is a result of that request and a subsequent CCC hearing held in March, 1994 which specifically addressed that issue.

One condition of Permit 4-82-300 which has often been raised in discussions concerning condition 3 (D), has been condition 6 which pertains to overnight camping limits and which reads in part, "***Six months after the issuance of this permit, and annually thereafter (or as needed) until a permanent staging area is operational, a formal review of the effectiveness of the conditions of this permit shall take place. This review shall be undertaken jointly by designated representatives of the California Coastal Commission, the California Department of Fish and Game, the County of San Luis Obispo, and Community of Oceano, the California Department of Parks and Recreation and user groups.***"

It is noteworthy that the operative language that limits the use of this condition is "until a permanent staging areas has been established". That permanent staging area has

been established through the approval of the Final EIR concerning alternative access corridors and the resultant establishment of a permanent staging area at the site of the interim staging area identified in Permit 4-82-300 (refer to **Figure 19** for location of staging area). The need for this EIR arose out of condition 6 of this same permit and the Coastal Commission's request to evaluate alternative entry corridors/points into Oceano Dunes State Vehicular Recreation Area. That Final EIR was completed on October 29, 1991 and subsequently approved by the Off Highway Motor Vehicle Recreation Commission and the State Parks Commission.

## II. Methodology in Evaluating Day Use Carrying Capacity

The methodologies used in this research effort were developed with the assistance of scientific experts and specialists from the academic, government and private sectors. These efforts were routinely shared with the representatives of the County of San Luis Obispo and the California Coastal Commission. These steps were taken in order to derive a mutually agreeable protocol which would not only generate the types of information needed for this assessment but which would also be repeatable and therefore scientifically valid.

### *A. Establishment of Criteria*

Several meetings and discussions were conducted among the staffs of San Luis Obispo County (SLO), the California Coastal Commission (CCC) and Department of Parks & Recreation (DPR) during the first half of 1994 to develop criteria that could be used to evaluate the off- highway vehicle (OHV) day use carrying capacity of ODSVRA. These criteria were determined to include:

1. Visitor type, interaction and compatibility of uses

2. Visitor safety

3. Sensitive natural resources

4. Sanitation

5. Traffic impacts on the local community

6. Air Quality

## B. Data collection and analysis for evaluation of criteria

### 1. Visitor characterization

In order to statistically analyze this criterion it was determined by the pertinent staffs that a formal survey should be made of the visitors to ODSVRA. Through a collaborative process questions were developed to specifically address these information needs. (See **Appendix A** for a copy of the survey/questionnaire). Methodologies for the administration of this survey were then discussed amongst the staffs and later reviewed by experts in the field of survey methodology. The following represents a partial list of those experts who were called upon for their technical advice and criticism:

*-Deborah J. Chavez, Ph.D., USDA Forest Service, Pacific Southwest Research Station, San Bernardino, California.*

*-Keith Demetrak, Supervisor, Planning Division, Ca Department of Parks and Recreation, Sacramento, California.*

*--Paul Brink, Wilderness Specialist, US Bureau of Land Management, Sacramento, Ca*

*-Sam Lolar Ph.D., Department of Recreation & Leisure Studies, Cal State Sacramento, Sacramento, Ca*

*-Gary He Ph.D. Candidate, Statistician, UC Davis, Technical Services Branch, Ca Department of Fish & Game, Sacramento*

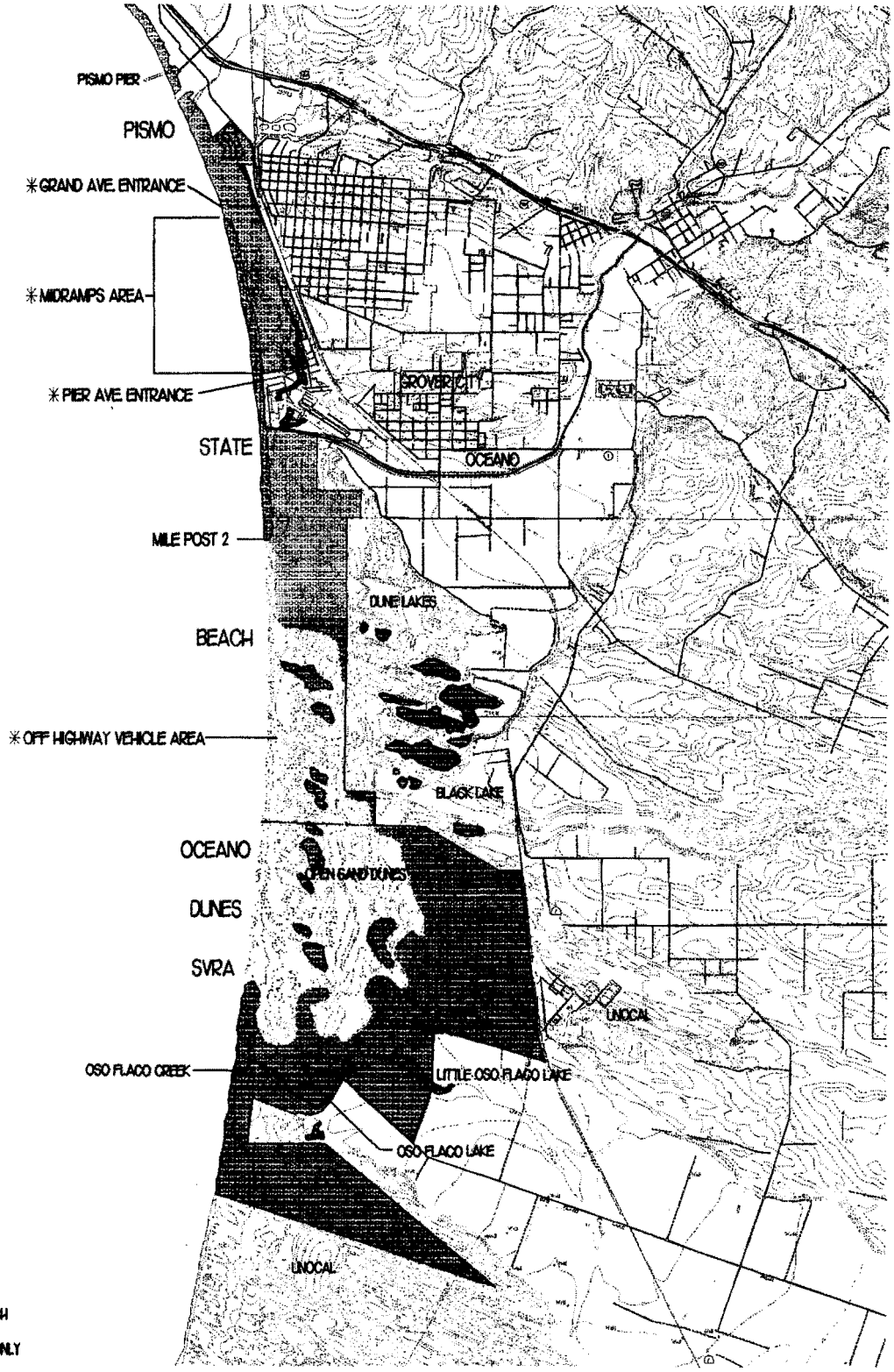
*-Steve Dennis Ph.D., Department of Park and Recreation Management, Cal State Chico, Chico, Ca*

*-Dr. Shaeffer Ph.D., Social Sciences Department, California Polytechnic Institute, San Luis Obispo, CA*

The staffs then mutually agreed upon a specific set of guidelines, which were then later used for the administration of the survey. These guidelines were designed to incorporate the advice and recommendations of the experts consulted thereby insuring that the results of this survey could be analyzed in a scientific and statistically valid manner. Factors such as: time of day, location, selection of participant, day of week, Holiday vs. non-Holiday, number of surveys, training of the survey administrators, etc. were all given special consideration in order to insure the validity of the survey. Actual protocol was tested via a practice run in early May 1994, the results of which generated further minor refinement. Moreover, on the first day of the survey a member of the SLO staff participated in the administration of the survey as a means by which to give final input. Ultimately, the survey was randomly administered to approximately 1650 participants during pre- selected time periods (listed below) at four different locations (**Figure 22**). These locations were chosen by the collective staffs and specifically selected in order to get a mix of visitors who were either interviewed as they were entering the Park in their vehicle or within the Park while they were "on foot" (i.e. pedestrians). Additionally the location of these sampling points was selected with the thought of evaluating the attitudes of different recreational groups towards vehicular beach use. Those surveys, which were conducted while the participant was in a vehicle, were performed at the Grand and Pier Avenue kiosks. Those surveys which involved pedestrian participants were

# FIGURE 22

***Location of Survey Point and Areas***



conducted on the beach strand area located between the two aforementioned entrances (referred to as "Midramps" by the Park staff) or along the beach strand area fronting the OHV open ride area (i.e. south of "Post 2"). The actual protocol for the selection of participants was discussed and agreed upon by the collective staffs, reviewed by expert consultants and ultimately represented a random process which would produce statistically valid data for analysis. The data in the field was carefully recorded such that it could later be analyzed along specific divisional criteria (e.g. location, method of entry, date, etc.).

Given the time constraints and the specific goals of this study (i.e. OHV day use carrying capacity) the collective staffs agreed to have the survey occur during the busiest visitor use season at PDSVRA (i.e. Memorial Day to Labor Day, inclusive). This period was emphasized due to the fact that historical experience has shown that it is highly unlikely that visitor day use during the "off-season" ever approaches the Park's carrying capacity. Additionally, sampling was done in a manner that would include both the peaks and valleys of the busy season. This was done in order to capture data, which would allow analysis through a range of use intensities. The dates selected for the survey were the following:

- May 27-31, 1994 (Memorial Day Weekend): This weekend is representative of one of the "busy season" Holiday weekends. One may logically assume that it would be weekends such as these when visitor day use might approach or even exceed the Park's carrying capacity for such use.

- June 11-12, 1994: A regular "busy - season" weekend; this weekend represents a typical non- holiday summer weekend.

- June 20-24,1994: A regular "busy -season" weekday period.

- July 1-4, 1994 (July Fourth Weekend): This weekend is unique as a "busy season" Holiday weekend for two important reasons: 1). It is the busiest, and 2). It attracts a tremendous number of day users who visit the Park to picnic and watch local fireworks displays.

- July 18-22, 1994: A regular "busy -season" weekday period.

- July 23-24, 1994: A regular "busy - season weekend.

- August 8-12, 1994: A regular "busy -season" weekday period.

- August 20-21, 1994 (A regular "busy - season weekend)

- September 3-4, 1994 (Labor Day Holiday)

## 2. Visitor Safety

Annualized and holiday period statistics on number of arrests, crime reports, accidents, number of badged officers, and officer work load for ODSVRA were analyzed and compared with similar statistics gathered from other enforcement jurisdictions which share similar qualities with the ODSVRA (e.g. the City of Pismo Beach, other State Parks, Beaches and Recreation areas). This information was analyzed in a comparative manner to measure the level of visitor safety experienced by the average Park visitor at ODSVRA. Oceano Dunes SVRA visitor safety issues were evaluated both in the context of criminal and vehicular activity/accidents. Oceano Dunes SVRA is generally recognized as unique, both as a State Park and State Vehicular Recreation Area. In spite of this recognition, this task was undertaken with the understanding that although any comparison may not be entirely perfect, these comparisons should clarify some of the questions which have been raised in the past over the issue of visitor safety.

Also computed and analyzed were visitor accident rates for the period of 1987 - 1996 and accident rates during busy holiday weekend periods. Trend lines for accident rates were calculated for visitor accidents for the past ten years.

Emergency services accident response times were researched as part of this study. Data for 1996, the first year for which information on such response times was recorded at the SVRA, has been gathered and analyzed in this study.

Both the cause and location of accidents as determined through peace officer investigations, were also analyzed for the period of 1987 - 1996. The findings of this analysis serve to focus both public education and safety awareness programs and law enforcement efforts within the SVRA.

## 3. Sensitive Natural Resources

### *a. Flora*

Utilizing historic and present day aerial photos, the health and extent of the vegetation within ODSVRA and its surrounding environs was analyzed. Those historic aerial photos dating previous to 1982 were principally utilized to elucidate some of the natural dynamic processes that govern the Nipomo Dunes ecosystem. Those vegetated areas which were originally identified in 1982 as sensitive, (by the staffs of the California Coastal Commission, the Department of Parks & Recreation, the County of San Luis Obispo and the California Department of Fish and Game), and specifically delineated for protection via fencing in 1983, were carefully examined in the context of their overall health today. Standard techniques of remote sensing/aerial photo analysis were employed. Additionally, newly-developed advanced image processing, display and analysis software (MIRA: Microcomputer Image Reduction and Analysis) was employed to precisely detect and analyze any measurable changes in the extent and health of the vegetation in question. Utilizing a combination of these techniques, changes and trends with regards to vegetation were evaluated (i.e. specifically, these photos were used to plot changes in vegetative cover). Additionally, past and present efforts towards resource enhancement within Oceano Dunes SVRA, (with particular emphasis on the vegetative component), were reviewed and evaluated for their relative success. The data thus obtained was combined with historical information on the level and type of visitor use. Together, this information was then pooled with the other measures, which were evaluated to provide valuable insight on the carrying capacity of the Park.

***b. Fauna***

The findings of past and on-going research and management efforts to monitor, enhance and protect the fauna within ODSVRA were carefully reviewed and evaluated. In particular, these efforts were evaluated for both their compliance and performance with respect to the State and Federal environmental statutes, which govern these activities and the operations of State Vehicular Recreation Areas. Additional care was taken in the evaluation of the Park's management and operational practices as they related to any State or Federally listed threatened or endangered species.

## 4. Sanitation

Data was analyzed in order to evaluate three primary areas of concern:

a. Illegal nighttime dumping of sewage from campers;

b. Impact on the local sewage treatment system;

c. The ODSVRA infrastructure capacity: i.e. the ability of the facilities within the ODSVRA to meet the needs of the visiting public;

These areas of concern were evaluated by collecting data from citation records, the local utility district and from ODSVRA Maintenance Staff records and personal accounts.

## 5. Traffic impacts on the local community

Systematic photographs of the traffic immediately surrounding the entry kiosks at Pier and Grand Avenues were taken via video camera on the three summer Holiday weekends of 1994 (i.e. Memorial Day, Labor Day and July 4th). . This data was evaluated to determine the impact of day use visitors on traffic and congestion immediately surrounding the entry kiosks. This procedure allowed for the evaluation of the degree of traffic (e.g. backup) in front of each kiosk at regular intervals. This photo information was then used in conjunction with the baseline data collected at the kiosks to make a specific determination of the impact of visitor day use on the local traffic patterns.

## III. Results and Analysis

The data collected in this study were carefully analyzed in the context of the Permit condition in question (i.e. 3d). Specifically, this information was reviewed and examined in order to assess the OHV day use carrying capacity of the Oceano Dunes SVRA. The following criteria were determined to be important in making that evaluation. They included: visitor type, interaction and compatibility of uses, visitor safety, sensitive natural resources, sanitation, air quality and traffic impacts on the local community.

### *A. Visitor type, interaction/compatibility of uses, and number/type of vehicles*

The results of an extensive visitor survey, which was conducted during the summer months of 1994, revealed a number of findings. Generally visitors were found to be day users, who resided either locally or were from the California Central Valley, had accessed the Park via a vehicle, viewed the importance of the use of their vehicle on the beach as being very significant to their visit and generally engaged in several activities with off-highway vehicle use, camping, sight-seeing, walking and beach driving being listed as the most popular. The survey also found that existing users felt that the level of conflict from visitor interaction was insignificant and that visitors with different and potentially conflicting recreational preferences naturally segregated themselves according to the different use zones designated by the General Plan **(Figure 19)**. The specifics of that visitor survey follow.

Utilizing a state of the art database management system designed specifically for the analysis of survey results (i.e. *Survey)*, the information from approximately 1650 survey questionnaires was compiled and tabulated (see **Appendix A** for a copy of the survey). This pooled data was then analyzed to characterize the fundamental descriptive

characteristics of visitors to ODSVRA. Subsequent to this initial basic analysis, the fundamental character data was then cross -correlated in order to examine the relationships between the different parameters. Specifically, the following relationships were evaluated:

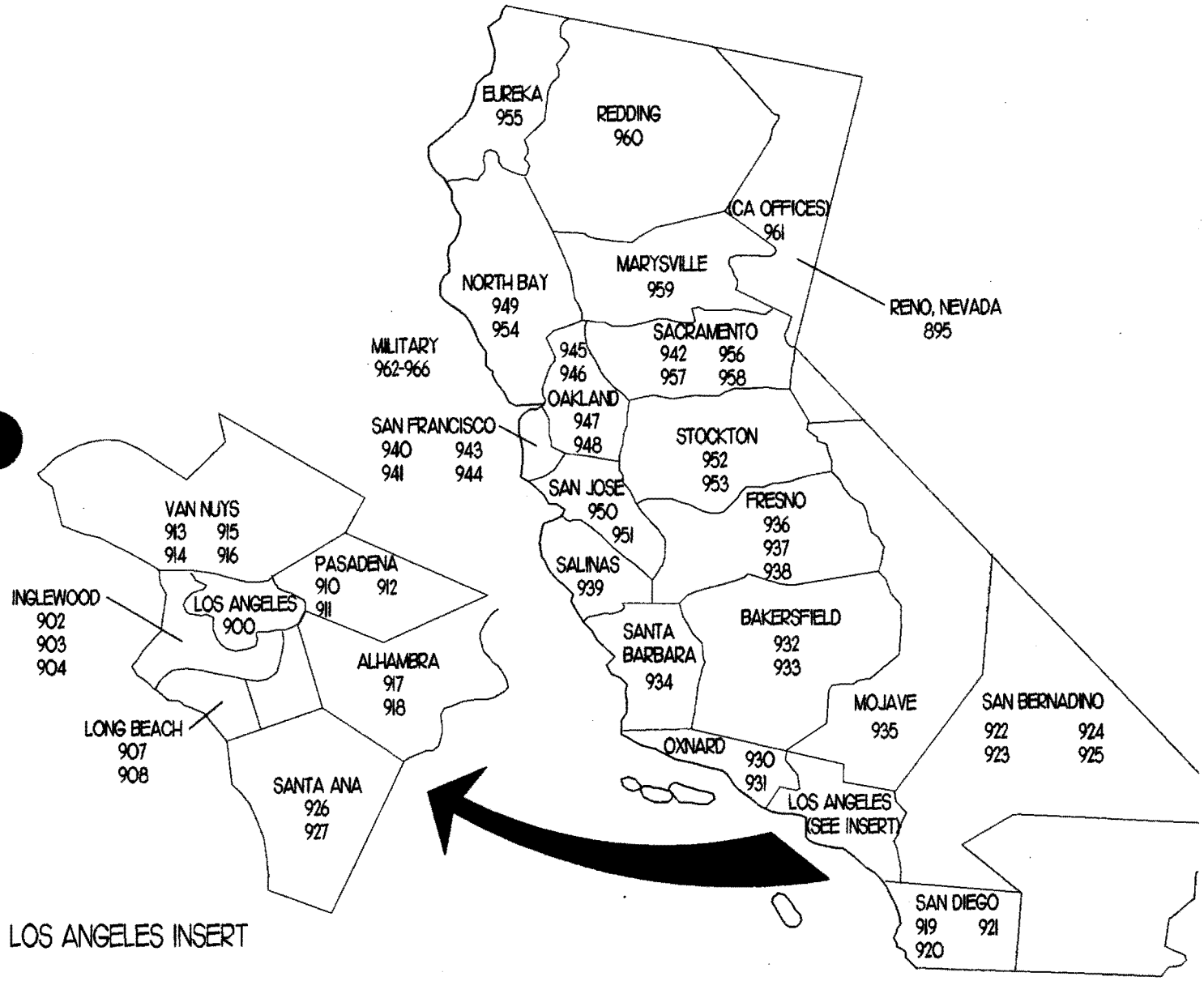
1. the influence of survey location on principal activity;
2. the influence of survey location on the importance of the use of a vehicle to the visit:
3. the influence of principal activity and the importance of the use of a vehicle to the visit;

Additionally, but less detailed cross- correlation analysis was also performed on the following characteristics:

1. the origin of the visitor (i.e. local vs. non- local) and the principal activity;
2. the origin of the visitor (i.e. local vs. non- local) and the importance of the use of a vehicle to the visit;
3. type of vehicle (i.e. sedan, truck, RV, etc.) the respondent arrived in and the number of ATV's brought with them;
4. type of vehicle (i.e. 2 WD vs. 4WD) the respondent arrived in and the number of ATV's brought with them;
5. primary activity and the number of children under the age of twelve;
6. primary activity and the number of people with a physical handicap;

Analysis of the fundamental visitor characteristic data derived from the survey, indicates that the "typical" visitor to Oceano Dunes State Vehicular Area accesses the Park via a vehicle, lives somewhere within the 93xxx zip code **(Figure 23)**, is part of a group of three with one child under the age of twelve, is not camping in the Park, has been to the Park before and spends most of their time in the OHV area partaking in several recreational activities. If ODSVRA were not available for use they would go elsewhere, but feel that the alternative would be poor compared to ODSVRA and rate the

# FIGURE 23
## Location map of California postal zip codes



ability to drive their vehicle on the beach as very important to their visit. Also noteworthy was the fact that of those surveyed 9% had a physically disabled person within their group.

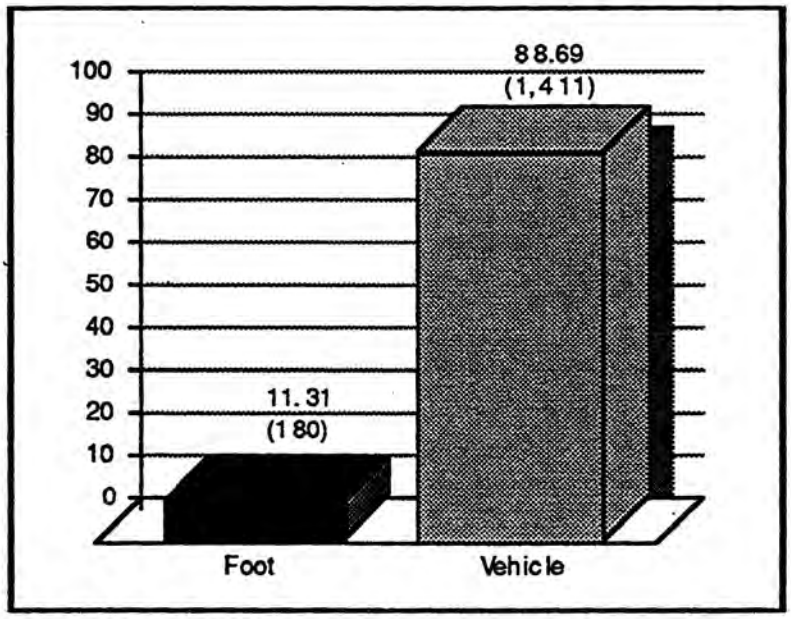
A breakdown of the compiled fundamental characteristic data follows. Of the visitors surveyed:

- 89% accessed Oceano Dunes SVRA via a vehicle **(Figure 24)**;
- 57% lived in the 93xxx zip code; 15% lived within the more proximate locale of southern San Luis Obispo County (i.e. San Luis Obispo, Arroyo Grande, Pismo Beach, Shell Beach, Oceano, Grover City, etc.; **Figures 23, 25**);
- The individual surveyed was with a group with an average size of 3 individuals **(Figure 26)**;
- The individual surveyed was with a group that had an average of 0.8 children under the age of twelve **(Figure 27)**;
- 67% were not camping overnight within the SVRA and were therefore day users **(Figure 28)**;
- 82% have previously been to Oceano Dunes SVRA **(Figure 29)**;
- 56% spend most of their time in the OHV area **(Figures 30-31)**;
- 72% felt that the use of a vehicle was at least very significant, if not extremely important to their visit, whereas only 10% felt that such use was not at all or minimally important **(Figures 32-33)**;
- 9% had within their group a person that was physically disabled **(Figures 32, 34)**;
- 53% of the day users planned on using the Park less than three hours **(Figures 32, 35)**;
- 38% listed beach driving or off-highway vehicle use as the principal reason for coming to the Park and additional 11% cited sightseeing (which usually was associated with beach driving); 11% cited walking; 11% cited camping and no other category garnered more than 5% **(Figures 32, 36)**;

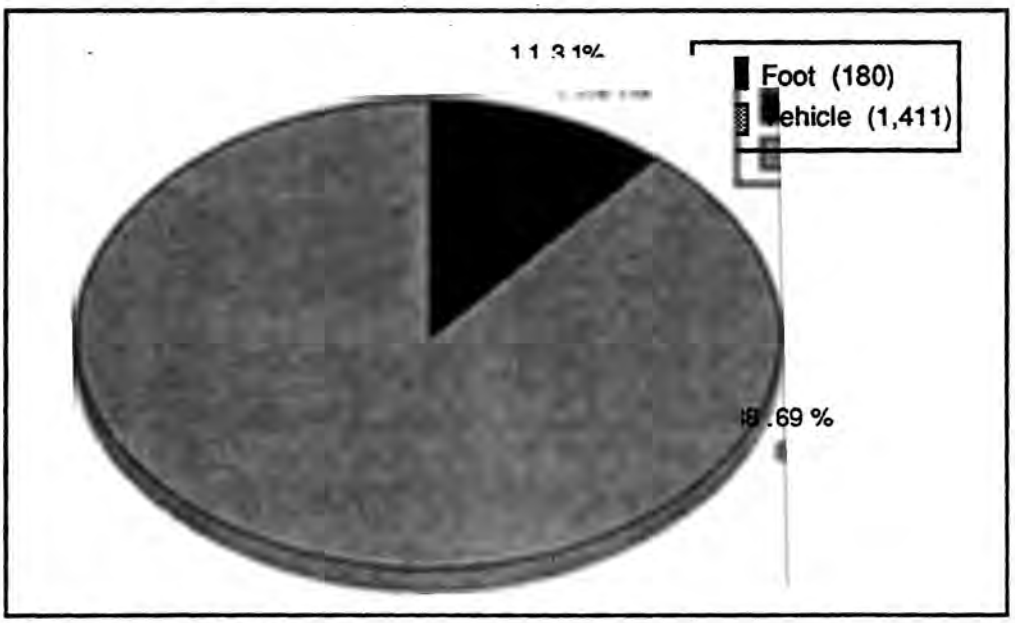
A more detailed analysis of the data via the cross correlation of fundamental character

# FIGURE 24

***Method used to access Oceano Dunes SVRA***



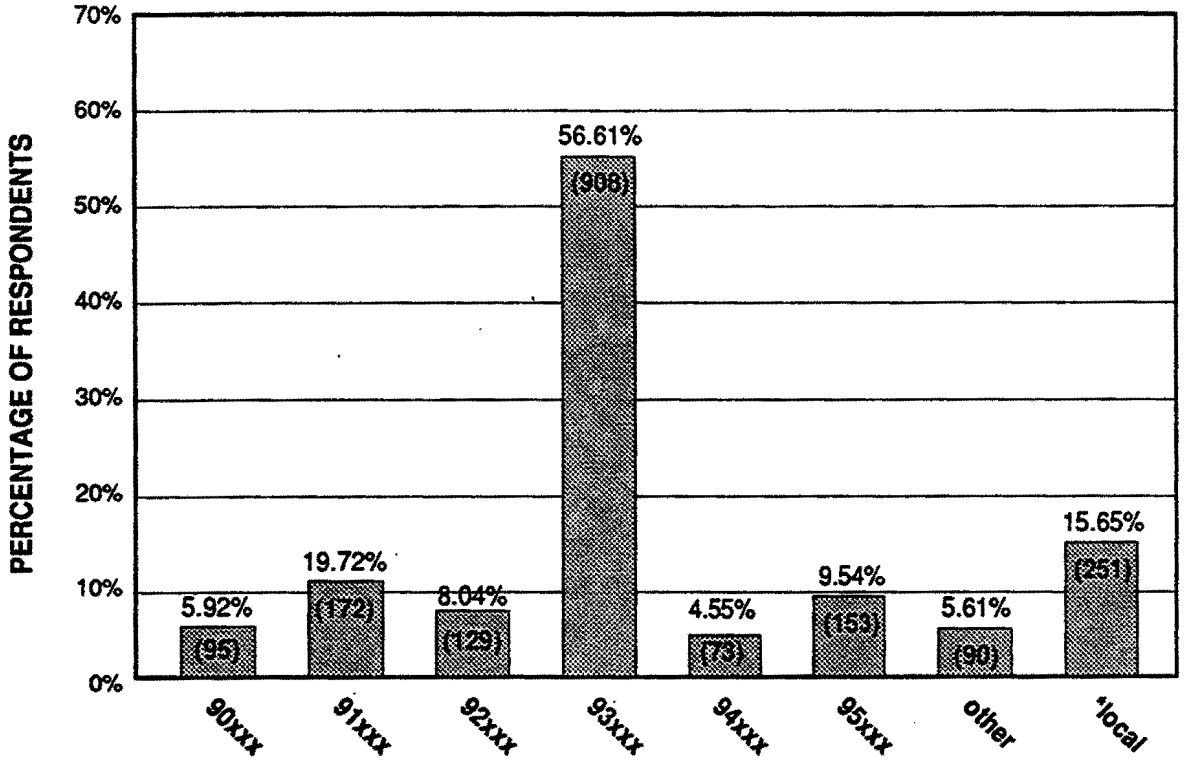

(XX) = Number of responses




(XX) = Number of responses

## FIGURE 25

### Zip code region of survey respondents




(xx) = Number of survey respondents per zip code region

% = Percentage of survey respondents per zip code region

*local: Grover Beach, Arroyo Grand, Santa Maria, Oceano, Nipomo, San Luis Obispo, Shell Beach; Local is a part of the 93XXX zip code

## FIGURE 26

### Average group size

| | | |
|---|---|---|
| Cases | = | 1,559 |
| Sum | = | 4,858 |
| Average | = | 3.12 |
| Std. error | = | 2.24 |
| Minimum | = | 1 |
| Maximum | = | 23 |

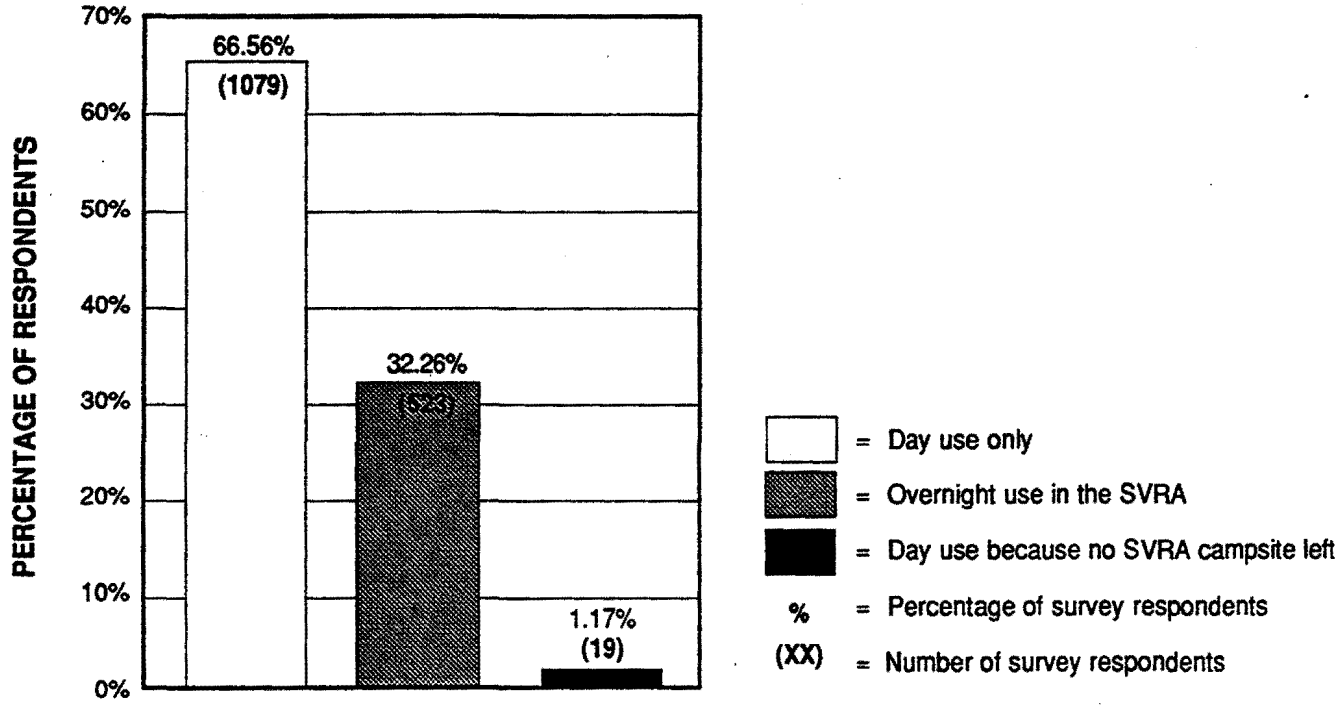
## FIGURE 27

***Average number of children under the age of twelve in each group surveyed***

| | | |
|---|---|---|
| Cases | = | 1,261 |
| Sum | = | 1,020 |
| Average | = | 0.81 |
| Std. error | = | 1.39 |
| Minimum | = | 0 |
| Maximum | = | 16 |

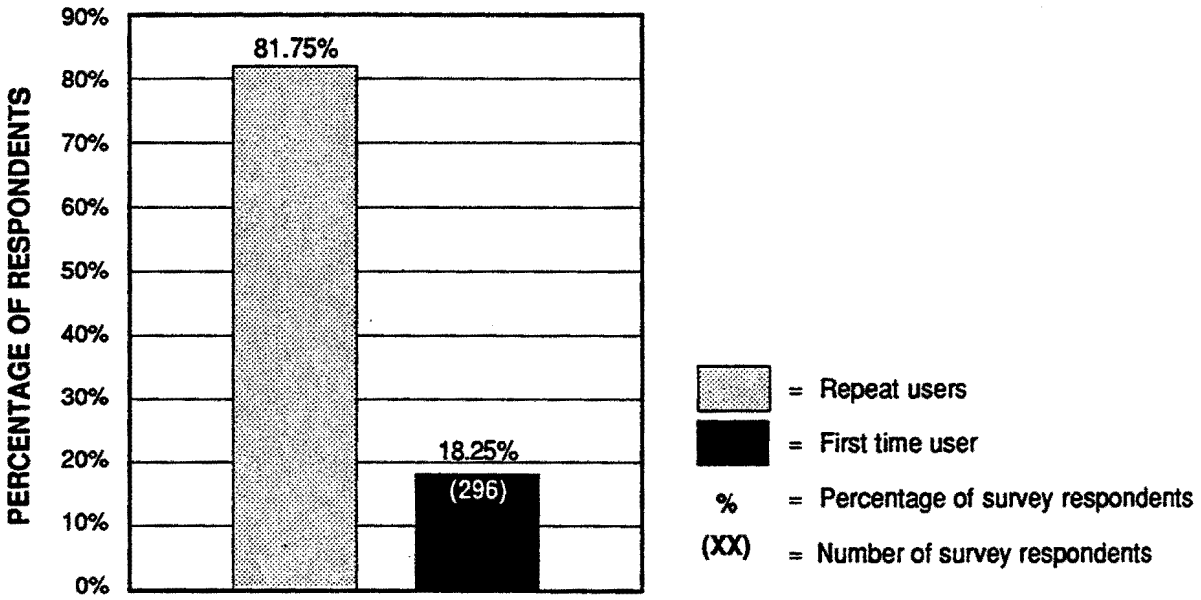
## FIGURE 28

***Number of day users versus overnight campers in the SVRA***



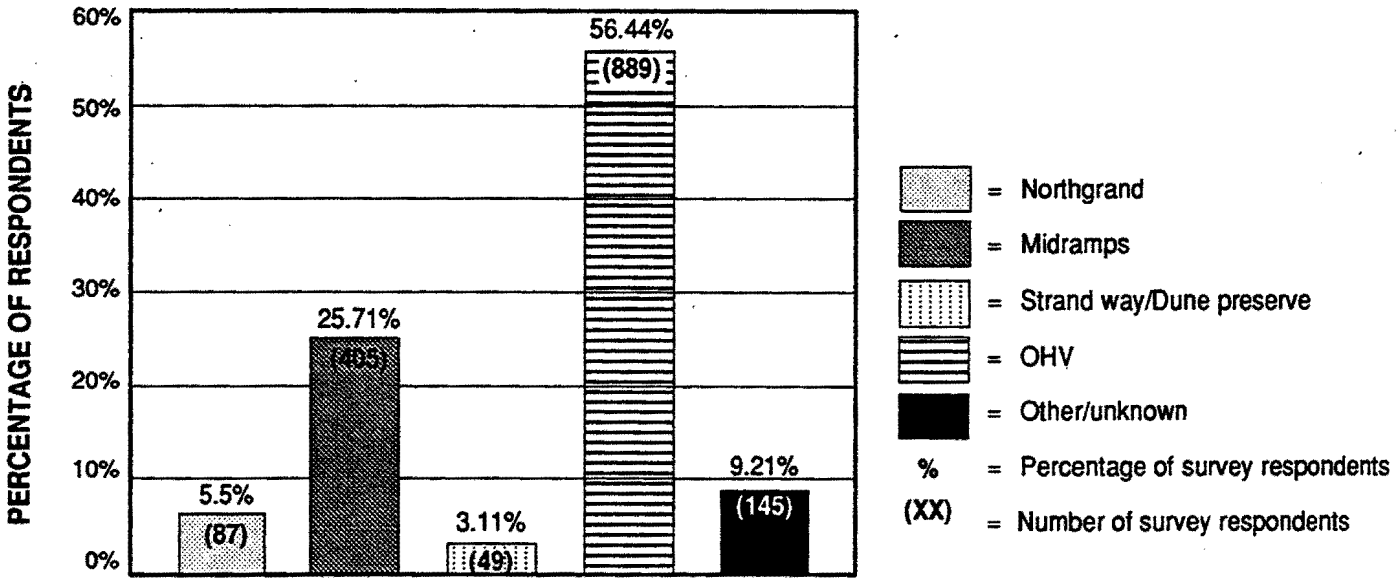
## FIGURE 29

***Number of repeat and first time visitors to Oceano Dunes SVRA***



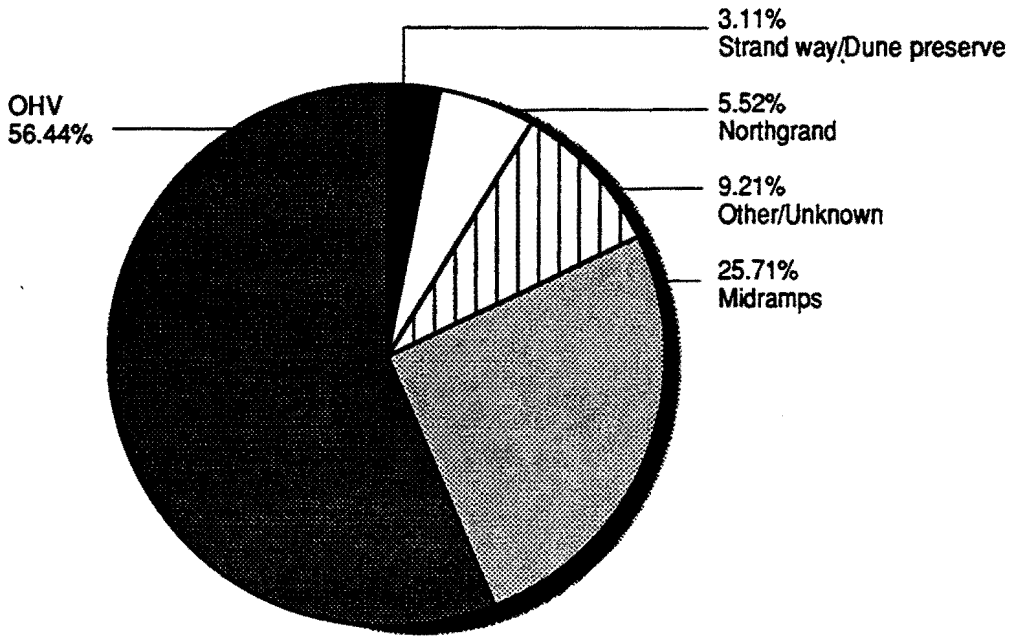

## FIGURE 30

***Area within SVRA where respondent spent most of their recreational time***



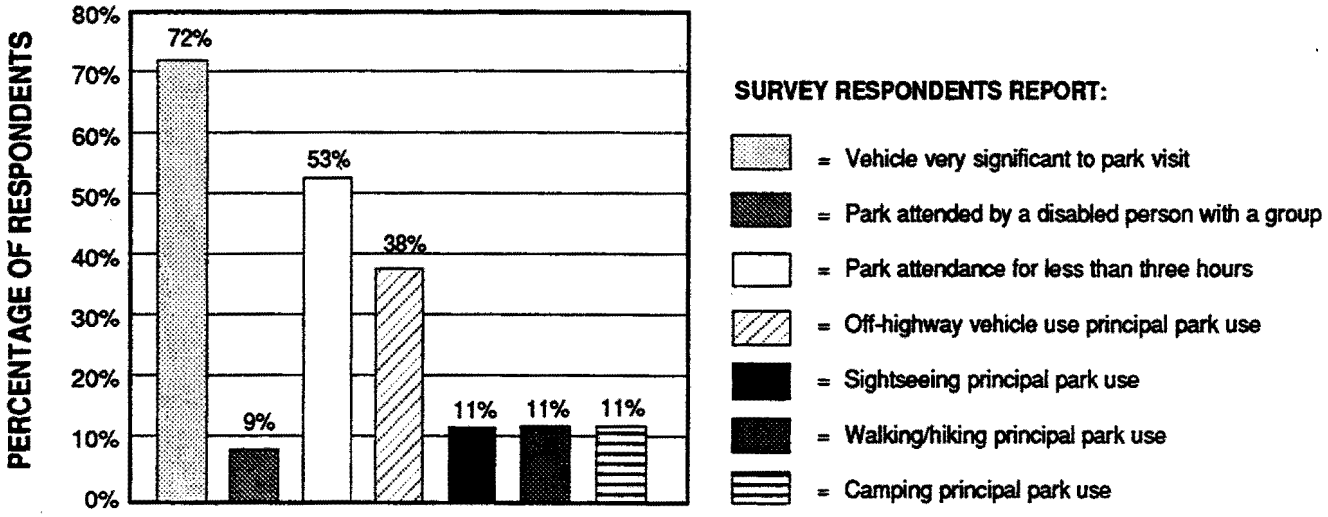
# FIGURE 31

***Area within SVRA where respondent spent most of their recreational time***



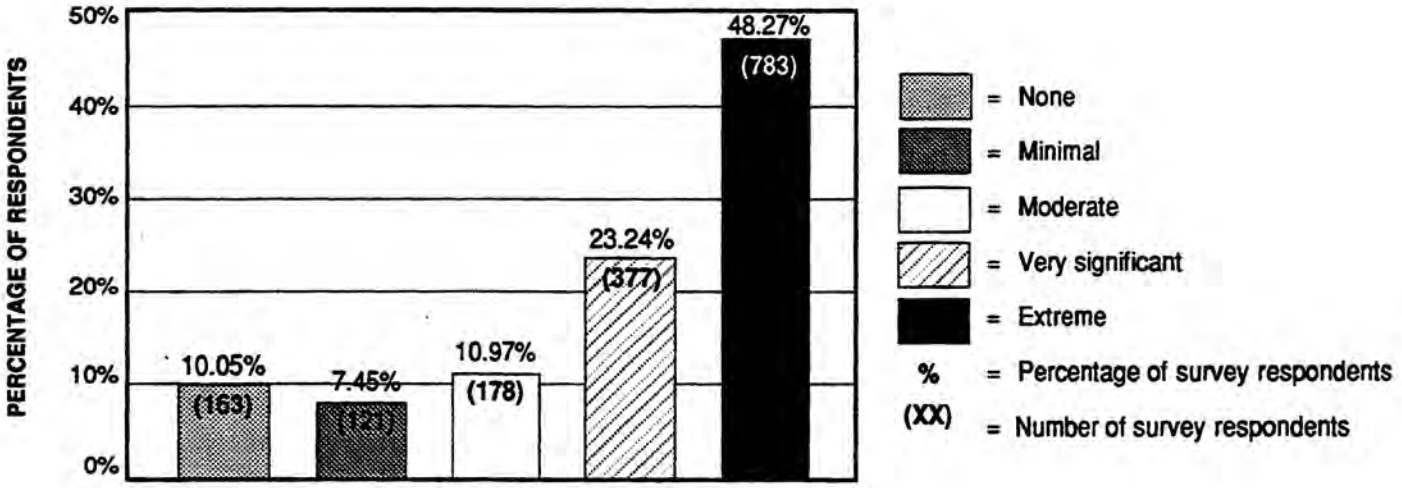
# FIGURE 32

***Miscellaneous analysis of park visitors***



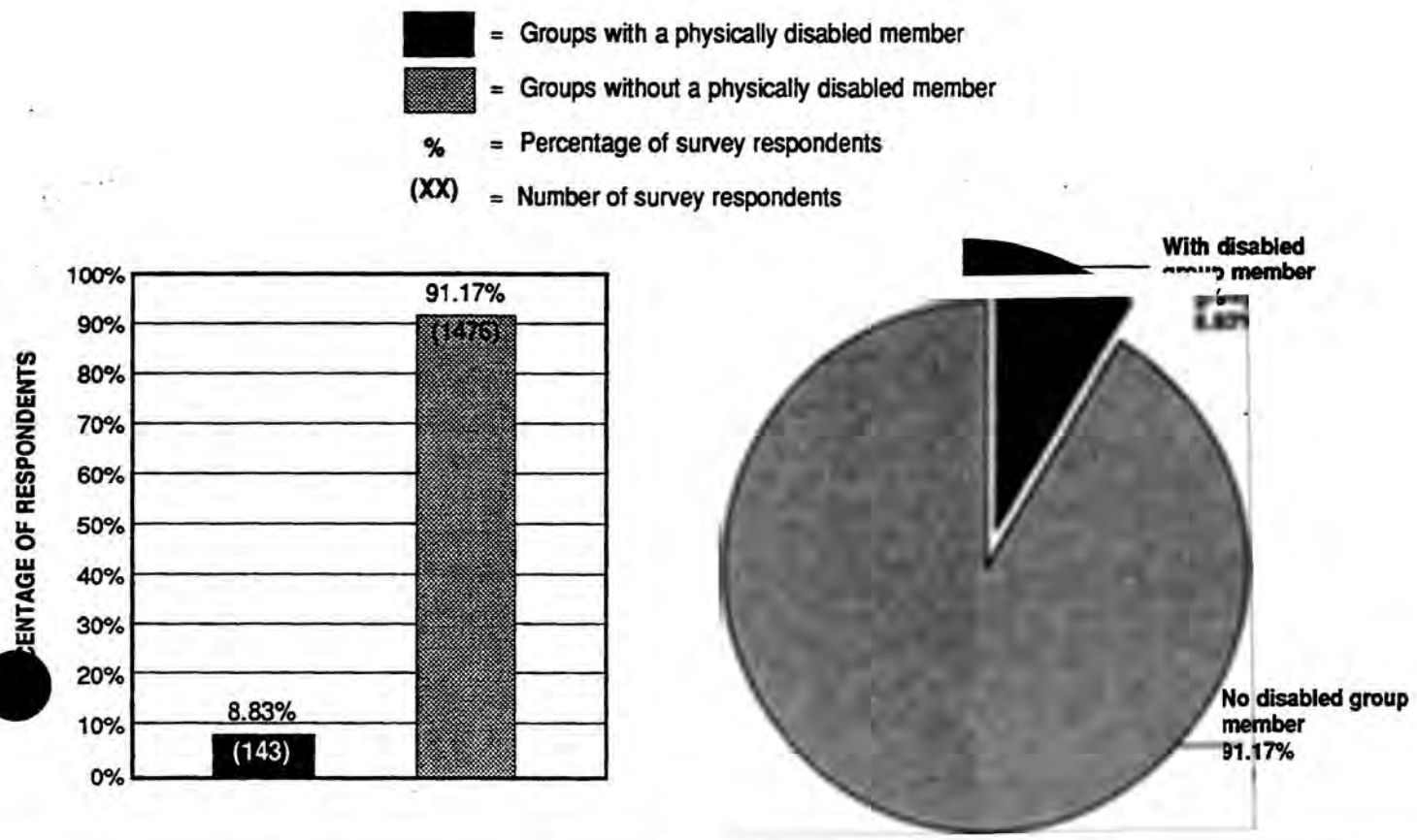
## FIGURE 33

***Importance of the use of a vehicle in the SVRA survey response***



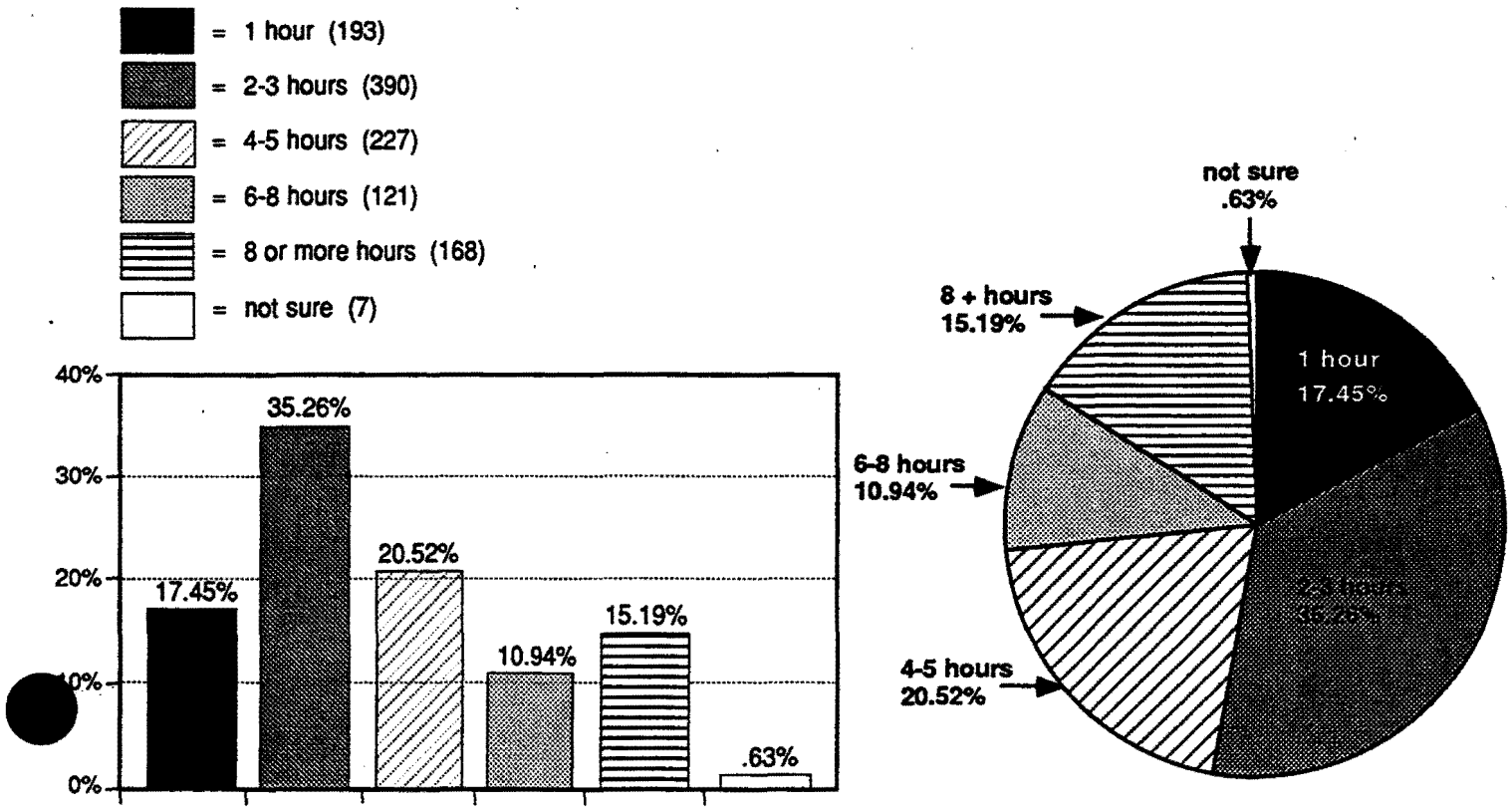

## FIGURE 34

***Number of surveyed groups with a physically disabled member***



# FIGURE 35

***Length of stay amongst day users***

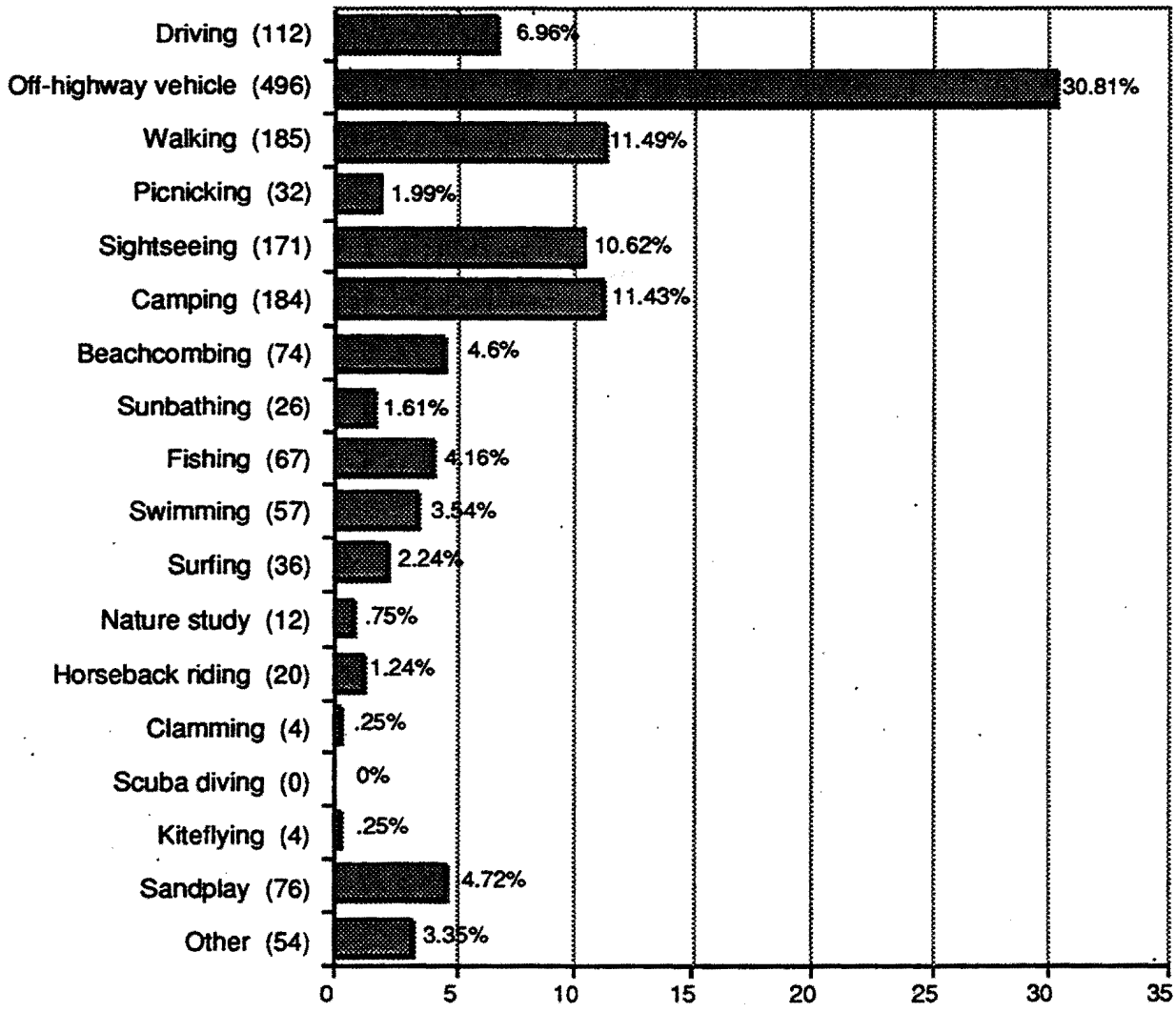


# FIGURE 36

***Principal park activities cited by survey respondents***

% = Percentage of survey respondents

(XX) = Number of survey respondents
(1610 Total surveyed)



data was performed to identify relationships, which might exist between the various parameters measured. In this analysis the following relationships were examined:

- The influence of survey location on principal activity **(Figures 37-38)**;
- The influence of survey location on the importance of the use of a vehicle to the visit **(Figure 39)**;
- The influence of principal activity and the importance of the use of a vehicle to the visit **(Figures 40-41)**;

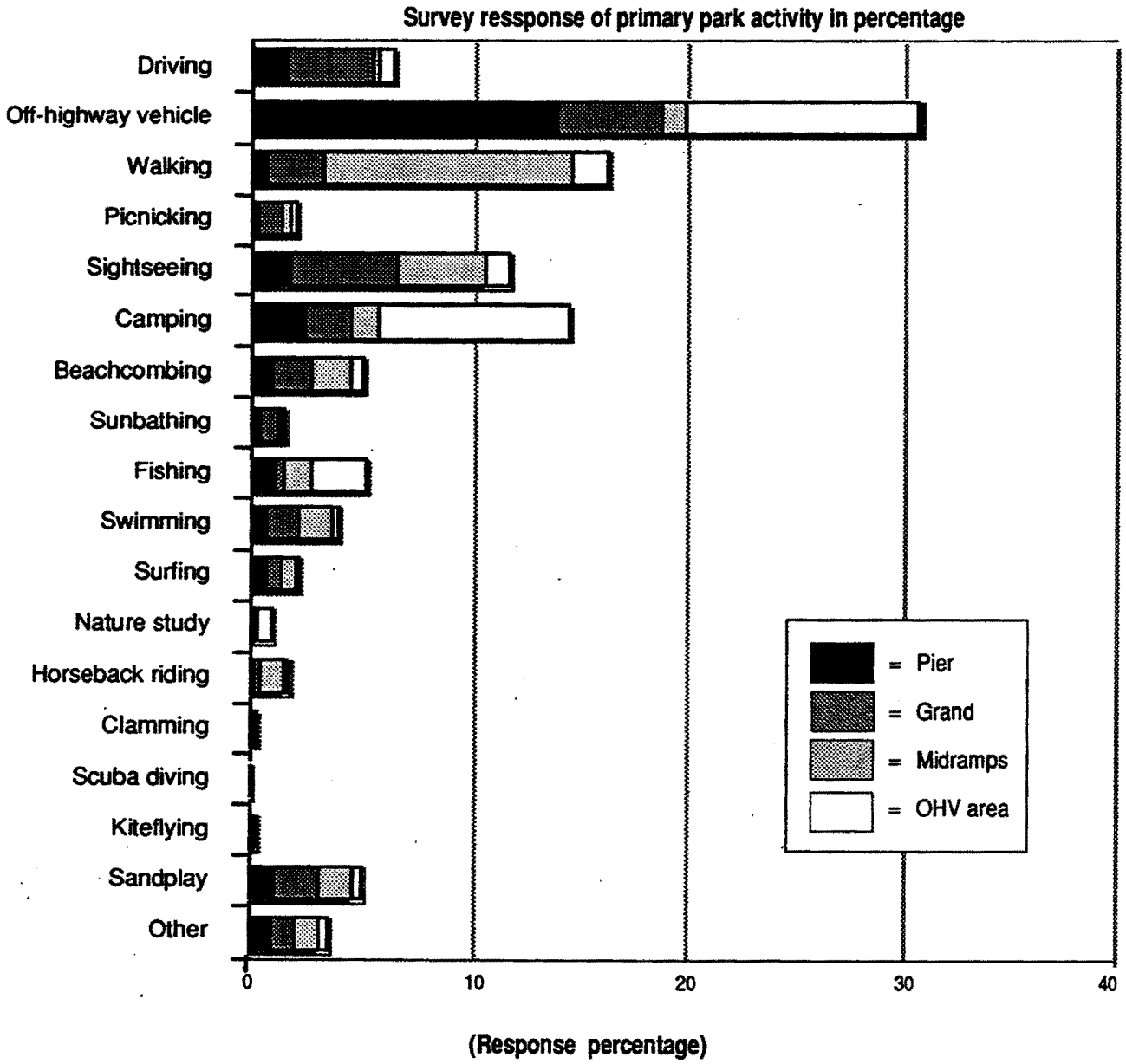
Analysis of the cross- correlated survey data with respect to the above parameters indicated the following:

**1. The influence of survey location on principal activity (Figures 37-38):**

- **a.** Of those surveyed at the Pier Avenue kiosk over 57% named either beach driving or off- highway vehicle use as their principal activity; other significant activities included: sightseeing, which was usually associated with beach driving (7%); camping (9%); and walking (3%);
- **b.** Of those surveyed at the Grand Avenue kiosk 31% named either beach driving or off-highway vehicle use as their principal activity; other significant activities included: sightseeing (17%); walking (9%); camping (7%); and picnicking (4%);
- **c.** Of those pedestrians which were surveyed along the beach which fronted the camping and OHV open-ride area 41% either named beach driving or OHV use as their principal activity; other significant activities included: camping (31%); walking (6%); and sightseeing (4%);
- **d.** Of those pedestrians which were surveyed along the beach between Grand and Pier Avenues (i.e. "mid-ramps") 40% named walking as their principal activity; other significant activities included: sightseeing (14%); beach driving and OHV use (5%); and camping (5%);

# FIGURE 37

***The influence of survey location on principal activity***

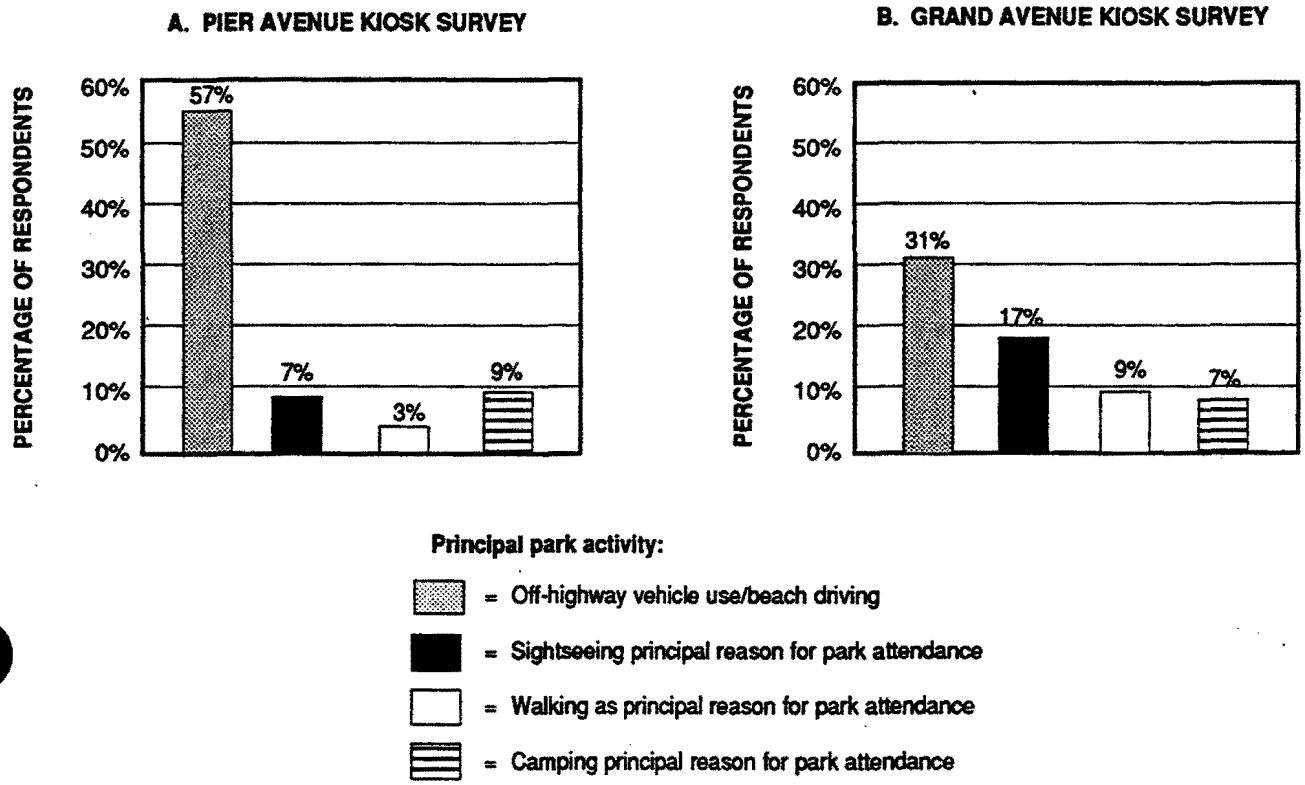



| ACTIVITY | PIER | GRAND | MIDRAMPS | OHV AREA |
|---|---|---|---|---|
| Driving | 6.35 | 13.47 | 1.13 | 2.24 |
| OHV use | 50.26 | 17.05 | 3.76 | 38.43 |
| Walking | 3.09 | 9.05 | 40.23 | 5.60 |
| Picnicking | 1.2 | 4 | 1.5 | .75 |
| Sightseeing | 7.03 | 17.05 | 13.91 | 4.1 |
| [illegible]mping | 8.92 | 7.37 | 4.89 | 30.60 |
| [illegible]chcombing | 3.43 | 6.95 | 6.39 | 1.49 |
| Sunbathing | 1.54 | 2.74 | .75 | .75 |
| Fishing | 3.77 | 2.11 | 4.51 | 8.58 |

| ACTIVITY | PIER | GRAND | MIDRAMPS | OHV AREA |
|---|---|---|---|---|
| Swimming | 2.92 | 4.84 | 5.64 | .75 |
| Surfing | 3.09 | 1.89 | 2.26 | .75 |
| Nature study | .17 | .63 | .38 | 2.24 |
| Horseback riding | .51 | 1.05 | 4.14 | .37 |
| Clamming | .34 | .21 | 0 | .37 |
| Scuba diving | 0 | 0 | 0 | 0 |
| Kiteflying | .17 | .21 | .75 | 0 |
| Sandplay | 3.77 | 7.58 | 5.64 | 1.12 |
| Other | 3.43 | 3.79 | 4.14 | 1.87 |

# FIGURE 38

***The influence of survey location on principal activity***



**2. The influence of survey location on the importance of the use of a vehicle to the visit (Figure 39):**

- **a**. Of those surveyed at the Pier Avenue kiosk 82% felt that the use of a vehicle was either very significant or extremely important to their visit, while only 9% felt that it was either minimally or not important at all;

- **b**. Of those surveyed at the Grand Avenue kiosk 73% felt that the use of vehicle was either very significant or extremely important to their visit, while only 13% felt that it was either minimally or not important at all;

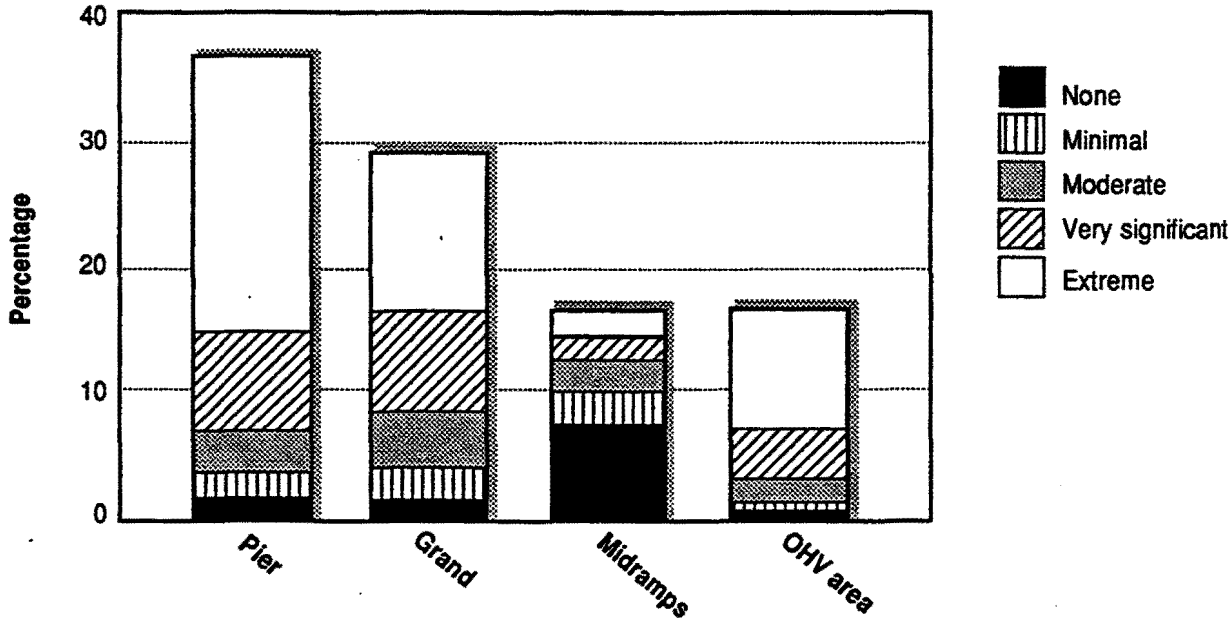
- **c**. Of those pedestrians which were surveyed along the beach which fronted the camping and OHV open-ride area 85% felt that the use of vehicle was either very significant or extremely important to their visit, while only 6% felt that it was either minimally or not important at all;

- **d**. Of those pedestrians who were surveyed along the beach between Grand and Pier Avenues (i.e. "mid-ramps") 31% felt that the use of vehicle was either very significant or extremely important to their visit and 58% felt it was either minimally or not important at all;

# FIGURE 39

## *The influence of survey location on the importance of a vehicle*

*How important is the ability to drive your vehicle on the beach to your visit to this recreation area?*




***Column:*** *How important is the ability to drive your vehicle on the beach to your visit to this recreation area?*
***Row:*** *Approximate location of survey*

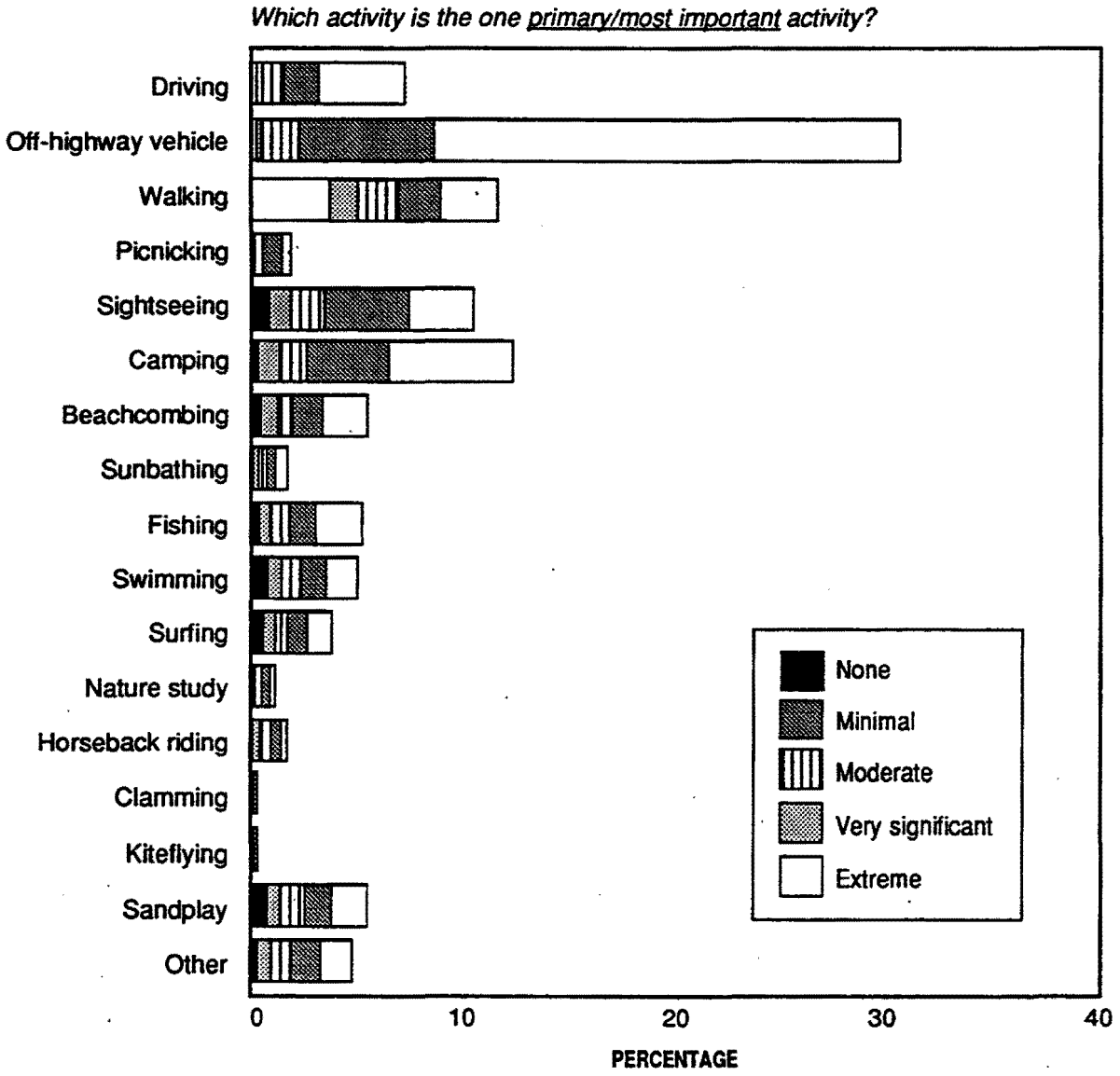
| | None | Minimal | Moderate | Very significant | Extreme | Total | Average | Standard Error |
|---|---|---|---|---|---|---|---|---|
| Pier | 20 | 31 | 53 | 130 | 355 | 589 | 4.31 | 1.06 |
| Column% | 12.27 | 25.62 | 30.46 | 34.85 | 45.98 | 36.74 | | |
| Row % | 3.4 | 5.26 | 9.0 | 22.07 | 60.27 | 100 | | |
| Grand | 16 | 44 | 68 | 125 | 223 | 476 | 4.04 | 1.13 |
| Column % | 9.82 | 36.36 | 39.08 | 33.561 | 28.89 | 29.69 | | |
| Row % | 3.36 | 9.24 | 14.29 | 26.26 | 46.85 | 100 | | |
| MIDRAMPS | 121 | 36 | 29 | 49 | 34 | 269 | 2.4 | 1.51 |
| Column % | 74.23 | 29.75 | 16.67 | 13.14 | 4.40 | 16.78 | | |
| Row % | 44.98 | 13.38 | 10.78 | 18.22 | 12.64 | 100 | | |
| OHV area | 6 | 10 | 24 | 69 | 160 | 269 | 4.36 | .95 |
| Column | 3.68 | 8.26 | 13.79 | 18.5 | 20.73 | 16.78 | | |
| Row % | 2.23 | 3.72 | 8.92 | 25.65 | 59.48 | 100 | | |
| TOTAL | 163 | 121 | 174 | 373 | 772 | 1603 | 3.92 | 1.34 |
| | 10.17% | 7.55% | 10.85% | 23.27% | 48.16% | 100% | | |

**3. The influence of principal activity and the importance of the use of a vehicle to the visit (Figures 40-41):**

The table below **(figure 42)** is a summary of the information of the cross-correlated statistics contained in **figures 40-41**. It is useful in revealing how the attitudes towards vehicle use vary according to principal recreational activity. Perhaps most striking is the fact that an overwhelming majority of the recreational classes (i.e. 82% or 14 of the 17 classes) who utilize Oceano Dunes had 50% or more of their participants state that the use of their vehicle was either very significant or extremely important to their visit. On the other hand, only 2 of the 17 (i.e. 12%) recreational classes had a majority of respondents that found that vehicle use was either minimally or not at all important to their visit. More simply stated, only those classes of recreational users who listed either horseback riding or walking as their principal activity had a majority of respondents who felt vehicle use was either minimally or not important to their visit. These observations are likely to be due to the fact that: 1). The overwhelming majority of horseback riders at Oceano Dunes enter into the Park via horseback and therefore do not have a need for a vehicle and; 2). Those that walk on the beach usually either walk to the beach or park their vehicle in the beachside parking lots. Interestingly, amongst the recreational class that listed walking as their principal activity, almost half (i.e. 47%) stated that the use of their vehicle while at Oceano Dunes was at least moderately important to their enjoyment of the Park.

# FIGURE 40

***The influence of principal activity and the importance of a vehicle***



# FIGURE 41

## *The influence of principal activity and the importance of a vehicle*

***Column:*** *How important is the ability to drive your vehicle on the beach to your visit to this recreation area?*
***Row:*** *Which acitvity is the one primary/most important activity?*

| | None | Minimal | Moderate | Very significant | Extreme | Total | Average |
|---|---|---|---|---|---|---|---|
| Driving | 2 | 3 | 16 | 27 | 64 | 112 | 4.32 |
| Column % | 1.23 | 2.5 | 9.09 | 7.28 | 8.23 | 7.97 | |
| Row % | 1.79 | 2.68 | 14.29 | 24.11 | 57.14 | 100.00% | 4.65 |
| OHV use | 2 | 7 | 29 | 87 | 371 | 496 | |
| Column % | 1.23 | 56.83 | 16.48 | 23.45 | 47.69 | 30.85 | |
| Row % | .40 | 1.41 | 5.85 | 17.54 | 74.80 | 100% | |
| Walking | 78 | 19 | 20 | 28 | 39 | 184 | 2.63 |
| Column % | 47.85 | 15.83 | 11.36 | 7.55 | 5.01 | 11.44 | |
| Row % | 42.39 | 10.33 | 10.87 | 15.22 | 21.20 | 100% | |
| Picnicking | 2 | 4 | 4 | 14 | 7 | 31 | 3.65 |
| Column % | 1.23 | 3.33 | 2.27 | 3.77 | .901.93 | | |
| Row % | 6.45 | 12.90 | 12.90 | 45.16 | 22.58 | 100% | |
| Sightseeing | 21 | 25 | 34 | 50 | 41 | 171 | 3.38 |
| Column % | 12.88 | 20.83 | 19.32 | 13.48 | 5.27 | 10.63 | |
| Row % | 12.28 | 14.62 | 19.88 | 29.24 | 23.98 | 100% | |
| Camping | 6 | 15 | 16 | 49 | 98 | 184 | 4.18 |
| Column % | 3.68 | 12.50 | 9.09 | 13.21 | 12.60 | 11.44 | |
| Row % | 3.26 | 8.15 | 8.70 | 26.63 | 53.26 | 100% | |
| Beachcombing | 10 | 8 | 8 | 21 | 27 | 74 | 3.64 |
| Column % | 6.13 | 6.67 | 4.55 | 5.66 | 3.47 | 4.60 | |
| Row % | 13.51 | 10.81 | 10.81 | 28.38 | 36.49 | 100% | |
| Sunbathing | 0 | 3 | 6 | 7 | 10 | 26 | 3.92 |
| Column % | 0 | 2.50 | 3.41 | 1.89 | 1.29 | 1.62 | |
| Row % | 0 | 11.54 | 23.08 | 26.92 | 38.46 | 100% | |
| Fishing | 6 | 5 | 5 | 18 | 33 | 67 | |
| Column % | 3.68 | 4.17 | 2.84 | 4.85 | 4.24 | 4.17 | |
| Row % | 8.96 | 7.46 | 7.46 | 26.87 | 49.25 | 100% | |
| Swimming | 5 | 10 | 8 | 14 | 20 | 57 | 3.6 |
| Column % | 3.07 | 8.33 | 4.55 | 3.77 | 2.57 | 3.54 | |
| Row % | 8.77 | 17.54 | 14.04 | 24.56 | 35.09 | 100% | |
| Surfing | 3 | 4 | 5 | 12 | 12 | 36 | 3.72 |
| Column % | 1.84 | 3.33 | 2.84 | 3.23 | 1.54 | 2.24 | |
| Row % | 8.33 | 11.11 | 13.89 | 33.33 | 33.33 | 100.00% | |
| Nature Study | 1 | 2 | 5 | 2 | 2 | 12 | 3.1 |
| Column % | .61 | 1.67 | 2.84 | .54 | .26 | .75 | |
| Row % | 8.33 | 16.67 | 41.67 | 16.67 | 16.67 | 100% | |
| Horseback riding | 9 | 2 | 2 | 4 | 3 | 20 | 2.0 |
| Column % | 5.52 | 1.67 | 1.14 | 1.08 | .39 | 1.24 | |
| Row % | 45 | 10 | 10 | 20 | 15 | 100% | |
| Clamming | 1 | 1 | 0 | 0 | 2 | 4 | 3.2 |
| Column % | .61 | .83 | 0 | 0 | .26 | .25 | |
| Row % | 25 | 25 | 0 | 0 | 0 | 0 | |
| Skin/cuba diving | 0 | 0 | 0 | 0 | 0 | 0 | |
| Kiteflying | 1 | 1 | 0 | 2 | 0 | 4 | 2.7 |
| Column % | .61 | .83 | 0 | .54 | 0 | .25 | |
| Row % | 25 | 25 | 0 | 50 | 0 | 100% | |
| Sandplay | 7 | 9 | 11 | 22 | 27 | 76 | 3.7 |
| Column % | 4.29 | 7.50 | 6.25 | 5.93 | 3.47 | 4.73 | |
| Row % | 9.21 | 11.84 | 14.47 | 28.95 | 35.53 | 100% | |
| Other | 9 | 2 | 7 | 14 | 22 | 54 | 3.7 |
| Column % | 5.52 | 1.67 | 3.98 | 3.77 | 2.83 | 3.36 | |
| Row % | 16.67 | 3.7 | 12.96 | 25.93 | 40.74 | 100% | |
| TOTAL | 163 | 120 | 176 | 371 | 778 | 1608 | 3.93 |
| | 10.14% | 7.46% | 10.95% | 23.07% | 48.38% | 100% | |

# FIGURE 42

## Importance of Vehicle on Activity at Oceano Dunes

| Principal activity listed by participant (% of respondents) | | % of participants feeling that vehicle use was either very significant or extremely important to their visit | % of participants feeling that vehicle use was moderately important to their visit | % of participants feeling that vehicle use was either minimally or not important to their visit |
|---|---|---|---|---|
| | | Extremely Important | Moderately Important | Minimally Important |
| beach driving | (7) | 81 | 14 | 4 |
| OHV use | (31) | 92 | 6 | 2 |
| walking | (11) | 36 | 11 | 53 |
| picnicking | (2) | 68 | 13 | 19 |
| sightseeing | (11) | 53 | 20 | 27 |
| camping | (5) | 80 | 9 | 11 |
| beach combing | (5) | 65 | 11 | 24 |
| sunbathing | (2) | 65 | 23 | 12 |
| fishing | (4) | 76 | 7 | 16 |
| swimming | (4) | 60 | 14 | 26 |
| surfing | (2) | 67 | 14 | 19 |
| nature study | (1) | 33 | 42 | 25 |
| horseback riding | (1) | 35 | 10 | 55 |
| clamming | (0) | 50 | 0 | 50 |
| skin diving | (n.s.) | n.s. | n.s. | n.s. |
| kite flying | (0) | 50 | 0 | 50 |
| sand play | (5) | 64 | 14 | 21 |
| other | (3) | 67 | 13 | 20 |
| **TOTAL** | **(100)** | **71** | **11** | **18** |

## 4. Visitor Characterization:

The Carrying Capacity of individual areas was outlined in the 1975 General Development Plan (GDP) for Pismo State Beach and Pismo Dunes State Vehicular Recreation Area. The distinction was made between camping and day use. The maximum number of day use vehicles for the area has historically been referred to as 4300 vehicles. In 1993, Coastal Commission staff recommended that the Commission require State Parks to determine the current day use carrying capacity at Oceano Dunes SVRA and to limit the number of overnight on-highway vehicles to 1,000 each day.

One conclusion that can be reached from visitor attendance is that street legal vehicle day use and overnight camping use at the park is highly variable, as is the number of green sticker off highway vehicles (OHVs) associated with each. These figures not only vary with the season of the year, but also with the day of the week and the type of day (i.e. holiday versus non-holiday). This type of variation in visitation by day users versus campers is not unlike that of most other recreational facilities. In order to increase the understanding of visitor use patterns State Parks will continue to gather, monitor and evaluate additional data pertaining to the subject.

OHVs are trailered into the park by day use vehicles and campers. Historically, both day use and camper vehicles have been monitored (counted) on a daily basis. Determining the approximate number of OHVs in the park on any given day, or the number over any given time span, then becomes a matter of understanding the relationship that exist between OHVs and their sources. This section of the ODSVRA Off-Highway Vehicle Day-Use Carrying Capacity Study will address the relationships between OHVs and their sources at the park.

### *a. Current Data Sets*

A vehicle count survey was conducted to support the Access Corridor EIR during the period of April 22 to April 28, 1991 that determined on and off-highway vehicle numbers and fleet composition. Over the course of the seven days surveyed, 2,601 on -highway vehicles entered the park and a total of 924 OHVs were trailered into the park resulting in a weekly average OHV/on-highway vehicle ratio of 0.36.

Since completion of the Access Corridor EIR, two additional surveys have been conducted that shed additional light on visitor and vehicle trends at the park. As part of the ODSVRA Off-highway Vehicle Day-Use Carrying Capacity study, a survey questionnaire (1994 Visitor Survey) was conducted between Memorial Day and Labor Day weekends, 1994 inclusive (**Appendix A,** aka **"Exhibit A"**). From this survey more accurate visitor trip lengths have been determined based on area code information gathered. This survey also generated vehicle composition information, as did the 1991 survey, along with a ratio of OHVs to on-highway vehicles of 0.81.

From June 14 to June 20, 1996, park staff conducted a third vehicle survey count. The results of this survey are substantially similar to the vehicle survey conducted from April 22 to April 28, 1991. Both surveys determined the ratio of OHVs to on-highway vehicles to be 0.36.

It is very important to note the similarities and differences between the three surveys conducted to date when reviewing and comparing data. Both the April 1991 and June 1996 surveys were conducted by counting vehicles entering the park, including trailered OHVs. In addition, both surveys completely cover a one-week period including five weekdays (Monday-Friday) and two weekend days (Saturday and Sunday). They also were both conducted during the spring period, neither covering a peak holiday (Memorial Day, 4th of July, Labor Day). Since the data was collected daily and represents full

vehicle counts, weekly trend profiles can be determined. It should be noted that the 0.36 OHV/on-highway vehicle ratios determined from both surveys represent weekly averages. The 1994 Visitor Survey, in contrast, includes data collected over approximately 14 weeks and captured three peak holiday periods (Memorial Day, July 4th and Labor Day). The method of data collection differs from that used in the April 1991 and June 1996 surveys. Rather than consisting of counts of all vehicle types entering the park, the survey was randomly administered to approximately one in five vehicles at the entry kiosks and randomly to pedestrians within the SVRA area. It should be noted that the results of this survey (0.81 ratio) were expected to be high. This was due to the fact that the collective staffs were interested in collecting data during peak periods, i.e., situations in which the Park visitorship would most likely be at or near the current day-use limit.

### *b. Daily and Weekly Trends*

#### 1. Non-peak, Low to Transitional Season

Assuming a non-holiday week, the current data sets show a strong correlation between the number of on- and off-highway vehicle numbers and the day of the week. The typical weekly vehicle trend can be separated into weekday and weekend use. From Monday to Thursday, vehicle use (of all types) appears to be relatively low and flat. The April 1991 survey averaged 0.17 OHVs per on-highway vehicle between Monday and Thursday with a high of 0.218 (Thursday) and a low of 0.119 (Wednesday). The June 1996 survey over the Monday through Thursday period averaged 0.29 OHVs per on-highway vehicle with a low of 0.26 recorded on Wednesday and Thursday, and a high of 0.36 measured on Monday.

Starting Friday, the weekend influx begins, typified by both greater numbers of all vehicles and a greater ratio of OHVs to on-highway vehicles. In fact, in both the April 1991 and June 1996 surveys, the OHV to on-highway vehicle ratio is greatest on Fridays. In addition, both studies indicate that the numbers of vehicles accessing the park (either day use or overnight campers) peak on Saturday. Sundays, while part of the weekend peak period, represent a decline in both the total number of vehicles and the ratio of OHVs to on-highway vehicles.

Actual on-highway day use vehicle counts were made by State Parks staff for days exceeding 1000 vehicles between May of 1994 and December of 1995. San Luis Obispo County planning staff then utilized this data to calculate the number of day use OHVs on these days. The number of day use OHVs were calculated utilizing the ratio OHVs/on-highway day use vehicles of 1.27. This value was based upon data contained in a memo from Don Patton to SLO APCD (9/96). Total day use vehicle counts (including estimated day use OHVs) were then tabulated. The County concluded that during the period in which the study was carried out, there was no time in which the current day-use carrying capacity exceeded.

## 2. Peak Season Daily and Weekly Trends

The sole body of data upon which conclusions may be drawn with respect to peak season daily and weekly use are the results from the 1994 Visitor Survey. Due to the fact that the other two referenced surveys did not take place during what is typically regarded as the "peak season", direct statistically valid comparisons of weekly vehicle trends are not possible. Nonetheless, the average weekly trend appears similar when plotting percent attendance in that vehicle use at the park is lowest Monday through Thursday peaking on Saturday and Sunday.

### *c. Seasonal Trends*

The seasonal vehicle use trends were developed using real monthly data counts on the numbers of day use and camper vehicles. The number of OHVs for each month was determined by applying the OHV/on-highway vehicle ratios derived from the three studies (0.36 and 0.81). Additionally a transitional ratio (0.6) was utilized for the months of May, September, and November based on the occurrence of peak weekends and higher camper rates during these months. The seasonal pattern is quite regular and repeatable and therefore lends credence to the use of OHV ratios to determine the likely number of OHVs at the park over a given period of time.

## 5. Establishment of OHV Day Use Capacity

On October 23, 1996 the San Luis Obispo Board of Supervisors passed Resolution 96-404, which recommended "that the day use carrying capacity of Oceano Dunes SVRA be established at 4,300 day use vehicles which includes the off highway vehicles and 1,000 camping vehicles". The resolution also recommended that State Parks monitor this level of use for the four major holiday periods and the normal summer usage and reevaluate this day use limit every three years. The Board recommended to the Coastal Commission that they direct an independent consultant to prepare a new study under contract directly to the California Coastal Commission.

The Oceano Dunes Day Use Carrying Capacity Study represents a significant interagency effort in which the staffs of the California Coastal Commission, the County of San Luis Obispo and State Parks worked closely together to develop criteria for evaluation of the carrying capacity of Oceano Dunes SVRA. Together, methodologies for both collecting and evaluating the data were developed. The outcome of that study indicated that for all criteria evaluated (sensitive natural resources, traffic, crime, sanitation, and visitor interaction) the SVRA's carrying capacity had not been reached.

Since the Board of Supervisors passage of Resolution 96-404, State Parks has:

- researched and gathered data for a ten year trend analysis for public safety criteria,
- has developed ongoing monitoring programs for all day use carrying capacity critical evaluation factors,
- and has developed data driven thresholds which will trigger management evaluation and action and possible operational changes should threshold limits be exceeded.

Baseline data, trend analysis, thresholds and a range of possible management actions are described elsewhere in this amendment document. It is the opinion of State Parks, San Luis Obispo County Planning staff and of the staff of the California Coastal Commission that the monitoring programs and thresholds now established obviate the

need for a new carrying capacity study.

The current limit on day use vehicles is 4,300. Since 1982, only those day use vehicles entering the SVRA under their own power (street legal vehicles) have been counted for attendance purposes. Towed or trailered day-use OHVs have not been counted as a part of this established limit.

Both the County of San Luis Obispo staff and the California Coastal Commission staff have expressed the desire to have all OHVs counted. Such OHV counts would include both those OHVs brought into the SVRA by day use vehicles and as well as those towed or trailered via overnight vehicles.

The San Luis Obispo County Planning Department analyzed field survey data collected by State Parks and has recommended an interim day use/OHV ratio of 0.5 for application in implementing a day use carrying capacity at Oceano Dunes SVRA.

In considering the establishment of a day use carrying capacity for Oceano Dunes SVRA which entails counting all day use OHVs, State Parks recommends the use of those survey results cited above by the County package as a valid means by which to establish day use on-highway vehicle/ OHV ratios. As previously mentioned these values will be subject to further verification by way of additional future studies. Specifically, State Parks plans to initiate a subcontract in 1998 to collect and study data relating to the issue of vehicle types and their numbers. This information will then be added to the previously described, ongoing vehicle monitoring efforts. State Parks proposes that this data then be utilized to create an annually corrected 3- year average ratio (i.e., day use on-highway vehicle /OHV). The purpose of utilizing a three year average would be to correct for most short -term anomalies and to account for any longer term changes which might affect this value, (e.g., temporary or long-term changes in: the economy, gas prices, sport popularity, demographics, etc.)

Perhaps the most important conclusion that can be reached from the Carrying Capacity Study is that the data strongly suggests that both current levels and patterns of visitor use have not reached the carrying capacity of the Park. In light of this, and in an effort to establish a day use carrying capacity which more closely matches both the current levels of use, as well as the current use patterns, State Parks recommends the implementation of a "sliding scale", a concept supported by both County staff and Coastal Commission staff. State Parks recommends the eventual utilization of separate "off season" (January, March, April, December), "transition" (i.e., February, May 1-15, October 15- November 30) and "peak season" (May 15 to October 15) day use on-highway vehicle/OHV ratios. These ratios would be developed over a period of three years, beginning in 1998 and then would be subject to update and refinement as discussed above. In the interim, State Parks proposes that the ratio of 0.5, originally suggested by the San Luis Obispo county planning staff, be utilized in calculating the day use carrying capacity limit. In addition to the safeguard of continual annual refinement based upon ongoing monitoring efforts, much more significant is the fact that total day use vehicle loads will ultimately be governed by the results of the threshold-driven environmental and safety monitoring discussed elsewhere in this document.

As a means by which to accommodate those occasional circumstances or situations which might cause Park visitation to exceed the day use limit, State Parks proposes that a process be developed by which "special events" could be accommodated. Such "special events" might include movie filming, beach clean-up days, Park open houses, motor sport events, etc. Such events would be subject to State Park management review and might require the issuance of a special event permit. A special event permit process is already in place at State Parks. Special event permits, before issuance, require consideration of a number of factors, including traffic impacts, visitor safety, and environmental protection. Not only would the consideration of special events allow for somewhat predictable short-term extraordinary attendance increases (e.g., picnicking families viewing fireworks from the beach on July 4th), but it would also allow for more unpredictable events (e.g. the filming of major motion pictures). This review or permit process for "special events" allows for the continued accommodation of public access to the beach. Special events

also have the positive impact of allowing the businesses in the local communities to benefit from short term increased tourism.

Critical to the establishment of a day use carrying capacity is a means to evaluate visitor impacts and management effectiveness. State Parks' monitoring and evaluation protocols and the establishment of thresholds for key rating factors will provide the data driven means to critically analyze SVRA attendance impacts and provide the means to evaluate the effectiveness of SVRA management actions to mitigate impacts. Additionally, it will serve as the principal basis for making any necessary future adjustments in the day use carrying capacity for Oceano Dunes SVRA.

## *B. Visitor Safety*

An analysis of the safety of visitors to Oceano Dunes SVRA with regards to both criminal activity and vehicular related accidents was performed. The findings of this analysis revealed that the average visitor to the Park was generally safer from criminal activity than a visitor to the nearby City of Pismo Beach or most other State Parks. The results of the vehicular accident analysis revealed that Oceano Dunes SVRA was significantly safer than most other California off- highway vehicle areas. More specific analysis of these results follows in the discussions below.

### 1. Criminal Activity- Comparisons with the City of Pismo Beach:

Annualized crime statistics for the years 1992, 1993, and the July 4th Holiday weekend for the years 1992-1994 were obtained from both ODSVRA and the City of Pismo Beach. This time period was selected for numerous reasons, principal of which was the fact that in 1992 the means by which such data was collected and recorded was completely overhauled. The changes made to this system were universal to the law enforcement community in California and unfortunately make comparisons to previous years (i.e. previous to 1992) at best difficult and extremely consumptive of staff time, if not impossible. (Additionally, the statistics for the period previous to this period were already submitted to both the Coastal Commission and County in 1991. They showed a long downward trend.) For the year 1994, the period of January 1-October 31 was selected because the first draft of this study was due on November 1 of that year. The City of Pismo Beach was principally selected due to its close proximity to ODSVRA and therefore would reflect the level of enforcement activity experienced in that locale. Additionally, Pismo Beach was selected because of the cooperative and positive

relationship which exists with Oceano Dunes SVRA and because they were willing to dedicate the manpower and facilities necessary to compile the statistics needed for this type of comparison. This comparison was performed to address past questions regarding the safety of the Oceano Dunes SVRA visitor as it relates to criminal activity and the concern that the SVRA has a disproportionately high level of criminal activity. Due to some variability in the methods by which this data was recorded, only that which could be standardized for like/accurate comparison was analyzed. Factors which could not be corrected for and but should be considered when evaluating the data include the following:

- Visitors to Oceano Dunes SVRA and the City of Pismo Beach are likely to encounter a range of crowd conditions depending on the time of day, season and year. As a result, the "density of the public" being served by the law enforcement community is likely to vary considerably and is likely to therefore affect the degree of law enforcement activity. For example, on July 4th weekend the visiting public at Oceano Dunes is likely to be significantly more densely "packed" than the public residing or visiting the City of Pismo Beach.
- Rangers at Oceano Dunes SVRA have significantly less total area to cover than do the officers of the City of Pismo Beach ;
- Rangers at Oceano Dunes SVRA should therefore be more visible, easier to find and therefore might be expected to engage in a disproportionately higher number of crime reports and arrests.

In order to assess and compare the criminal activity at these two jurisdictions crime statistics were evaluated based upon measurements of both per capita crime rate and peace officer workload.

## *a. Annualized data (1992-1993):*

### 1. Officer Work Load:

**a.** During the years 1992-1993 the Oceano Dunes SVRA (i.e. Park) had almost ***3 times*** greater badged officer presence per citizen (i.e. residents and visitors) than that of the City of Pismo Beach (City).

**b.** In 1992 the arrest load per badged officer in the City was ***4.2 times*** greater than that of badged officers at the Park. In 1993 this rate grew to ***5.46 times*** greater.

**c.** In 1992 the number of crime reports per badged officer in the City was ***3.75 times*** greater than that experienced at the Park. In 1993 that figure grew to ***4.69 times*** greater.

### 2. Crime Rate:

**a.** In 1992 the rate of arrests per citizen in the City was ***1.61 times*** greater than that of the Park. In 1993 this rate grew to ***1.86 times*** greater. This measure is particularly significant when one considers the tremendous amount of officer time that it takes to book an arrestee (time which could instead be out on "the beat").

b. In 1992 the crime rate per citizen in the City (i.e. as measured by the number of crime reports) was **1.44 times** greater than that of the Park. In 1993 that rate grew to **1.59 times.**

***b. July 4th Holiday Weekends (1992-1994)***

**1. Officer Work Load:**

**a.** The number of citizens served by each badged officer per day of this weekend in:

- 1992 was ***1.44 times*** greater at the Park than at the City;
- 1993 was ***1.06 times*** greater at the Park than at the City;
- 1994 was ***1.08 times*** greater at the Park than at the City;

**b.** The number of arrests per officer per day of this weekend in:

1992 was ***1.15 times*** greater at the City than at the Park;
1993 was ***7.39 times*** greater at the City than at the Park
1994 was ***1.14 times*** greater at the Park that at the City;

**c.** The number of crime reports per officer per day of this weekend in:

- 1992 was ***1.64 times*** greater at the Park than at the City;
- 1993 was ***1.28 times*** greater at the Park than at the City;
- *1994 was* **1.32 times** *greater at the Park than at the City;*

**2. Crime Rate:**

**a.** The number of arrests per citizen per day of this weekend in:

- 1992 was ***1.66 times*** greater at the City than at the Park;
- 1993 was ***7.99 times*** greater at the City than at the Park;
- 1994 was ***1.06 times*** greater at the Park than at the City

**b.** The number of crime reports per citizen per day of this weekend in:

- 1992 was ***1.14 times*** greater at the Park than that at the City;
- 1993 was ***1.22 times*** greater at the at Park than at the City;
- 1994 was ***1.22 times*** greater at the Park than at the City;

## 2. Criminal Activity- Comparisons with other State Parks, Beaches and Recreation Areas:

California's State Parks and Recreation Areas have traditionally been considered to be "safe islands", far removed from the everyday human activity including criminal activity. Today, as a result of both increased urbanization and the emphasis on placing our parks closer to population centers, these "islands" are no longer completely removed from those ills of society which our guests often hope to flee.

Crime statistics for the first 10 months of 1994, as a representative sampling of State Beaches and Recreation Areas, are compared in **figure 43**. Oceano Dunes SVRA ranks in the lower one-third of those Park facilities listed. The latest felony crime statistics (i.e. 1993) for the entire California State Park System and Oceano Dunes SVRA are compared in **figure 44.** Although Oceano Dunes SVRA accounted for 1.54% of all Park attendance for that year, it accounted for no willful homicides, forcible rapes (or attempts), robberies or burglaries. In the category of assault it accounted for 1.4 % of the assaults. In all these aforementioned categories the proportion of these crimes attributable to Oceano Dunes SVRA is less than what would be expected for a State Park with its level of attendance. In only two categories does the proportion even reach or exceed that proportion of crimes that one would expect at Oceano Dunes SVRA (i.e. motor Vehicle Theft and Larceny/Theft). In conclusion, Oceano Dunes State Vehicular Recreation Area's crime rate is no worse than, if not actually better, than that experienced within the typical California State Park.

One other valuable measure for which there are no precise statistics is that of mutual aid calls, (i.e. in accordance with interagency agreements to assist one another when needed.) Recently retired Park Superintendent Patton can recall no instance in his 15+ years of service at Oceano Dunes SVRA in which the Park has had to call for outside law

# FIGURE 43

***Law enforcement statistics for a sample of California State Parks, Beaches and Recreation Areas***

**JANUARY 1 – OCTOBER 31, 1994**

| PARK UNIT | NUMBER OF REPORTED CRIMES* | ATTENDANCE | REPORTED CRIMES PER 100,000 VISITOR DAYS |
|---|---|---|---|
| Pt. Mugu SP | 43 | 905,720 | 4.7 |
| Huntington SB | 158 | 2,512,157 | 6.3 |
| Oceano Dunes SVRA | 83 | 845,820 | 7.4 |
| San Onofre SB | 79 | 932,788 | 8.5 |
| Silverwood Lake SRA | 40 | 424,283 | 9.4 |
| Bolsa Chica SB | 111 | 1,058,423 | 10.5 |
| Doheny SB | 57 | 510,637 | 11.2 |
| Lake Perris SRA | 171 | 1,240,192 | 13.8 |
| San Clemente SB | 27 | 158,274 | 17.1 |
| Carpenteria SB | 27 | 158,274 | 17.1 |
| Leo Carillo SB | 45 | 209,050 | 21.5 |

**Does not include vehicle, harbor, navigation boating and waterway codes.*

# FIGURE 44

***Felony crime statistics for Oceano Dunes SVRA and the California State Park System***

## CRIME STATISTICS FOR 1993*

| CRIME | DPR TOTAL | PISMO DUNES | PISMO PERCENT OF CRIMES |
|---|---|---|---|
| Willful Homicide | 0 | 0 | N/A |
| Forcible Rape (Attempts) | 6 | 0 | 0 |
| Robbery | 0 | 0 | 0 |
| Assault | 72 | 1 | 1.4 |
| Burglary | 187 | 0 | 0 |
| Motor Vehicle Theft | 34 | 4 | 11.8 |
| Larceny/Theft | 34 | 4 | 11.8 |

**Crime Statistics provided by Department of Justice for Calendar Year 1993*

| | |
|---|---|
| Total DPR Attendance**: | 65,500,000 |
| Total Pismo Dunes Attendance: | 1,011,000 |
| Pismo Dunes Percent of Total Attendance: | 1.54% |
| | |
| Attendance: | 1.5% |
| Crimes Against People: | 1.1% |
| Crimes Against Property: | 2.1% |

***Attendance Figures are for fiscal year 1993/94.*

enforcement aid. On the other hand, other adjoining local law enforcement agencies regularly enlist the assistance of the rangers (badged officers) from Oceano Dunes SVRA.

## 3. Vehicle-Related Accidents:

Most forms of outdoor recreation involve some degree of risk. In many activities, some participants consider the risk factor as a part of their basic enjoyment of the activity. Many off-highway vehicle participants primarily use their vehicles to explore the great outdoors. They use a vehicle to accomplish the same ends as others who use a horse, bicycle, cross-country ski's or their feet. Other off-highway enthusiasts participate primarily for the exhilaration and challenge of driving over difficult terrain. Of course, most ORV enthusiasts participate in a mixture of the two different aspects of the sport.

At least one other form of outdoor recreation, snow skiing, has an established "acceptable" accident rate (one accident per one thousand skier days). No such standard exists for off-highway vehicle recreation. Given the intent of the condition to establish a day use carrying capacity, several different measurements of "vehicle safety" were analyzed. They are as follows:

### *a. Vehicle Accidents involving Pedestrians, Bicycles, or Animals:*

Review of Oceano Dunes SVRA records for the period 1987-1996 revealed no vehicle accidents involving pedestrians, bicycles or animals for 8 of those 10 years. One vehicle-pedestrian accident occurred in 1993, which constituted 0.4% of the total of all accidents reported. Two vehicle-pedestrian accidents occurred in 1996, which constituted 1.0% of all reported accidents. For the 10 year period researched, vehicle-pedestrian accidents accounted for 0.001% of all reported accidents, a total which may be considered statistically insignificant.

### *b. Multiple Vehicle Collisions:*

A review of Oceano Dunes records for multi-vehicle collision accidents was conducted for the period 1987-1996. Accident report data for this type of vehicular accident was not available for 1987 and 1988. During the 8 year period for which data was available, 89.3% of all vehicular accidents only involved a single vehicle, 8.4% of all vehicular accidents involved moving vehicles colliding with one another, and 2.3% of reported accidents involved a moving vehicle colliding with a stopped or parked vehicle. All vehicular accidents of this type are reported quarterly to the California Highway Patrol for data entry into the California Statewide Traffic Accident Reporting System. The typical causal factor in multi-vehicle collisions involved a "following vehicle" striking a leading vehicle, which had made a sudden stop or turn. **Figure 45** lists these multi-vehicle accidents.

# FIGURE 45

## VEHICLE ACCIDENT STATISTICS

### *OCEANO DUNES SVRA*
### *1987-1996*

| Year | Vehicle Accident Total All Types | Vehicle vs. Vehicle Accident Total | Vehicle vs. Parked Vehicle Accident Total |
|---|---|---|---|
| | | | |
| *1987* | 387 | Not Available | Not Available |
| *1988* | 223 | Not Available | Not Available |
| *1989* | 231 | 15 | 5 |
| *1990* | 144 | 14 | 6 |
| *1991* | 211 | 20 | 4 |
| *1992* | 199 | 16 | 7 |
| *1993* | 240 | 22 | 3 |
| *1994* | 242 | 20 | 6 |
| *1995* | 194 | 19 | 2 |
| *1996* | 187 | 12 | 6 |

| Year | Total Accidents | Total Vehicle vs. Pedestrian Accidents | Total Vehicle vs. Bicycle Accidents | Total Vehicle vs. Animal/Horse |
|---|---|---|---|---|
| | | | | |
| *1987* | 387 | 0 | 0 | 0 |
| *1988* | 223 | 0 | 0 | 0 |
| *1989* | 231 | 0 | 0 | 0 |
| *1990* | 144 | 0 | 0 | 0 |
| *1991* | 211 | 0 | 0 | 0 |
| *1992* | 199 | 0 | 0 | 0 |
| *1993* | 240 | 1 (0.04%) | 0 | 0 |
| *1994* | 242 | 0 | 0 | 0 |
| *1995* | 194 | 0 | 0 | 0 |
| *1996* | 187 | 2 (1.0%) | 0 | 0 |

# FIGURE 46

***Vehicle accident statistics for selected California OHMVR facilities***

**JANUARY 1 – OCTOBER 31, 1994**

| PARK UNIT | NUMBER OF VEHICLE INJURY ACCIDENTS | ATTENDANCE | ACCIDENTS PER 100,000 VISITORS |
|---|---|---|---|
| Oceano Dunes SVRA | 191 | 845,820 | .23 |
| Hungry Valley SVRA | 38 | 79,950 | .48 |
| Hollister Hills SVRA | 98 | 71,274 | 1.37 |
| Carnegie SVRA | 69 | 32,554 | 2.12 |
| Ocotillo Wells SVRA | 25 | 234,240 | .11 |
| Imperial San Dunes BLM | 180* | 300,000 | .6* |

**"Serious" accidents only. This figure would be dramatically higher if it were measured in the same manner as the SVRA's.*

**4. Accident Rate Comparison with Other OHV Parks:**

Data was compiled for Oceano Dunes SVRA and other OHV parks relating injury accidents, park attendance and accident rate per 1,000 visitor days **(Figure 46)**. Analysis of these statistics should not be undertaken without the understanding that there are a number of factors that can affect the recorded accident rate. For example, both the type and difficulty of the riding terrain and even the rate at which accidents are reported to park staff can greatly affect the accuracy of such statistics. These, and other factors, can make direct comparisons of accident rates between different OHV areas less than completely trustworthy. For example, Carnegie SVRA has the highest accident rate of the State facilities cited. However, Carnegie is primarily a motorcycle hill climb park (the most accident-prone OHV activity), and has very limited/controlled access. Therefore, the Park staff probably records a higher percentage of the Park's total accidents than any other park listed. At the other end of the spectrum is Ocotillo Wells SVRA, a very large park with almost unlimited access. At this Park one might expect that a comparatively small percentage of accidents are reported to the Park staff and hence the true accident rate may in fact be higher than that listed in the figure. The Imperial Sand Dunes (a.k.a. Glamis) are included because the riding area of that BLM administered area most closely resembles Oceano Dunes SVRA (i.e. sand dune riding). The figures assigned to Glamis are gross estimates that have been made by BLM rangers. The 180 identified "injury accidents" represents the staff's best estimate for <u>serious</u> injury accidents (i.e. requiring ambulance evacuation due to the seriousness of the injury). The total injury accident numbers are unknown but obviously are considerably higher. By comparison, the statistics cited for Oceano Dunes SVRA include <u>all</u> injuries, including those accidents where the injuries were described as only "bruises" or merely "complaint of pain".

## 5. Vehicle accident trends at Oceano Dunes

Prior to the 1982 coastal permit, (which required this study), accident conditions at Oceano Dunes more closely resembled the current conditions at Glamis. There was no controlled access and the Park's staff was hard pressed just to document the most serious of accidents. Additionally, since the State had no management agreement with the County of San Luis Obispo, virtually no reports were made for accidents on County property. As the 1980's progressed, the ability of the Park staff to actually "manage" the facility increased. With that increased management presence came the ability to document increasing percentages of the actual number of accidents occurring in the Park. The number of vehicle accident reports documented by staff has shown a downward trend between 1985 and the present **(Figure 47)**. One relatively "constant" measure of accident severity was found for this time frame. Accurate statistics of the number of accident victims transported to hospitals are available from 1985 to the present. **Figure 48** presents graphic evidence of the decreasing number of ambulance runs (and therefore the number of serious injuries) over the past ten years.

Over the past ten years fatal accidents at Oceano Dunes State Vehicular Recreation Area have varied between zero and two fatalities per year. Statistics for 1993 represent the latest year for which comparative data exists for both the state park system and the National Park System. During 1993, one fatality occurred at Oceano Dunes. A pedestrian (a young girl) was killed in a "low speed" accident on the beach. During that same year there were 64 fatalities in the California State Park System 1993 (30 were aquatic accidents). During 1997, two fatalities occurred in single vehicle accident at Oceano Dunes SVRA. **Figure 49** compares attendance and fatalities at some National Park units with Oceano Dunes.

# FIGURE 47

## *Number of documented vehicle accident reports*

| Year | Memorial Day | | July 4th | | Labor Day | |
|---|---|---|---|---|---|---|
| | Search & Rescue | Oceano Reports | Search & Rescue | Oceano Reports | Search & Rescue | Oceano Reports |
| 1994 | 27 | 15 | 25 | 16 | 34 | 21 |
| 1993 | 37 | 15 | 41 | 20 | 29 | 23 |
| 1992 | 43 | 13 | 40 | 16 | 40 | 16 |
| 1991 | | 6 | | 16 | | 18 |
| 1990 | | 12 | | 7 | | 13 |
| 1989 | | 16 | | 13 | | 16 |
| 1988 | | 12 | | 18 | | 21 |
| 1987 | | 30 | 33 | 28 | | 22 |
| 1986 | 39 | 28 | 63 | 21 | 35 | 34 |
| 1985 | | 40 | 60 | 35 | | 27 |
| 1984 | | 44 | | | 58 | 31 |
| 1983 | | 18 | | 16 | | 26 |
| 1982 | 80-100 | 54 | 107 | | 60 | 40 |
| 1981 | 80 | 17 | 100+ | 41 | 65 | 47 |
| 1980 | | 24 | 76 | 59 | 60-65 | |
| 1979 | | 38 | | | | 49 |

*Search and Rescue statistics prior to 1992 are from newspaper reports.*
*Park Reports are actual number of accident reports taken.*
*Blank spaces indicate no records found.*

## FIGURE 48

***Comparison on number of accident reports to number of amulance transports***

| Year | Accident Reports | Ambulance Transports | Transport Percentage | Park Attendance | Transports/ 10,000 Visitors |
|---|---|---|---|---|---|
| 1994 | 214 | 72 | 34 | 961,859 | 0.75 |
| 1993 | 213 | 69 | 32 | 1,030,695 | 0.67 |
| 1992 | 170 | 79 | 46 | 1,166,456 | 0.68 |
| 1991 | 192 | 81 | 42 | 855,352 | 0.94 |
| 1990 | 207 | 91 | 44 | 779,875 | 1.17 |
| 1989 | 205 | 100 | 49 | 760,443 | 1.32 |
| 1988 | 188 | 126 | 67 | 674,152 | 1.87 |
| 1987 | 200 | 131 | 66 | 620,973 | 2.11 |
| 1986 | 185 | 153 | 83 | 620,286 | 2.47 |
| 1985 | 203 | 179 | 88 | 812,937 | 2.2 |

## FIGURE 49

***Comparison of fatalities at National Park units with Oceano Dunes***

| PARK | FATALITIES | ATTENDANCE | FATALITIES/ 1,000 VISITORS |
|---|---|---|---|
| Lake Mead | 24 | 9,566,725 | 0.0025 |
| Yosemite | 9 | 3,962,117 | 0.0022 |
| Grand Canyon | 7 | 4,384,318 | 0.016 |
| Death Valley | 3 | 1,008,598 | 0.0030 |
| Sequoia | 2 | 1,761,655 | 0.0011 |
| Channel Islands | 1 | 240,000 | 0.004 |
| Oceano Dunes | 1 | 961,859 | 0.001 |

## 6. Accident Analysis

Through data analysis State Parks is identifying factors involved with the rate and cause of vehicular accidents and is developing strategies for reducing the rate of accidents. The development and implementation of a Vehicular Accident Reduction Plan, in addition to meeting the concerns of San Luis Obispo County staff, is also a required measure of the 1997/98 Oceano Dunes Performance Based Budget Contract with State Parks and the California State Legislature. Some factors that have been identified include unfamiliarity with equipment, operator error, speed too fast for conditions and poor visibility.

*a. Accident Causes*

Off highway vehicle use may be hazardous. The vehicle operator's skill, experience, and use of safety equipment and safety apparel, as well as vehicle condition, terrain and weather all affect operator safety. The attached chart (**Illustration 3**) displays, for example, identified accident causes for the period 1/1/96 - 12/31/96.

State Parks is committed to providing as safe an off highway vehicle and outdoor recreation experience as possible for SVRA visitors. State Park Rangers are peace officers and are certified by the California Commission on Peace Officer Standards and Training (POST). Additional specialized POST certified training in Traffic Accident Investigation is provided to SVRA peace officer staff.

The vast majority of vehicular accidents (90%) are single vehicle accidents, while only 8% are multi-vehicle collisions (**Illustration 4**). Peace officer staff investigates all reported accidents and their causes. Accident causes have little, if any, correlation to the volume of attendance. Factors contributing to accidents include unfamiliarity with equipment, inattention, speed too fast for conditions, poor visibility and driving under the influence. Accident causes are analyzed so that State Park law enforcement efforts are focused on the most common causes of accidents in the park.

Accident analysis in some recreation areas may identify facility design deficiencies that are a contributing factor in accidents. Vehicular accidents at Oceano Dunes SVRA, however, are almost exclusively caused by operator error.

State law does not require minimum vehicle operator qualifications or experience for most OHV operations. Laws contained in the California Vehicle Code do specify training and adult supervision for ATV operators under age 18 only. By law, the responsibility for coordinating and establishing this training is with the California

Accident Causes, 1996

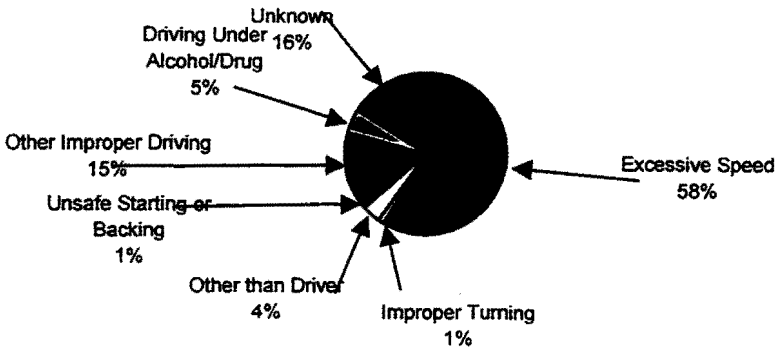



Illustration 3: This chart shows the primary causal factors of vehicle accidents which occurred in 1996.

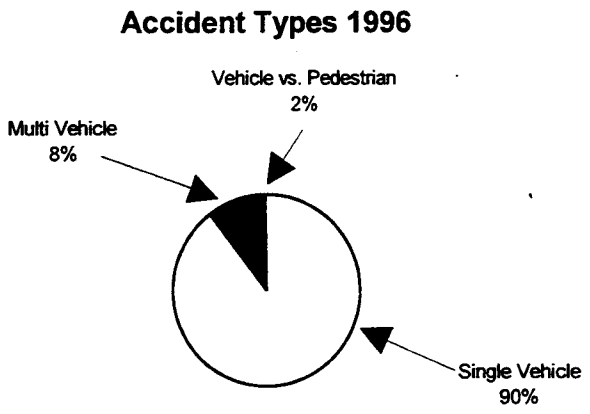



Illustration 4: This chart shows the percentages of single vehicle accidents, accidents involving multiple vehicles and accidents involving a vehicle and pedestrian.

Department of Motor Vehicles. Currently, no certified state training organizations exist, and the referenced training is unavailable. State Park staff does not conduct hands on safety training for off highway vehicle operators. Oceano Dunes, like other SVRAs, has a designated safety training area and promotes safe vehicle operations by providing a venue for private organizations to conduct OHV safety training. Organizations that have conducted such training are the ATV Safety Institute, the California Association of 4 Wheel Drive Clubs, and the California Police Activities League (CALPAL). These public training opportunities, however, currently reach very few SVRA visitors.

In order to better identify accident causal factors, future accident investigation reports will include more details. Specifically, the following information will be collected: the OHV operator's age, off-highway vehicle experience with the vehicle type involved, items of safety apparel worn, safety devices in use (e.g. lap belts, shoulder harnesses), degree of familiarity with the SVRA (first time, occasional, frequent visitor), and experience with vehicle operations on sandy terrain. Analysis of these factors may indicate statistically significant data which may suggest focused public education efforts which might be implemented by the SVRA to effect a reduction in the accident and/or accident severity rates.

State Parks does provide written safety education materials to the public, produced both by private organizations and by State Parks. Analysis of causative factors shows that ultimately the responsibility of accident prevention rests with individual vehicle operators, not SVRA facilities or operations. State Parks will continue its public safety education program, which consists of procuring safety education publications addressing the common vehicle accident causative factors and making them available to SVRA visitors. State Parks will, at a minimum, annually utilize statistical data to analyze changes in vehicular accident causative factors to assess the effectiveness of its public safety awareness program. State Parks will use the findings to change or modify the type or content of safety education materials and delivery methods.

### *b. Accident Rates*

The Department of Parks and Recreation's law enforcement program focus has a direct bearing on visitor safety and has been the key factor in achieving a consistent reduction in the visitor accident rate in the SVRA. (**Illustrations 5 and 6**) The vehicle speed limit of 15 mph on the beach, 10 mph slower than that in school zones, is strictly enforced.

California Vehicle Code Section 38505, in place since 1989, requires operators of all terrain vehicles to wear protective helmets. Section 38506, in place since 1990, prohibits the carrying of passengers on ATVs. These legal requirements are rigidly enforced within the SVRA.

Several OHV safety education panels are mounted on exhibit shelters in high traffic areas within the SVRA. In 1997, the Department of Parks and Recreation began the planning phase for the development of a "Safety Education Center" consisting of a highly visible, readily accessible kiosk where safety education panels can be more easily viewed by the public. Construction of this facility will occur in 1998.

Visitor Injury Vehicle Accident rate comparisons have been made in the Day Use Carrying Capacity Study for major OHV recreation areas in California. Investigation and discussion with the National Safety Council and the Consumer Product Safety Commission (personal comm.: Alan Hoskins, NSC, 9/97) has revealed that there are no national statistics available on OHV injury accident rates. Nationwide, gross numbers of serious accidents requiring the hospitalization of operators of ATVs has been tallied, and totaled 125,136 in 1994, the most recent year for which this data is available. Information on the total national number of ATV operators and the frequency of ATV use is not available, making accident rate determination impossible. The national ATV accident total reflects recorded serious injuries involving ATVs, but makes no distinction as to whether the ATV was being operated recreationally or was being operated during

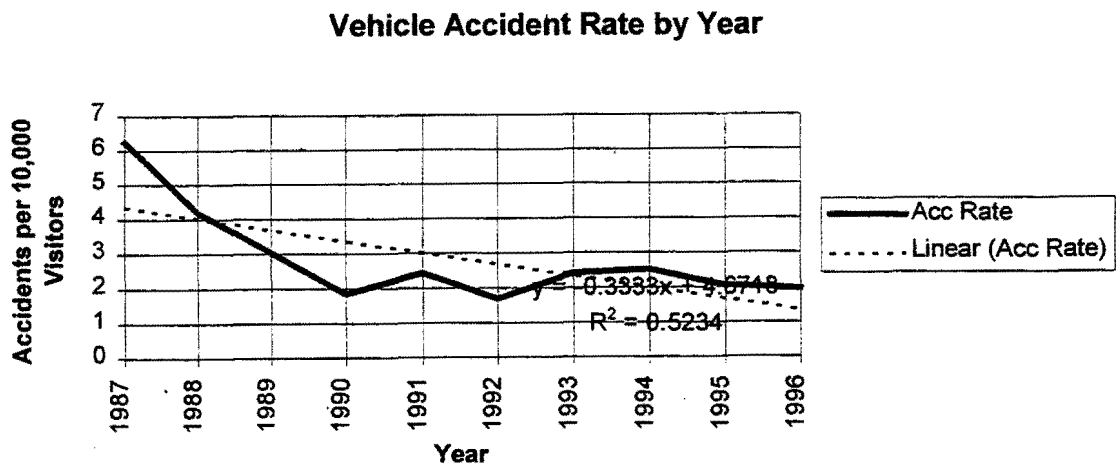



Illustration 5: This chart plots the yearly vehicle accident rate for the years 1987 to 1996. This chart also includes a trend line (linear regression) which indicates a trend toward lower accident rates in recent years.

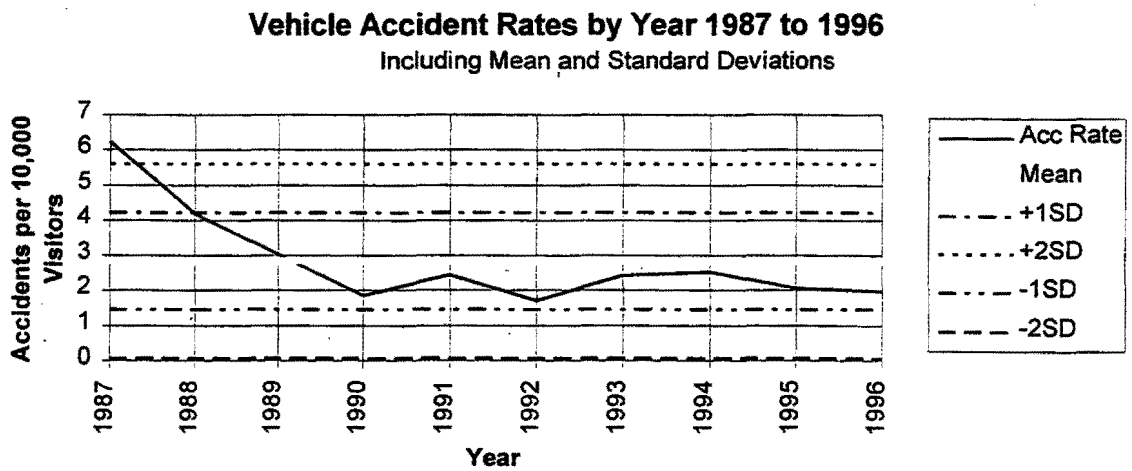



Illustration 6: This chart plots the yearly accident rate for all vehicle accidents, including property damage only accidents where no injuries were sustained for the years 1987 to 1996. The chart includes a plot of the mean vehicle accident rate (2.84 veh. acc. per 10,000 visitors) and two standard deviations above and below the mean.

business or farming operations, commercial uses for ATVs which are common throughout the country.

There are not any national vehicle injury accident statistics maintained either for 4 wheel drive vehicles or motorcycles operated off road.

There is then no large comprehensive national database or OHV injury accident rate measure which State Parks could use as a basis for comparison for the OHV accident rates recorded within Oceano Dunes SVRA.

The average injury accident rate for Oceano dunes SVRA over the last ten years is 2.51 injury accidents per 10,000 visitors (**Illustration 7**).

## Vehicle Injury Accident Rate 1987 to 1996

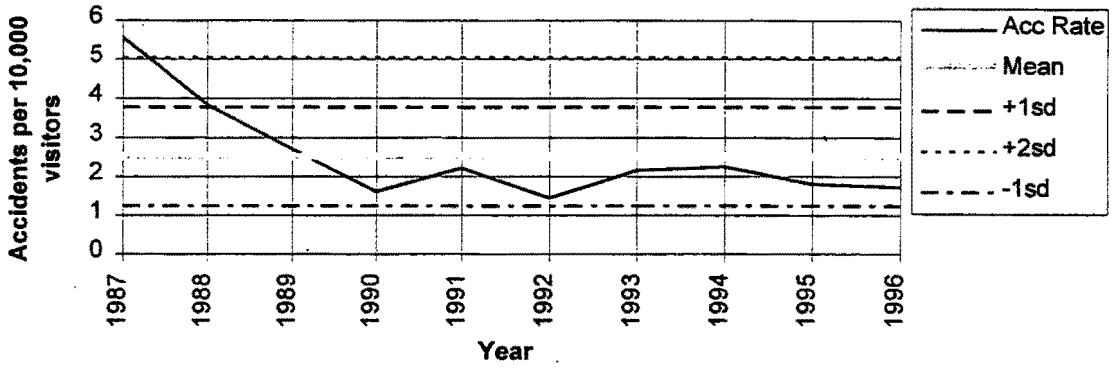



Illustration 7: This chart only plots accidents which resulted in injuries. Accidents which only resulted in damage to vehicles or property are not included. The chart also includes the mean injury accident rate for the last ten years (2.51 inj. acc. per 10,000 visitors) and lines indicates two standard deviations above and one standard deviation below the mean rate (two negative deviations resulted in a value less than zero, so it was not plotted).

### *c. Relationship of Accident Rate to Visitation*

**Illustrations 8** and **9** show variations in accident rates when indexed to yearly, monthly, holiday weekends and summer seasons.

Data shows that accident rates are higher in the summer season and on holiday weekends than during other times of the year (**Illustration 8**). Data also shows, interestingly, that when viewed over the past ten years, there has been a trend during all periods to a reduced accident rate (**Illustration 9**). Data also shows that, over the same ten-year period, days of highest attendance produced a lowering of accident rates (**Illustration 10**).

State Parks will employ accident rate reduction strategies and analyze accident causal factors as discussed previously. Additionally, the accident rate patterns during holiday and summer seasons will be studied further in order to determine any peculiar accident causes. Once these are identified, special public education efforts and/or enforcement strategies will be implemented via SVRA management actions to effect a lowering of the accident rates during these periods.

## Vehicle Accident Rates by Month, 1996

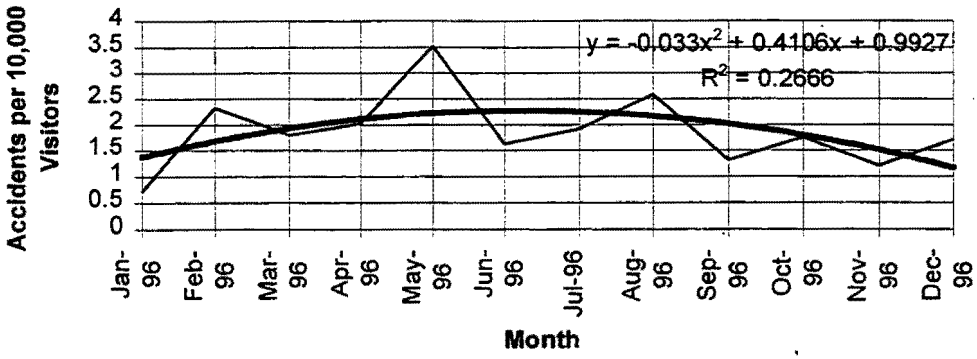



Illustration 8: This chart plots the accident rates for each month of 1996. The polynomial regression line indicates a trend towards higher vehicle accident rates during the summer months.

## Vehicle Accident Rates for Major Holiday Periods

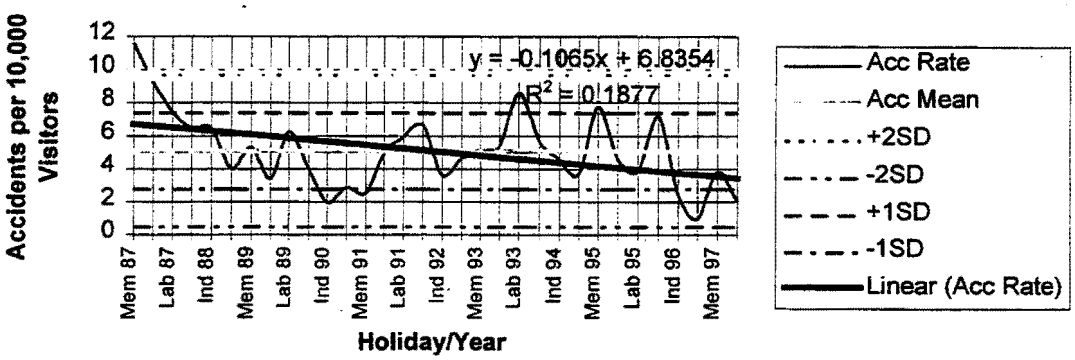



Illustration 9: This chart plots the accident rates for the four day period (Friday-Monday) surrounding the Memorial Day, Independence Day and Labor Day holidays for the years 1987 to 1997. The chart also plots the mean holiday period vehicle accident rate (5.08 veh. acc. per 10,000 visitors) along with two standard deviation above and below the mean. The trend has been plotted (linear regression) and indicates a downward trend in accident rates on holiday periods in recent years.

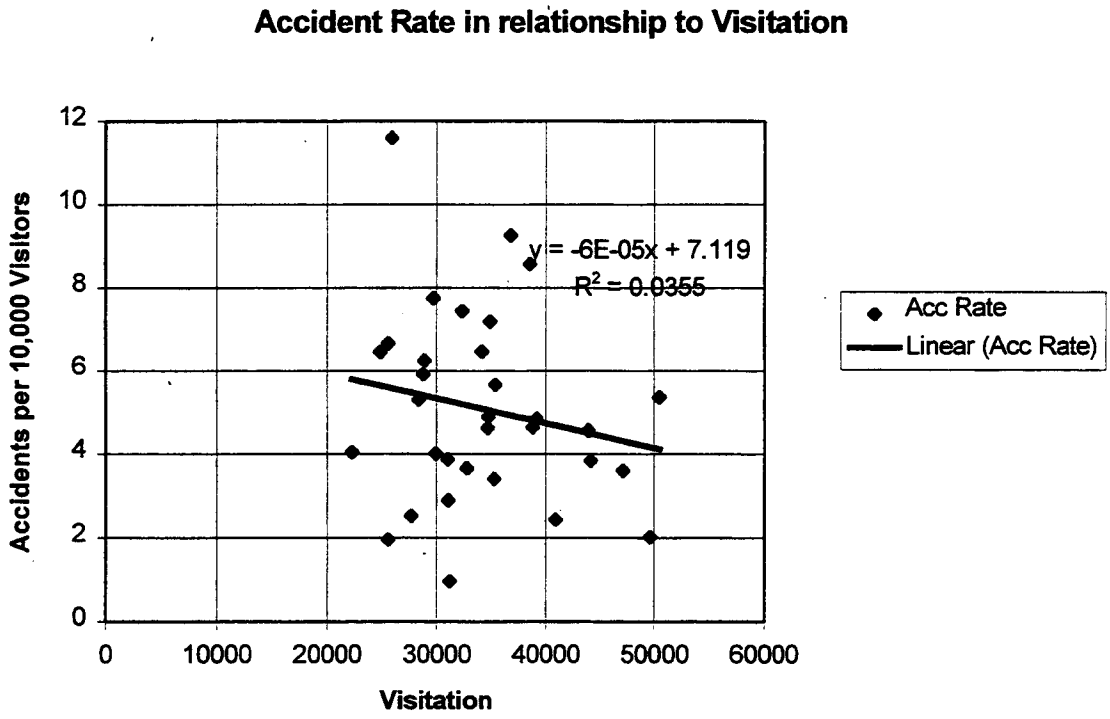



Illustration 10: This chart represents ten years worth of Memorial Day, Independence Day and Labor Day holidays. Each point on the chart indicates the vehicle accident rate in accidents per 10,000 visitors charted against the visitation for the four day holiday period. The chart includes a linear regression trend line. The trend line illustrates that holiday weekends with higher visitation levels tended to have lower vehicle accident rates.

*d. Accident Response Time*

The time taken to respond to an accident, that is, the time elapsed between the receipt of an accident report and arrival at the accident scene, may also be an important factor in determining the carrying capacity of the park. Factors that could influence response time include, but are not limited to, the number of emergency personnel available, the number of accidents within the park at a given time, and the route that emergency vehicles use to reach the accident. For example at high tide some emergency vehicles are unable to cross Arroyo Grande Creek, which may increase response time in the event of an emergency. During such times, i.e., when Arroyo Grande creek is not passable, EMT-trained Park rangers are specifically posted to cover the camping/OHV area. They, as well as emergency vehicles, are able to reach this area via another access corridor, which is reserved for administrative and emergency purposes.

Unlike cities and counties, off highway vehicle areas contain few or no paved access roads, lack numerous cross streets, may have poor telephone coverage, and often do not have readily identifiable landmarks. These conditions are generally known and acceptable to the recreating public, and indeed create an enjoyable atmosphere and a sense of independence, excitement and freedom, which is of high value to the visitor. Vague directions and accident location information is common of reporting parties. Typically, reporting parties are secured to guide emergency response personnel to accident scenes. The physical terrain conditions and other factors listed above can result in longer response times to accident scenes than for comparable distances in urban areas with street access.

The San Luis Obispo County staff has recommended that a program be implemented to monitor emergency response times to accidents and that periodic reports be submitted to the County and the Coastal Commission.

In 1996 State Parks instituted a data collection system to capture information on individual accident response times within the SVRA. A sample graph attached

(**Illustration 11**), displays data for 1996. Data collection is ongoing and will be used to analyze the patterns and changes in response times and the effectiveness of operational changes in reducing response times to accident scenes. A grid system is used to plot accident locations for analysis of response times to accidents (**Illustration 12**).

Accident response time analysis is a part of the SVRA patrol program. Data is used to adjust patrol schedules to both focus on accident prevention law enforcement efforts, as well as to physically position ranger patrols to assure as rapid response times to accident scenes as is possible. Annual accident response time data and analysis will be provided to San Luis Obispo County and to the California Coastal Commission.

During 1996, the average accident response time at Oceano Dunes SVRA was 3.25 minutes.

State Parks has procured and installed a solar powered emergency phone call box at the entrance to Sand Highway. Additional call boxes may be installed if analysis of the use of the existing call box indicates enhanced emergency responses resulting from its use.

Protocols established with San Luis Obispo County Sheriff Search and Rescue and California Highway Patrol helicopter medi-vac are actuated on major holiday weekends which enhances the timeliness and effectiveness of emergency responses for medical attention and any evacuations as may be necessary.

The San Luis Obispo County Sheriff's Office reviewed the Carrying Capacity Study and indicated that "an increased use of off-highway vehicles resulting from a rise in carrying capacity may impact other aspects of public safety services provided by the Sheriff's Office. Increased injuries would create a negative impact upon the Sheriff's Communication Center, which is responsible for dispatching all ambulances. Further, increased use may result in an increase in volunteer services such as the Search and Rescue Team." The Carrying Capacity Study does not propose an increase in the current

## Average Response Times by Grid 1996

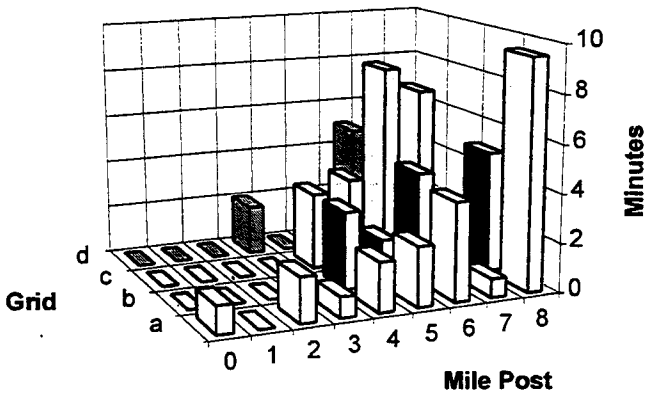
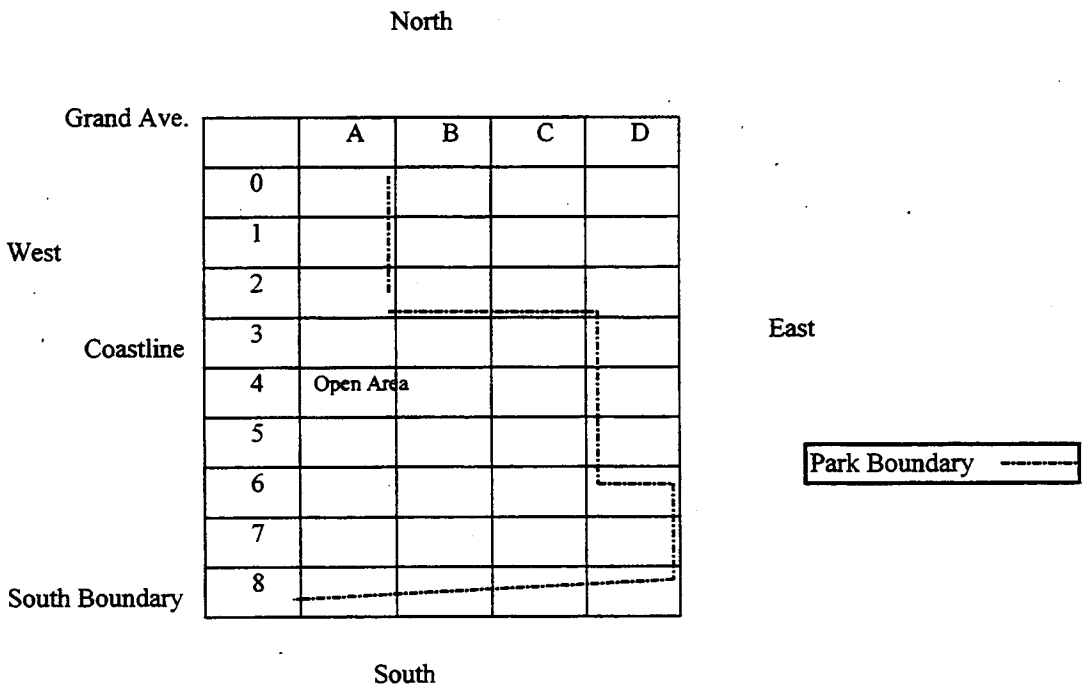



Illustration 11: This chart plots the average response time to vehicle accidents which occur in each area of Oceano Dunes SVRA. The mile post axis represents the coastline from Grand Ave. at the north limit of the park to post 8 at the south boundary of the OHV riding area. The grid axis represents zones from the coastline to the east boundary of the park, with zone "a" representing the beach.



## Accidents By Grid 1996

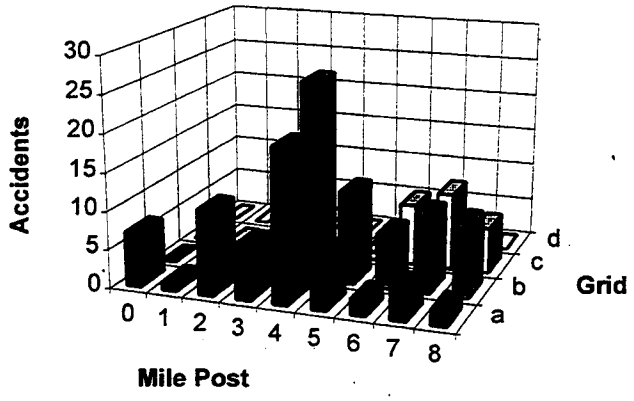
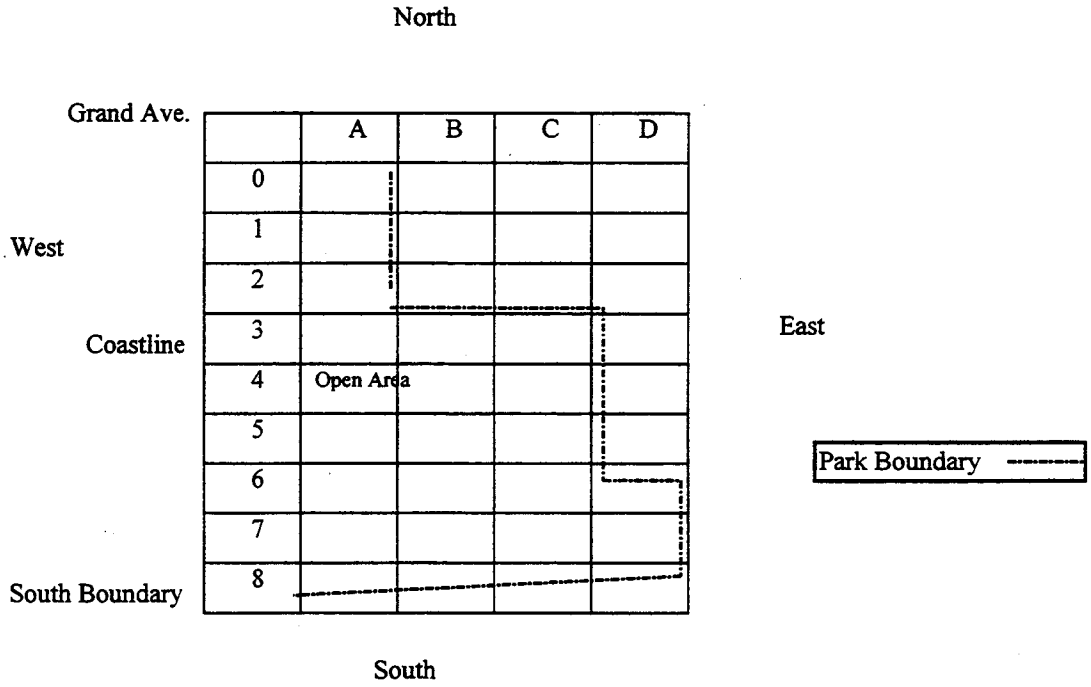



Illustration 12: This chart plots number of accidents which occurred in each area of Oceano Dunes SVRA. The mile post axis represents the coastline from Grand Ave. at the north limit of the park to post 8 at the south boundary of the OHV riding area. The grid axis represents zones from the coastline to the east boundary of the park, with zone "a" representing the beach.



limit, however the Sheriff's concern should be considered if the Department of Parks requests an increase in the future.

State Parks will solicit and gather input from the Sheriff's Department through ongoing communications on any changes in workload for the Sheriff's Office Communications Center created by SVRA operations and/or attendance changes, and will work with the Sheriff's Department to mitigate impacts found to be affecting Sheriff's Department operations.

## C. Sensitive Natural Resources

An analysis of the information available regarding the Park's efforts to monitor, enhance and manage its natural resources found that both the magnitude of effort and success to be very significant. The OHMVR Division of DPR was found to have engaged in a continuous succession of projects and studies since the Park's inception which have allowed the staff to fine tune a resource enhancement program which has met with much success, while still maintaining OHV recreational opportunity. In most cases, these projects have resulted from the collaborative efforts of many academic institutions, government agencies and private groups whom are either specialized or interested in resource management issues. Many of these projects have been proactive and /or "cutting edge" and reflect a positive supportive attitude by the Park's management and staff towards the success of its resource management programs (see Appendix G). The success of these efforts and the positive attitudes driving them can be best exemplified by:

1). The Park's sensitive natural areas are significantly healthier than they were in 1982;
2). The Park's Snowy Plover/Least Tern monitoring and management program is viewed by most experts as one of the most advanced and successful in California and;
3). That program and the knowledge gathered therein will soon serve as the template for other similar programs at the balance of California's State Beaches and Parks where these species are found.

Specific discussion of the results and analysis of the natural resource criteria follow:

## 1. Flora

### *a. Vegetation Protection Efforts within Sensitive Resource Areas:*

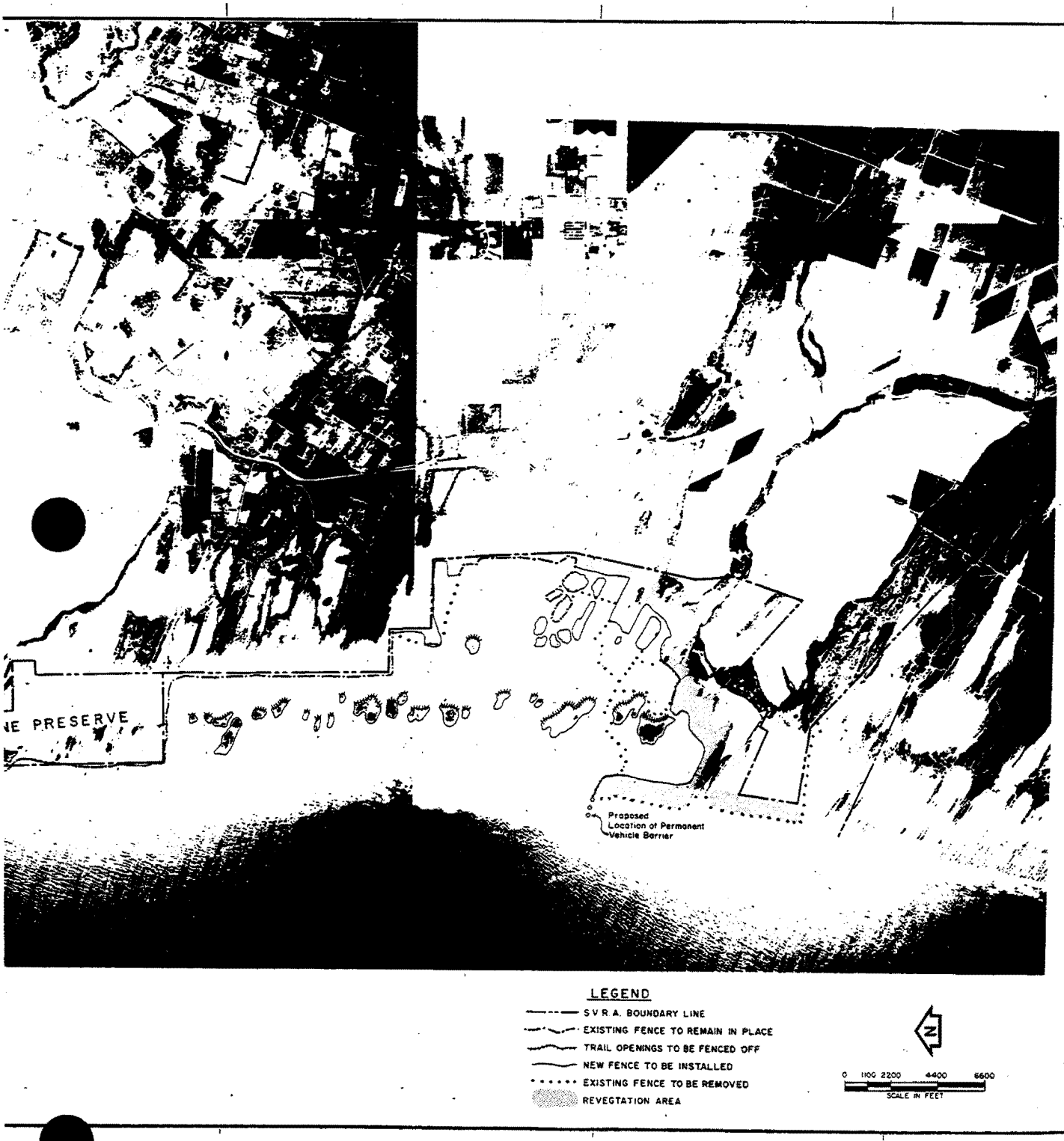
A series of aerial photographs of the Guadalupe-Nipomo Dune complex, and specifically the Callendar Dune complex in which ODSVRA is located, were analyzed comparatively for the period 1983 - 1994. These photos provide an excellent means for documenting the effects of urban development, vehicle use, recreation and protective fencing on the health of the sensitive vegetative resources identified and fenced in accordance with the specifications delineated by the 1983 Coastal Development Permit (4-82-30). The language of that permit in Section III: Findings and Declarations reads in part **"in addition, 35,000 linear feet of wire mesh fencing will be placed around sensitive resource areas within the park to protect them from further degradation and destruction from off-highway vehicle users. Within the fenced off areas the DPR will undertake a vegetated dune restoration program. (See exhibit C for the proposed placement of the kiosks and fencing."** That same staff report in its concluding remarks, went on to endorse this project, as fulfilling the needs of the Public Resource Codes which govern the actions of the Coastal Commission with the following language: **"Because the two projects proposed herein are the initial integral phases of, and do set the direction for, the DPR's longer term program to manage OHV use within the park units consistent with the access, recreation and resource protection policies of the Coastal Act (PRC Sections 30210, 30240, 30231) and because that program in its present concept is a product of the input of the Coastal Commission and its staff, the County of San Luis Obispo and its staff, representatives of the Department of Fish and Game and Representatives of the Department of State Parks and Recreation, and because the program has been formulated as a specific response to a coastal resource issue which has been the subject of prior Commission action (permit #21-17, 1975) and is now again the subject of Commission action, it is therefore appropriate and necessary that the specific elements of said program be**

**incorporated as conditions of permit approval."** Based upon the language of the Coastal Commission staff report cited above, the determination of the placement of the fencing in 1983 involved the professional input of several pertinent agencies (i.e. the staffs of the California Coastal Commission, the California Department of Fish and Game, the County of San Luis Obispo Planning Department and the California Department of Parks and Recreation). This resulted in a carefully planned program for the protection of sensitive resources, which were specifically delineated by location **(Figure 50)**.

The sensitive resources that were originally delineated for protection within the "open ride" area of the Park principally include what are referred to by some resource professionals as "vegetation islands". These "vegetation islands" vary in size from less than an acre to approximately ten acres in size and are typically characterized by vegetation of the community types "coastal willow/wax myrtle thicket" and "coastal dune swale". Their fragmented "island" nature is generally viewed as resulting from their dependence upon the existence of a specific dune habitat which is characterized by shallow wind-protected swales located in close proximity to the water table. Outside of the "open ride" area, the sensitive resources that were specifically delineated for protection were located in several different areas, but are generally located in the vicinity of Oso Flaco Lake and creek. This protected area around Oso Flaco is substantially greater than 1,000 acres in size and includes vegetation which is representative of every community type found within the region's dunes complex. The vegetation located within this protected area of Oso Flaco Lake is generally less fragmented. This is due to the effect of both the lake itself and the creek which flows through the area, the net result of which is a source of water which is more readily accessed by plant roots, (i.e. a very shallow water table). Those areas that were not earmarked for protection and hence left available as "open ride" areas, overwhelmingly consisted of habitat characterized by open shifting sand dunes and "sheets", (i.e. areas in which vegetation did not naturally exist).

# FIGURE 50

***Fence location plan (sensitive resource delineation) as approved by the Coastal Commission in October 1984.***




Source: *California Coastal Development Permit (4-82-30); Section III, Exhibit C.*

A comparative examination of these protected sensitive resource areas utilizing aerial photos taken of Oceano Dunes SVRA during the period 1983 through 1994 clearly reveals the dynamic nature of this ecosystem. Generally, these photos show that:

- The vegetation has made substantial recovery in those habitat areas where it naturally occurs (i.e. generally in those habitats that are protected from onshore winds and sufficiently close to the water table). This is in contrast to those naturally occurring areas where the environmental conditions are not conducive to vegetative growth and where therefore vegetation did not typically grow, (e.g. active dunes whose surface is located high above the water table).
- most of the protected sensitive areas commonly referred to as "vegetation islands" are today characterized by a mixture of both generally contiguous vegetation and open sand; the proportion of each principally determined by environmental conditions;
- In 1983 these protected sensitive resource areas were characteristically of a highly fragmented nature. This was principally due to the network of trails that had been created during the previous forty years of recreational vehicle use. The 1994 photos reveal how those same trails are generally non- existent or at least much diminished. This positive change has resulted in significant part to the Park staff's efforts to find a specific fence type and methodology for its placement. This not only protects the vegetation within these sensitive resource areas from human trespass, but also protects them more effectively from scarification and burial by blowing sand.
- In addition to an expansion in vegetative cover within these protected sensitive resource areas, there has also been a noticeable increase in the density of the vegetation. This observation seems to indicate an increase in one or more of the horizontal vegetative strata (e.g. forb, shrub, tree, etc.) and/or the general health of these plant communities.
- Most recently, with the advent of improved restoration techniques (and perhaps more importantly with the end of one of California's more historically significant droughts), the pioneer plant species which characterize this ecosystem are finally realizing those conditions which will and have allowed for their re-establishment.

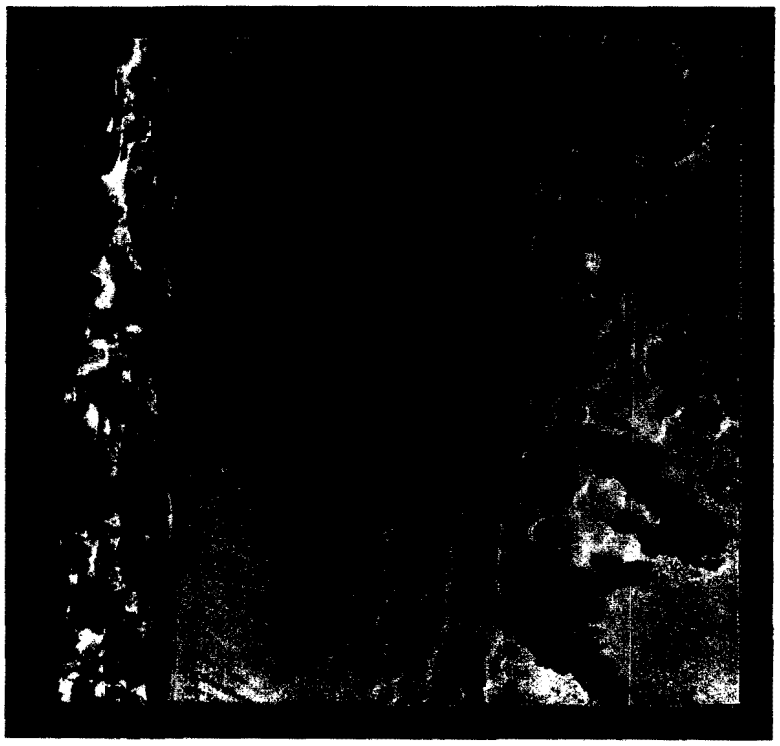
Additionally, academic contractors from California State University, Fresno, have performed a precise computer analysis of these historical photos. Their study utilized a sophisticated new software package, "Microprocessor Image Reduction and Analysis" (*MIRA)* for the aerial photo analysis. This software operates by utilizing computer analysis to identify and interpret different wavelengths of refracted light as recorded on photographs. It was specifically selected for this project because its abilities far exceed the levels of sensitivity commonly offered by normal infra- red aerial photographic analysis. The developer of this software worked directly with our contractor to make significant modifications that are specific to the needs of this project and future earth-based resource analyses. **Figure 51** specifically illustrates and quantifies the changes in vegetative cover which have occurred within some of the protected sensitive areas (i.e. "vegetation islands") north of the Oso Flaco area and the vegetation enhancement area located north and adjacent to Oso Flaco lake and creek. The findings of that study can be generally summarized as:

- The total extent of vegetative cover in 1994 was found to be 138% of that which existed in 1983; when that same analysis included those areas that have been re-vegetated, the increase was 308%.

- The health of the vegetation as measured by vegetation density was found in 1994 to be 218% of that in 1983; when that same analysis included those areas that have been a part of the re-vegetation program, the increase during that period was 435%.

# FIGURE 51

***Comparative aerial photos of "vegetation islands" within Oceano Dunes SVRA***



1983

*Comparative photopraphs illustrating the success of the Oceano Dunes SVRA staffs' resource enhancement and protection efforts. The vegetation islands shown are within and just north of the Oso Floco sensitive resource area.*

1994

***b. Vegetation Enhancement Efforts within Sensitive Resource Areas:***

Additional comparative analysis of the aerial photos taken since 1983 also allow for the assessment of the numerous vegetation enhancement and restoration projects which have occurred since 1983. Undertaken as a condition of the original 1982 Coastal Development Permit, these projects have experimented with a variety of techniques in different locations principally within the designated protected sensitive resource areas. These efforts towards vegetation enhancement have generally not taken place in the "open-ride" areas. The notable exceptions to this are some locales located either upwind of Oso Flaco lake or some of the "vegetation islands". Some of the parameters that have been assessed in the search for an effective vegetation enhancement/restoration strategy have included varying the following parameters:

- the types of wind fencing of varying materials (e.g. cloth, plastic, etc.), hole size, height, etc.;
- the location of wind fence placement relative to the area being protected;
- the types of barricade used, snow fencing, "field fence or "hog wire", straw bales, tree branches, etc.;
- the size of the individual plants, e.g. seed, container stock of various sizes- 6" tubes, 12" tubes, cell packs, 1 gallon , 5 gallon, etc.;
- the density of the planting, e.g. pounds/acre, plants/acre;
- the amount of site preparation and method of application, e.g.: fertilization, straw-punching, hydro-mulching, moisture retentive polymers, etc.; each of these has in turn been varied, (i.e. application rates, straw type, time of year, order of application)
- the amount of irrigation, i.e. from only natural rainfall to irrigation systems which were experimentally designed to vary their application rates;
- the geographical location of these efforts relative to distance from the beach, e.g. behind , in front and on the side of dunes, in swales, in the flats, etc.;
- the time within the planting time for these varying applications and experiments (e.g. October vs. December vs. February) each with their inherent typical amounts of precipitation, wind speed and sun;

- all of these variables have been experimented with using a variety of different plant species of different successional stages;

Although most of these earlier projects met with only limited success, they were useful in that they gave both Park personnel and researchers valuable information on which techniques are not likely to be successful for resource enhancement and protection. They were also important in that they helped in the development of techniques that are now proving to be successful. The most recent photos dramatically show that at those locations in which restoration efforts have occurred, not only has the deterioration of the sensitive dune vegetation been arrested, but also in most cases it has either been effectively reversed or completely restored. However, the current levels of success have not left the staff at Oceano Dunes SVRA or DPR OHMVR headquarters ecologists and planners complacent. In fact to the contrary, these respective staffs are in a continuous dialogue evaluating each past methodology and developing new ones. This is done both with each other and in consultation with a number of other professionals, e.g.:

- University Professors from: Cal Poly San Luis Obispo: San Jose State University; The University of California , Davis and; The University of California, Los Angeles;
- The staff of the California Department of Fish & Game;
- The United States Fish and Wildlife Service;
- The staff of the Department of Parks & Recreation, Resource Protection Division;
- The staff of The Nature Conservancy;
- The Society for Ecological Restoration, California Chapter (SERCAL): Dune Guild
- Volunteers from the California Native Plant Society;
- The owner of Native Sons (a locally operated native plant nursery);
- Volunteers from the local group "Friends of Pismo Dunes";

*c. Summary*

The field of restoration ecology is in its infancy as a science. As a result, the development of techniques that will prove successful for the enhancement of the dune resources at Oceano Dunes SVRA will continue to rely on iterative experimentation to find those techniques that respond best to the set of unique circumstances that are found there. Indeed attendance by DPR staff at the 1994 "*Dune Guild Conference*", which was held by the Society for Ecological Restoration, California (SERCAL) at Asilomar revealed that the efforts at Oceano Dunes SVRA probably dwarf all others in the Western U.S. (i.e. in terms of staffing, acreage, logistical constraints and expenditures). That suspicion was generally confirmed by participants in the 1995 conference, which was hosted at and by Oceano Dunes SVRA.

A partial list of those past efforts, studies and reports which have assisted State Parks resource enhancement and protection program includes the following:

- 1975. *Pismo Dunes SVRA State Beach and Pismo Dunes SVRA Dunes State Vehicular Recreation Area: General Development Plan and Resource Management Plan.* State of California. The Resources Agency. Department of Parks & Recreation. This document has served as the initial guiding document for all management decisions. Subsequent to its creation other documents and studies have added substantially to the total information base which in now used for management decisions at Oceano Dunes SVRA.

- 1976. *The Natural Resources of the Nipomo Dunes and Wetlands.* California Department of Fish and Game. U.S. Fish and Wildlife Service. This document has served as another principal document which has assisted the management of Oceano Dunes SVRA and Pismo State Beach in their decision- making processes, particular as they relate to resource issues. This document was certainly used extensively by

those agencies in 1982 (i.e. CCC, SLO Co., DPR and CA F&G) who were responsible for the delineation of sensitive areas within Oceano Dunes SVRA.

- 1978. *Pismo State Beach and Pismo Dunes SVRA Land Acquisition and Development: Final Environmental Impact Report.* California Department of Parks & Recreation. This document has served the staff at DPR Headquarters and Oceano Dunes SVRA as supplemental source of valuable information.

- 1977-1980. DPR engaged in miscellaneous research investigating both the extent of off-road vehicle damage and the distribution of and status of endangered native plants.

- 1980. Plans to start a long-range revegetation program were initiated through the joint efforts of six groups: The Santa Maria Four Wheelers; The Sierra Club; The California Native Plant Society; The Audobon Society; The California Conservation Corps and the Pismo State Park rangers. This coalition selected Dune Buggy Hill and Little Coreopsis Hills as their first target areas. Sand fencing and mesh netting were installed that year at those sites.

- 1980. DPR entered into a contract with California Polytechnic State University to initiate a dune revegetation program.

- 1981. DPR delegated $200,000.00 in funds for the purchase of fencing and plant propagation within the dunes of the SVRA.

- 1981. DPR engaged in exploratory studies to develop a resource management program for the Oso Flaco Lake area.

- 1981-1982. DPR engaged in studies at Oceano Dunes SVRA investigating dune stabilization and soil nutrient analysis. Further work was done on the distribution of rare, threatened and endangered plant species.

- 1981-1983. Staff at Oceano Dunes SVRA cooperated in studies with the University of California, Los Angeles on the geomorphologic and textural relationships of the Oceano Dunes Complex. This effort was designed with the intent of expanding our understanding of the processes and dynamics of dune formation.

- 1982-1983. Staff at Oceano Dunes SVRA cooperated in additional studies with the University of California, Los Angeles on the mechanics of the movement of transverse dunes within the Park.

- 1983. DPR engaged in studies experimenting with the use of container- grown native plants as a means of dune restoration/enhancement.

- 1984. *Policy Document. Local Coastal Program Land Use Plan.* California Coastal Commission and County of San Luis Obispo. This document has served as another supplement to the General Plan as a policy and management document for the staff of the Department of Parks & Recreation.

- 1984. DPR engaged in studies that reviewed and developed propagation techniques for native plant species that could be used in future dune restoration/enhancement efforts.

- 1985. The dune stabilization project of 1980-85 ends. After five years of effort, the survival rate of 50,000 seedling was less than 5%.

- 1988 - 1989. California Fish & Game, Natural Heritage Division with the cooperation of DPR Staff conducted several studies for the listing of several threatened and endangered plant species.

- 1989 - 1991. DPR subcontracted with Cal State University, San Jose to conduct an inventory of the flora and fauna of Oceano Dunes SVRA. This study was conducted to meet the legislative mandate called for in the OHMVR Act of 1988.

- 1990. DPR established a group of interested parties to review and evaluate the many resource projects then underway at Oceano Dunes SVRA (particularly in the Oso Flaco area). The group is also asked for their input on future projects. Participants included The Nature Conservancy, Los Padres Audubon Society, Cal Poly San Luis Obispo, the Sierra Club, People for a Nipomo Dunes National Seashore, People for a Vehicle- Free Nipomo Dunes, the California Native Plant Society and the Department of Parks & Recreation.

- 1990 - 1991. DPR subcontracted with San Jose State to evaluate the effects of sand fences on plant restoration/enhancement efforts.

- 1991. *Draft/ Final Environmental Impact Report. Pismo State Vehicular Recreation Area Access Corridor Project.* Prepared for DPR by the Environmental Planning Section of the Office of Project Development and Management, Department of General Services. This document has served as another supplemental source of information for the staff of DPR.

- 1991. DPR engaged in studies to evaluate other means sand stabilization without the use of sand fencing (e.g. straw bales, branches, etc.);

- 1993 -1995. DPR subcontracts with Cal Poly San Luis Obispo to inventory, evaluate and monitor the "vegetation island" areas of Oceano Dunes SVRA. This study was initiated to meet the recommendations of the 1988 - 1991 San Jose State research, which recommended a more detailed vegetation study be conducted after a normal year of precipitation; (recall the many years of drought during this period).

- 1986 - Present. DPR continues in its efforts to stabilize and enhance the vegetative component of the area located north and northwest (i.e. upwind) of Oso Flaco Lake and Creek (i.e. the same general areas experimented with in pre- 1986 projects). The results of these efforts have met with poor to good levels of success; (the variability

of which is primarily attributable to environmental conditions, principal of which is the lengthy nature of the drought during this period.) However, much knowledge has been and continues to be gained, the results of which are a relatively successful program subject to continual refinement.

- 1995. Native plant nursery established at Oceano Dunes SVRA to support dune stabilization and revegetation planting efforts.

- 1997 - 1998. Formulation of a comprehensive five-year natural resource maintenance program began.

## 2. Fauna

An assessment of the efforts of Oceano Dunes SVRA to monitor, enhance and manage the fauna with respect to the legislative mandates that govern such activities was performed. This evaluation specifically reviewed the pertinent State and Federal Legislation, which is concerned with resource protection and the efforts of Oceano Dunes SVRA in meeting the requirements of that legislation.

Oceano Dunes SVRA is subject to the enabling State legislation which created the Off-Highway Motor Vehicle Division 1982 (Public Resources Code 5090 et seq.) and the subsequent amendments to that legislation in 1985,1987, 1988 and 1993. The Off-Highway Motor vehicle Recreation Act of 1988 continued to recognize the increasing popularity of the sport, the potential for negative environmental impacts from such activity, the need for specific facilities catering to the sport and the recognition that ***"conservation and enforcement are essential for ecologically balanced recreation".*** This section goes on to state that ***"existing off-highway motor vehicle recreational areas, facilities, and opportunities be expanded and be managed in a manner consistent with this chapter, in particular to maintain sustained long-term use".*** This legislation called for an inventory of wildlife populations and their habitats and a program to monitor and manage that wildlife and its habitat. This program and the legislation which created it, fall under the jurisdiction of The California Environmental Quality Act (CEQA), The California Endangered Species Act (CESA; enforced by the CA DF&G) and the Public Resources Code.

Additionally, the operation and management of ODSVRA as it relates to resource protection is subject to several Federal laws and the many Federal agencies (and State agencies) responsible for their respective enforcement. The principal resource laws and the pertinent enforcement agencies include:

- The *Federal Endangered Species Act* (ESA) which is enforced jointly by United States Fish & Wildlife Service (USFWS) and the California Department of Fish & Game;
- The *Federal Clean Water Act*, Section 404 which is jointly enforced by The United States Army Corps of Engineers (ACE) and the CA Water Control Board.
- The *Federal River & Harbors Act*, Section 10 which is enforced by The United States Army Corps of Engineers;

Balancing the legislatively mandated recreational requirements of the off-highway vehicle enthusiast with the numerous Federal and State mandates concerning resource protection is at best a challenging task. The resource specialists (i.e. ecologists, planners and analysts), enforcement and maintenance staffs and the management within the Department of Parks & Recreation have worked diligently since the establishment of Oceano Dunes SVRA to at least meet if not exceed these demands. Significant fiscal and personnel resources have been and are continuing to be spent to meet these resource management challenges. As a result of these significant efforts much has been accomplished. The following is a partial accounting of those accomplishments:

- The status of the wildlife and wildlife habitats within ODSVRA have been regularly inventoried by experts from the Department of Parks & Recreation, the Department of Fish & Game, The University of California and the California State University System.

- A program to manage and monitor the status of the wildlife and wildlife habitat within ODSVRA for its continued health and enhancement has been developed and implemented in accordance with the above mentioned research and its recommendations. These efforts have been carried out in the past and continue to be performed by natural resource experts from the Department of Parks & Recreation (Headquarters Staff), The California State University System and the professional staff at Oceano Dunes SVRA.

- "Species of special concern" (i.e. listed Federally or by the State of California as rare, threatened or endangered) which have been located within ODSVRA have been identified and monitored on a regular basis (please reference the previous descriptive listing of activities under "flora");

- The habitat needs of these "species of special concern" have been identified and the appropriate steps for their protection and/or enhancement either have been implemented or are being implemented (i.e. in accordance with CEQA, NEPA and ESA). Many of these efforts to manage, protect and/or enhance the viability of these species and their necessary habitats have been proactive both in the timing of their implementation and in their methodology. These positive efforts by the staff of Oceano Dunes SVRA and the Department of Parks and Recreation have been recognized by outside academic researchers as being in the forefront of programs which have been designed to protect and help recover populations of the Least Tern and Western snowy plover species (see **Appendix B**).

Specifically, programs to monitor and enhance the status of the Federally "listed" Western snowy plover and least tern have proven to be highly successful. The staffs of Oceano Dunes SVRA, Department of Parks and Recreation, San Jose State University, California Fish & Game, and U.S. Fish & Wildlife Service have jointly developed a program, which has both dramatically improved the status of snowy plover habitat and increased its numbers. Under this management program OHV recreational opportunity has been maintained while snowy plover nests have increased from zero in 1978 to forty-one in 1994. This change is noteworthy in that a survey performed in 1978 not only revealed zero plovers and but also rated the habitat as having "been destroyed or made unsuitable by human activity or development" (California Department of Fish and Game 1979, Page and Stenzel 1981). Additionally, the U.S. Fish and Wildlife document "Management Guidelines for the Western Snowy Plover" (November 1984) ranked the Pismo/Nipomo area (i.e. an area of which Oceano Dunes SVRA is a part) as having breeding birds, but did not at that time represent a major breeding location. Today by comparison, that same area

is now recognized by Western snowy plover experts as having one of the most reproductively successful coastal populations of snowy plovers in the state (Burton 1995, personal comm.). A total of 87 nests were found in this area in 1994, of which 41 were on lands administered by Oceano Dunes SVRA (Perry 1994). This positive change in the status of this threatened species occurred, while statewide its population declined by 11%, (during the period 1981-1989). The success of the management program at Oceano Dunes SVRA has been noted recently by the USFWS, California DFG and Department of Parks and Recreation, and is likely to serve as a template for other recovery programs statewide. The staffs of Department of Parks and Recreation, California DFG and U.S. FWS are currently developing a Habitat Management Plan (HMP) as part of a Section 7 consultation process, (i.e. as called for in the Federal Endangered Species Act). Much of this HMP will be a formalization of the program, which thus far has been so successful.

Most, if not all of the resource efforts at Oceano Dunes SVRA are difficult to categorize as solely benefiting only the flora or fauna within the Park. Ecological theory, since its incipience has held that the interrelationships between species within a community are inextricably intertwined, hence the term "ecosystem". Recent acceptance of this concept has led to the common use of terms like "holistic approach". Recently the U.S. Department of Interior and the California Resources Agency have embraced this concept by experimenting with a new approach to endangered species management, i.e. "The NCCP process" otherwise known as the Natural Communities Conservation Plan. It is therefore of no surprise to discover that the efforts to manage and enhance the floristic communities, (otherwise referred to as "sensitive areas" in this report and in the Coastal Commission Permit), have by no accident and in fact have often been designed to also benefit the fauna within the Park. As a result of this relationship, many if not most of the studies, reports, projects, etc. listed above under the section titled "flora", have or will benefit the fauna located within the Park. Some additional specific programs, studies and efforts, which are more closely aligned with the animal component of the SVRA resource management program, include the following:

- 1989. DPR/OHMVR performed exploratory studies of the status of water quality within the Oso Flaco Lake area.

- 1989 -1991. DPR subcontracted with Cal State University, San Jose to conduct an inventory of the flora and fauna of Pismo Dunes SVRA. This study was conducted to meet the legislative mandate called for in the OHMVR Act of 1988.

- 1990. The staff of Oceano Dunes SVRA cooperated with The Nature Conservancy in performing a census of the nesting of Snowy Plovers and Least Terns on the Nipomo Dunes Preserve.

- 1990 -1993. Staff at DPR/OHMVR headquarters and Oceano Dunes SVRA have participated the California Coastline Bird and Mammal Project. This research, which primarily consisted of an extensive census, was done cooperatively with the University of California, Davis.

- 1992. Recognizing its special and unique natural qualities the management at DPR/OHMVR headquarters and at Oceano Dunes SVRA enter into an agreement to have The Nature Conservancy cooperatively manage the Oso Flaco Region of the SVRA.

- 1992 - 1993. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA participated in research to develop management guidelines for the protection of the Snowy Plover and Least Tern within the Park. This research was done with a two-fold purpose: 1). To supplement U.S. FWS guidelines for the protection of the Snowy Plover that had been published nearly a decade earlier (i.e. 1984) and 2). To develop techniques that were more specific to the environment found at Oceano Dunes SVRA. This work was done cooperatively with San Jose State University, principally during the 1992-breeding season.

- 1993. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA participated in a research project, which focused on the vegetation and water chemistry of Oso

Flaco Lakes. This work was done cooperatively with the University of California, Davis.

- 1993 - 1994. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA participated in research on and monitoring of the reproductive behavior of the Snowy Plover and Least Tern. This work was done cooperatively with San Jose State University during the 1993-breeding season.

- 1993. Staff at DPR/OHMVR headquarters initiated formal consultations with the California Department of Fish & Game concerning its Snowy Plover management and research efforts.

- 1993. Staff at DPR/OHMVR headquarters initiated formal consultations with the U.S. Fish & Wildlife Service concerning its Snowy Plover management and research efforts. Oceano Dunes SVRA staff initiated the process to receive a "scientific take permit" for the research being done on the species.

- 1993. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA jointly develop an interpretative program to educate visitors to the Park about its special natural attributes and the efforts being put forth by the Park staff to enhance and manage those resources.

- 1993 -1994. Staffs from DPR/OHMVR headquarters and Oceano Dunes SVRA initiated correspondence between and held meetings with adjoining landowners to explore the prospects for a Section 10 process (i.e. Habitat Conservation Plan (HCP)) and to discuss possible cooperative management strategies.

- 1994. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA expanded the visitor natural history interpretative program to include increased educational signage.

- 1994. Staffs at DPR/OHMVR headquarters and at Oceano Dunes SVRA continue working with the staff at California Department of Fish & Game. Staff participates in special interagency meetings held in southern California to coordinate preseason efforts to manage Least Tern nesting in the state.

- 1993 -1995. Staffs from DPR/OHMVR headquarters and Oceano Dunes SVRA initiate and finance a program to monitor the status of the Snowy Plover and Least Tern on approximately 16 miles of coastline. Most of this coastline is outside the jurisdiction of Oceano Dunes SVRA but is done with the cooperation of the adjoining landowners/land managers.

- 1994. Throughout the year the staff at DPR/OHMVR headquarters consult with the U.S. F&WS on current and future Snowy Plover management and protection efforts.

- 1994 - 1995. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA participated in research on and monitoring of the reproductive behavior of the Snowy Plover and Least Tern. This work was done cooperatively with San Jose State University during the 1994-breeding season.

- 1994. Staff at DPR/OHMVR headquarters initiate consultation meeting with the U.S. Army Corps of Engineers concerning the establishment of a Section 7 process (i.e. Federal nexus) under the Federal Endangered Species Act.

- 1995. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA established the Section 7 process with the U.S. Army Corps of Engineers.

- 1995. Staff at DPR/OHMVR headquarters and at Oceano Dunes SVRA initiated the formal consultation process of a Habitat Management Plan through the U.S. Army Corps of Engineers with the U.S. FWS.

- 1995. The research, monitoring, habitat enhancement and resource management programs at Oceano Dunes SVRA continue. These efforts include the ongoing Snowy Plover/Least Tern programs both within the Park and on the adjoining lands.

- 1996 - 1997. Snowy Plover Night Survey. Research conducted by San Jose State University on the behavioral response of snowy plovers to nighttime beach vehicle activities.

- 1998. Initiation of a snowy plover banding program (in consultation with the USFWS and US Army Corps of Engineers). This effort is being done as part of the Habitat Management Plan, which is in the process of being implemented in accordance with the USFWS Biological Opinion.

The above list is only a partial listing of the efforts put forth by the staffs at DPR/OHMVR headquarters and at the Park itself. The number of other routine programs and efforts are too numerous to list completely, but include:

- Regular consultation with Snowy Plover/Least Tern experts and the U.S FWS for recommendations on any changes in management protocol; This process has resulted in the voluntary creation of areas within the vehicular area which are seasonally closed during the nesting season to all human activity.

- extensive efforts to educate the line Park ranger and maintenance staff on issues concerning resource management (e.g. Plover recognition and the management procedures for its protection);

- the assignment of at least two full-time DPR Associate - level ecologists/planners and one three-quarters time Assistant field ecologist to the issues of resource management at Oceano Dunes SVRA;

- the assignment of the majority of the Oceano Dunes SVRA maintenance personnel and staff time to issues relating to resource management;

- the assignment of a management- level ranger at Oceano Dunes SVRA to a newly created position of "Resource Ranger" with the specific purpose of assisting in the orchestration and management of the numerous resource projects;

- The development and coordination of special days and events utilizing volunteers for trash clean-up, planting native container plants in certain areas of the Oso Flaco region and removing exotic/weedy plant species. These groups of volunteers are often drawn from a cross-section of OHV clubs and environmental groups and have assisted alleviating misunderstanding, which often exists between these two groups.

### 3. Western Snowy Plovers and California Least Terns

Oceano Dunes SVRA has prepared a draft Habitat Management Plan (HMP) in response to a Biological and Conference Opinion (1995) written by the U. S. Fish and Wildlife Service and California Department of Fish and Game (**Appendix C**). This plan will be the primary basis for evaluating impacts to Federal and State listed threatened and endangered species in the areas that are open to vehicular use.

In order to maintain the two sand ramps at Pier and Grand Avenues, which serve as vehicle access routes to the beach and dunes, Oceano Dunes SVRA was required to apply for a permit with the Army Corps of Engineers. In the Section 7 consultation, the U.S. Fish and Wildlife Service (USFWS) was concerned with the potential impacts to the Western Snowy Plovers and California Least Terns from both the direct and indirect effects of maintaining the ramps, i.e. allowing vehicles on the beach. A Habitat Management Plan (HMP) was developed pursuant to the consultation. The Draft HMP is currently being reviewed by USFWS. The plan specifies many management and monitoring protocols, including the construction of fenced off areas (exclosures) to isolate and protect nest sites as they are discovered. A permit from USFWS (PRT 815214) has been issued which authorizes specified SVRA employees to construct exclosures.

In 1992 the monitoring protocol described in the HMP was established both in consultation with USFWS and the widely recognized experts at Point Reyes Bird Observatory. The SVRA ecologist maintains contact with members of the USFWS Snowy Plover Recovery Team to discuss monitoring protocol as it pertains to the SVRA's breeding surveys. Recovery team members have trained the SVRA resource ecologist in monitoring techniques. Recovery team members are assisting SVRA staff with the development and permitting of a chick-banding program, proposed in the HMP for the 1998 season.

In 1995 an environmental services intern was hired by State Parks to coordinate a monitoring effort, which included the area from Pismo Creek to Mussel Rock. With the exception of the UNOCAL property at Guadalupe, Oceano Dunes SVRA has taken the lead in coordinating the breeding season monitoring of Snowy Plovers along the fifteen mile stretch of coastline from Pismo Creek to Mussel Rock (most of which is outside State Park jurisdiction). The USFWS is currently writing the "Terms and Conditions" permit for the state park ecologist which will allow monitoring work outside the SVRA. State Park staff is also working very closely with the staff of The Nature Conservancy.

The SVRA makes extensive use of volunteers in its monitoring program. In 1997 the USFWS provided the SVRA with new guidelines regarding the training of volunteers. Volunteers must now have four hours classroom training and twenty hours field training with a USFWS permitted person. Ongoing interactions with other organizations, agencies, and knowledgeable individuals have allowed the SVRA to maintain an up-to-date, comprehensive, and successful monitoring program.

**4. Environmental Monitoring System Coordination**

The Nature Conservancy (TNC), UNOCAL, TOSCO and State Parks are in the process of evaluating similar plant and animal communities found within their individual jurisdictions in the Guadalupe-Nipomo Dunes Complex. It is vital that data is collected in a standardized manner that will facilitate comparison. Ideally, a monitoring protocol will be mutually agreed upon by all parties involved in evaluating dune habitat. Each party will then be responsible for performing their own monitoring. Additionally, State Parks will provide their data to the California Natural Diversity Database (administered by CDFG) to ensure that the data collected by State Parks is available to the public and other interested parties.

### *a. TOSCO:*

During 1996 TOSCO bought the UNOCAL refinery and associated property. Portions of this property abut the southeastern portion of the SVRA. As mentioned above, any efforts by State Parks towards habitat monitoring shall be coordinated with those employed by TOSCO. Additionally, as neighbors, all pertinent routine day to day activities will be coordinated. For example, TOSCO's Environmental Services staff met with the SVRA ecologist in April, 1997 to discuss TOSCO's maintenance of their pipeline south of Post 8, regarding possible impacts to nesting plovers and terns. The SVRA was concerned that TOSCO might inadvertently disturb nests during their pipeline maintenance activities. A protocol was established in which TOSCO's heavy equipment operator would inspect the pipeline each Monday to assess if the vents were covered by a sufficient amount of sand. Any necessary equipment maintenance work is overseen by the SVRA ecologist, per agreement established between the SVRA and TOSCO.

### *b. UNOCAL:*

Since the public acknowledgment by UNOCAL in 1997 of a large diluent leak, attempts to coordinate snowy plover (or other habitat) monitoring efforts have met with limited success. The data they have collected has not been released due to pending litigation. UNOCAL has however, provided access to the location of two rare native dune plants found on UNOCAL property.

### *c. The Nature Conservancy: Oso Flaco Lake*

Since the early 1990's State Parks and The Nature Conservancy have coordinated efforts towards the management of the Oso Flaco Lake and its surrounding environs. Information regarding the basic ecology of the area (e.g. species lists) and specifics

regarding plover and tern monitoring have been and are continually shared. Efforts have been made to coordinate re-vegetation and exotic species eradication projects. Due to significant changes in the management at both entities and the fact that State Parks is far ahead of The Nature Conservancy in its efforts to develop a Habitat Monitoring Program for the area, efforts to coordinate a regional habitat monitoring plan are only at the beginning stages. However, now that the transitions in management are complete and now that State Parks has a monitoring program that is currently being implemented, expectations are that these efforts should successfully move forward.

## 5. Habitat Monitoring System (HMS)

As required by Public Resources Code Chapter 1.25 State Parks has prepared a draft OHMVR Habitat Monitoring System (**Appendix D**). The goals identified in the program are to develop and implement a monitoring plan and protocol to acquire, analyze and store critical ecological information and to determine environmental health and ecological trends by tracking population changes of indicator animals and plant communities over time.

The monitoring program will be utilized not only to determine what effect SVRA operations have on the natural communities, but will also ensure continued compliance with Condition Number 4 of Coastal Commission Permit #4-82-300. This condition requires that a dune restoration program is implemented for the vegetated dunes within the fenced off areas. As stated previously, these fenced areas were specified in the original permit by the joint agreement of the staffs of the California Coastal Commission, the County of San Luis Obispo Planning Department, the California Department of Fish and Game and the California Department of Parks and Recreation.

The re-seeding and planting in referenced fenced off areas of the SVRA with native plants is accomplished through a multi- year resource maintenance program administered and managed by the SVRA. These efforts have been and will continue to be coordinated with a number of pertinent technical and non-technical entities, e.g.: The Nature Conservancy; The Dune Guild of the Society for Ecological Restoration, California Chapter (SERCAL); Native Sons Native Plant Nursery; California Polytechnic State University, San Luis Obispo; Cal-4WD clubs; Boy Scouts of America; Pacific Bell volunteers; school groups; etc.

The monitoring program is important in determining what the former, normal or unimpaired state or condition of the fenced off portion of park was and where and what species should be included in the restoration plan. The monitoring protocol designed to meet Coastal Commission Permit conditions are contained in the Habitat Monitoring System for Oceano Dunes SVRA.

## 6. Geographic Information System (GIS)

In the summer of 1997, The Nature Conservancy began developing a GIS database for mapping the vegetation (including the rare plants) and animals in the Mobil Coastal Preserve. San Diego State University, under contract with State Parks, has developed a comprehensive GIS database for Oceano Dunes SVRA. The SVRA and the State Parks GIS coordinator have worked closely with TNC, sharing knowledge, data and advice to assist TNC's efforts in establishing a GIS database.

## 7. Other Cooperative Efforts

### *a. The Nature Conservancy*

As mentioned above, since the early 1990's meetings have been held with The Nature Conservancy to exchange biological and monitoring information. State Parks will continue to work with TNC to coordinate and combine natural resource monitoring efforts.

Efforts to coordinate activities other than fundamental habitat monitoring have and will continue to take place. For example, the SVRA ecologist meets with TNC volunteers to look at populations of surf thistle and beach spectacle pod in the southern portion of the Mobil Coastal preserve in order to compare those sites with those populations in the SVRA.

Though The Nature Conservancy has plans to cease its direct involvement in the management of the Mobil Coastal Preserve, the groundwork and information systems sharing by State Parks will readily transition to subsequent property managers.

### *b. Friends of Nipomo Dunes and the Central Coast Natural History Association*

Volunteers from both organizations have assisted the SVRA numerous times in the past. Volunteers present public education and interpretive programs. Additionally, volunteers have identified undesirable exotic plants within the SVRA, and have worked with SVRA staff to eradicate non-native plants, e.g. European beach grass, ice plant, pampas grass, etc.

### c. *California Native Plant Society (CNPS)*

Dr. David Chipping, professor of geology at California Polytechnic State University, San Luis Obispo, and statewide Vice President of CNPS, has assisted State Parks with Strand Way foredune management. Dr. Chipping has also provided State Parks with advice on managing the vegetation islands located within the SVRA.

### d. *Native Sons Nursery (Arroyo Grande)*

Native Sons Nursery assisted State Parks in establishing a native plant propagation program and greenhouse, the operation of which supports SVRA re-vegetation programs. Native Sons Nursery advises State Parks on native plant propagation and re-vegetation techniques.

### e. *Guadalupe - Nipomo Dunes Forum*

State Parks has been an active participant in The Guadalupe - Nipomo Dunes Forum since its inception in May of 1997. The Forum is an affiliation of individuals, agencies and organizations that share information and resources related to the developed areas and natural environment of the Guadalupe-Nipomo Dunes complex. The agencies and organizations in attendance can vary with each meeting. However, a typical representation will include the California Coastal Conservancy, The Nature Conservancy, County of Santa Barbara 5th District, People for the Nipomo Dunes, Guadalupe Historical Society, Land Conservancy of San Luis Obispo, City of Santa Maria, County of Santa Barbara, Gordon Sand, Santa Barbara County Parks, the offices of U. S. Representative Walter Capps, State Senator Jack O'Connell, and State Assembly Representative Tom Bordonaro, UNOCAL, U.S. Fish and Wildlife Service, California

State Parks, and the Growers Association. In a spirit of cooperation and recognition of many common goals, the participants strive to share information on the availability of grants and other moneys to finance projects within the dunes, seek feedback and ideas from the others regarding project proposals, and explore the potential for sharing data related to the monitoring of threatened and endangered species and habitat condition.

## D. Sanitation

A review of the information gathered in analyzing the criterion of sanitation showed that the capacity of the Park's facilities to meet the needs of its visitors is far from being exceeded, even on the busiest of Holiday weekends. Additionally, the issue of dumping waste from holding tanks onto the beach no longer exists. The result of this analysis is detailed below.

In order to assess the status of this criterion data was obtained from the records of the City of Grover Beach, the Oceano Community Services District, the Maintenance Chief at ODSVRA and the Chief Ranger at ODSVRA.

### 1. Nighttime dumping:

An examination of the citations written at ODSVRA since the end of 1991 through October of 1994 failed to produce any associated with the illegal discharge of sewage. Specifically there were no citations written during that period for either CCRT14 432 (sanitation) or CFG 5650/5652 (polluting within 150' of a water body). Previous to 1991 there are no records available for review. However, Park Superintendent Patton cannot recall any citations or reports regarding such activity being recorded during the last decade. His personal observations (as well as those of his staff, which have served at the Park longest) indicate that this problem was one of the 1970's and no longer exists. The decline/disappearance of this illegal activity has probably occurred due to a number of reasons. Most prominent among these are:

- A proactive educational effort aimed at the visitors to ODSVRA; (e.g. the distribution of a newsletter at the entry kiosk which discussed the ramifications of and alternatives to such activity, ranger/visitor contacts);
- The availability of a convenient local dump station located adjacent to the Grand Avenue kiosk. This facility is free to visitors of ODSVRA and is advertised for use in the newsletter which is given to visitors as they enter the Park); (this station was recently upgraded in 1990- 1991 utilizing approximately $40,000.00 in funds from the OHMVR Division);
- An increased awareness of proper environmental etiquette by the general public through the educational efforts of the media and the staff of agencies like DPR;
- The presence of larger holding tanks in the newer RV's which enables them to remain self- contained for at least several days; this innovation has significantly reduced the frequency by which RV's typically need to "dump";
- The increased presence of rangers and other ODSVRA staff which make both enforcement and educational contacts with the public;
- The availability of inexpensive readily useable auxiliary holding tanks;

**2. Impacts on the local sewage treatment system:**

The visitors at ODSVRA have access to several different means and locations to meet their personal sanitary needs. In Grover Beach a complete restroom facility is located at the west end of Grand Avenue. Located nearby is the recreational vehicle (RV) dump station (referred to as "LeSage") which serves the ODSVRA beach campers, the Oceano campground and other visitors from various campgrounds in the area. This RV facility like the adjacent bathroom is available free to the visitors at ODSVRA. In nearby Oceano ODSVRA also operates another complete restroom facility at the west end of Pier Avenue. This restroom primarily serves the beach users who park in the adjacent day use parking lot. This facility also includes an outdoor shower that is primarily used by visitors who have entered the ocean (e.g. surfers, swimmers, etc.). Additionally, there

are located throughout the Park (including locations in the back dunes) as many as 119 chemical toilets and six semi- permanent vault toilets. . These facilities are strategically placed such that a visitor will typically have to walk approximately no more than 100 yards from the water's edge or down the beach less than one-quarter mile. These chemical toilets are pumped on a regular time interval, which is based on the level of visitor usage within the Park. The waste that is removed from the chemical toilets is disposed of into the dump station located on Grand Avenue.

The local Sanitation District performed an evaluation of the impact of the restroom facilities and RV dump station on the local sewage treatment plant in 1991. At that time, their conclusion was ***"taking into consideration the small gallonage figures pumped into LeSage, the pounds are insignificant when total loading of the plant is taken into account (less than four hundredths of one percent for both suspended solids and B.O.D. respectfully".***

The attached **illustrations 1-2** show the location of the chemical toilets that are located throughout the park for both the summer busy season, and the balance of the year. SVRA personnel using a sewage pumper truck service chemical toilets a minimum of once per week during the summer season, continuously by daylight during holiday periods and as needed during the balance of the year. Toilets are pumped in place and the collected effluent is then transported by truck for offsite disposal at the Le Sage Dump Station.

In 1989, the Sanitation District conducted an analysis of the effluent dumped by State Parks into the Le Sage Dump Station. That analysis compared the (concentrated) effluent with that from an "average" household. The highest month evaluated by the district indicated that effluent was roughly equal to that generated by 24.3 homes.

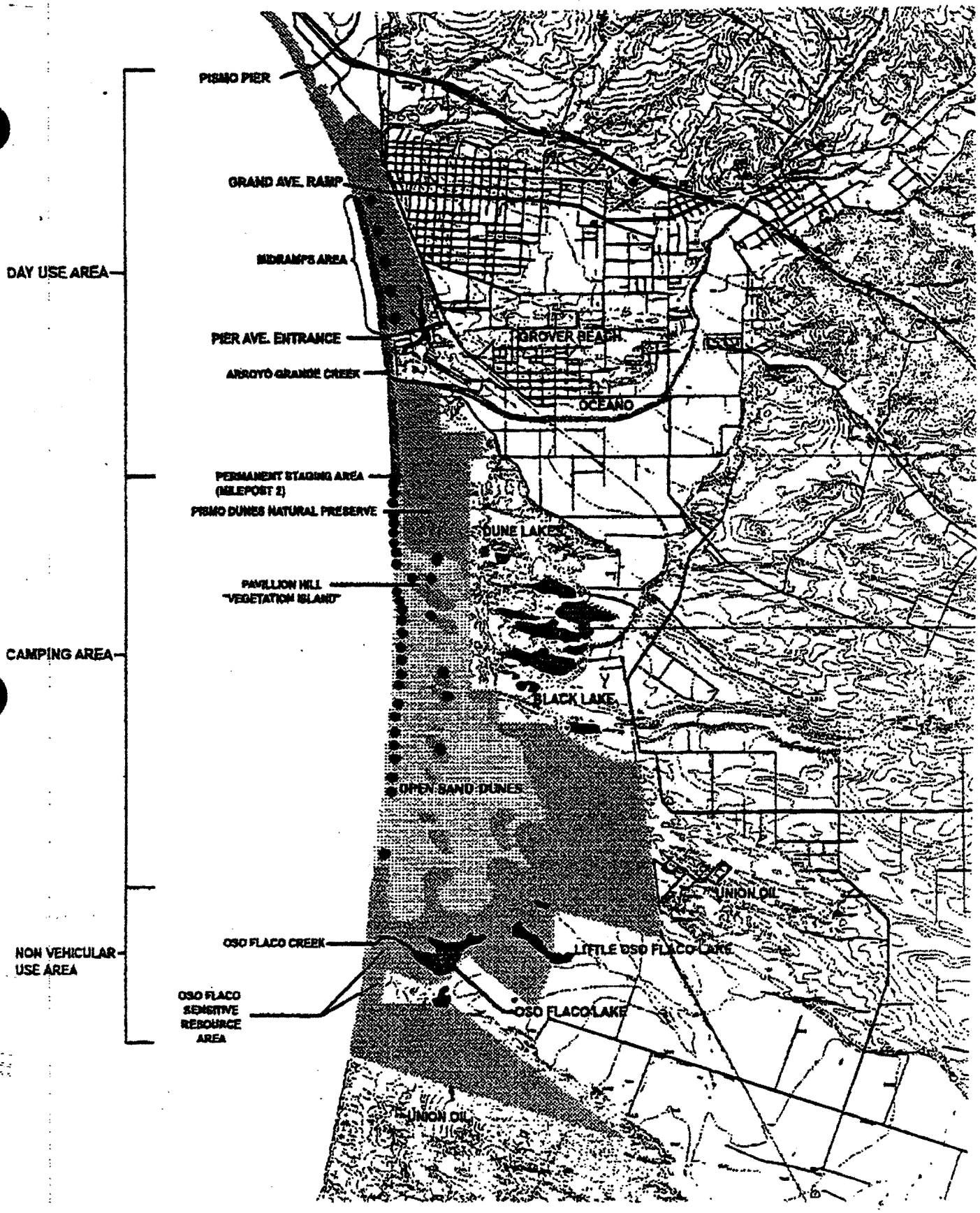
San Luis Obispo County's 1995 Annual Resource Summary Report indicates that the South SLO County Sanitation District is just over 50 percent of capacity. Since the Resource Summary Report indicates that there is no level of severity at this facility the

ILLUSTRATION 1: SANITARY FACILITY LOCATIONS WITHIN OCEANO SVRA

| Location | Mileage | Summer | Winter |
|---|---|---|---|
| Grand Ramp | 0.00 | 2 | 0 |
| Mid-Ramps | 0.25 | 2 | 0 |
| Mid-Ramps | 0.50 | 2 | 2 |
| Mid-Ramps | 0.75 | 2 | 2 |
| Near Pier Ramp | 0.90 | 2 | 0 |
| Post 2 | 2.05 | 4 | 4 |
| | 2.10 | 3 | 3 |
| | 2.20 | 3 | 0 |
| | 2.28 | 3 | 3 |
| | 2.36 | 3 | 0 |
| | 2.45 | 3 | 3 |
| Post 3 | 2.53 | 3 | 0 |
| | 2.60 | 3 | 3 |
| | 2.72 | 3 | 0 |
| Open Area | 2.78 | 3 | 3 |
| | 2.88 | 3 | 0 |
| Post 4 | 2.95 | 3 | 3 |
| Pavilion Hill | 3.05 | 3 | 0 |
| Sand Highway Entrance | 1.15 | 5 | 2 |
| | 3.25 | 4 | 3 |
| | 3.36 | 4 | 0 |
| Post 5 | 3.45 | 4 | 3 |
| | 3.55 | 4 | 0 |
| | 3.65 | 4 | 3 |
| | 3.70 | 4 | 0 |
| | 3.80 | 4 | 3 |
| Post 6 | 3.92 | 4 | 0 |
| | 4.05 | 3 | 3 |
| | 4.20 | 3 | 3 |
| | 4.32 | 3 | 3 |
| Post 7 | 4.55 | 3 | 2 |
| | 4.80 | 2 | 2 |
| Post 8 | 4.90 | 2 | 0 |
| | 5.20 | 2 | 2 |
| Moy Mell | | 2 | 0 |
| Worm Valley | | 2 | 0 |
| BBQ Flats | | 2 | 2 |
| Cottonwood | | 2 | 2 |
| Eucalyptus Tree | | 2 | 2 |
| Pipeline | | 2 | 0 |
| Oso Flaco | | 2 | 2 |

*Summer season is Memorial Day Weekend to Labor Day Weekend

Illustration 2




**LEGEND**

STREET LEGAL VEHICLES ONLY
NON-STREET LEGAL VEHICLES PROHIBITED

OFF-HIGHWAY VEHICLE AREA

SVRA RESOURCE MANAGED LANDS (VEHICLE USE PROHIBITED)

PISMO STATE BEACH (INCLUDING PRESERVE)

● Chemical Toilet Locations

effluent generated by the park was determined not to have a significant impact on the capacity of the district.

With the availability of a convenient disposal system it seems unlikely that illegal dumping remains a serious concern. However, it is important that visitors are aware that facilities are available.

State Parks will post signs at both kiosks advising visitors of the dump station location. Future issues of the "Dunes Forum", a free newspaper provided to all SVRA visitors, will contain text addressing beach sanitation, regulations, and will also provide dump station location information. The current edition of the Oceano Dunes brochure, also given to each visiting party, already provides dump station location information.

**3. Oceano Dunes SVRA infrastructure capacity:**

An evaluation of the chemical toilet facilities was performed for the July 4th Holiday weekend for the years 1992 - 1994. This weekend was selected because it represents the time period of greatest visitation experienced at ODSVRA and therefore places the greatest demand on the facilities. During this weekend these facilities are pumped on a continuous basis. Based upon the total capacity of the chemical toilets in place and the number of gallons disposed of at the dump station each day a determination of the total percent capacity % for each day was achieved. The cumulative results from each of the three Holiday weekends is as follows:

- *1992*: **46%** of total capacity

- *1993*: **30%** of total capacity
- *1994*: **24%** of total capacity

An analysis of the downward trend of % total capacity revealed that two concurrent factors are having a positive effect on the level of service. These are an increased level of diligence on the part of the maintenance staff to provide a positive experience for the visitor to ODSVRA and new this year, the acquisition of additional chemical toilets which have a greater holding capacity.

## *E. Traffic Impacts on the Local Community*

The traffic impacts of visitors to Oceano Dunes SVRA on the local community were found to be insignificant. A review of videotapes filmed on Holiday weekends revealed that at the Park entrances traffic was seldom backed up more than two cars deep. Certain Park improvements and protocol changes, as well as the one million-dollar Pier Avenue widening project (funded through a grant from the OHMVR Division of DPR) have been successful in mitigating this historic issue. Specific analysis of this criterion follows.

The impacts of the additional traffic created by visitors to ODSVRA have historically been an area of concern to some of the local residents residing in the adjoining Community of Oceano. This community is adjacent to the Pier Avenue kiosk, which is located adjacent to a small retail business district and residential area. Comparatively, the Grand Avenue kiosk, which adjoins Grover City, is located adjacent to either vacant State Park lands or a State Park vehicle parking lot. As a result of these differences in the locales surrounding these entry kiosks the effects of traffic being delayed upon entry into ODSVRA is obviously felt more acutely at the Pier Avenue kiosk. In the late 1980's the Off- Highway Motor Vehicle Recreation Division of the Department of Parks & Recreation responded to the concerns raised by the Community of Oceano over this issue by awarding the County of San Luis Obispo a grant in the amount of approximately $1,000,000.00. The funds from this grant were expended on projects designed to improve traffic flow along Pier Avenue. Today this project is complete and reports have indicated that it has ameliorated those traffic conditions that created those initial concerns.

In order to assess the success of that project, a video camera was mounted at both kiosks on a variety of days and times to record the traffic levels experienced at those locations. At the Pier Avenue kiosk the camera was mounted on May 29, 1994 (Sunday, Memorial Day Weekend) from 0900 - 1100 and again at 1330 - 1530 and again on July 2,

1994 (Saturday, July 4th Weekend) from 0940 - 1500. At the Grand Avenue kiosk the camera was mounted on September 3, 1994 from 0930 - 1500. Analysis of this film showed that traffic backups were generally equal to or less than two vehicles and that it was extremely rare for the number of vehicles in line to exceed four. Specific measurements of the 14 plus hours of tape were made by stopping the tape at approximately every 8.5 minutes of playtime. A count was taken of the number of vehicles stopped and/or backed up at the kiosk. (At the Pier kiosk the count was taken from the longer of the 2 lanes.) Recorded below **(figure 52)** are the results of those counts.

The critical factor in assessing traffic impacts created by visitors to Oceano Dunes SVRA is the number of cars that can be accommodated at the Pier Avenue kiosk line before the intersection of Pier Avenue and Strand Way is impacted. The distance from the kiosk to the middle of Strand Way is 191 feet. Even with the 'generous' average of 40 feet per vehicle, it would take five vehicles backed up to impact Strand Way. Approximately 6% of the recorded incidents of vehicle backups at entry kiosks involved more than five vehicles. It should be noted that the number of vehicles backed up as referenced in the 1994 study are the total recorded at both the Pier Avenue and Grand Avenue kiosks. The percentage of vehicles backed up at Pier Avenue is an estimate based on the information available.

Two streets provide access to the Strand Way neighborhood: Strand Way and Lakeside Avenue. If there are more than five vehicles waiting to enter the park, Lakeside Avenue could be used to access the neighborhood in case of an emergency. The distance from the kiosk to the middle of Lakeside Avenue is 858 feet. Twenty-one vehicles would need to be backed up to impact Lakeside Avenue.

The other factor impacting the local community is the effect that high tide has on the ability of visitors to access portions of the park south of Arroyo Grande Creek. Several times a year the tide is too high for most vehicles to cross Arroyo Grande Creek. During this time SVRA staff restrict entry to the park until the creek is passable. State Parks

# FIGURE 52

***Recorded incidences of vehicle backups at entry kiosks***

| Number of Vehicles Backed Up | Number of Instances |
|---|---|
| 0 | 40 |
| 1 | 18 |
| 2 | 12 |
| 3 | 8 |
| 4 | 5 |
| 5 | 4 |
| 6 | 0 |
| 7 | 1 |
| 8 or more | 0 |

acknowledges that restricting entry to the SVRA has caused backups in the past. In 1996 it became the practice of State Parks to sell passes, inform visitors when the tide will be low enough to accommodate vehicular crossings, and ask visitors to return later in the day.

The County has recommended that vehicles backed up at the Pier Avenue kiosk should not impact the intersection of Pier Avenue and Strand Way. During periods of anticipated heavy traffic, State Parks operates two entry lanes to kiosks and quadruples staffing to expedite traffic flow into the SVRA. This protocol has all but eliminated negative traffic impacts at Pier Avenue and Strand Way.

Pier Avenue is a County owned roadway. State Parks has suggested that San Luis Obispo County Planning staff work with the San Luis Obispo County Engineering Department Traffic Engineer to install sign(s) and/or marking(s) upon the roadway, advising motorists to keep the intersection at Pier Avenue and Strand Way clear. County Planning staff accepted this suggestion on June 30, 1997, and has since presented this proposal to the County Traffic Engineer. A subsequent County traffic engineering review of this intersection found that even if the west bound lanes of Pier Avenue had traffic backed up through the "T" intersection at Strand Way, there would be no impact or delay in any emergency vehicle response to Strand Way. The proposed signing and/or striping, while not required from a legal or engineering standpoint, will be considered by County staff for implementation.

## F. Determining Daily Vehicle Attendance

To date State Parks has not counted daily OHV attendance within the SVRA, but has rather only counted on-highway vehicles entering the SVRA.

Ratios of day use on-highway vehicles to OHVs were determined through three surveys conducted by State Parks. Those ratios were accepted and used by San Luis Obispo County staff to develop average seasonally adjusted ratios of day use on-highway vehicles to OHVs for Oceano Dunes SVRA.

State Parks, San Luis Obispo County and the California Coastal Commission are in agreement that there are differences in day use on-highway vehicle to OHV ratios by day of week, by holiday period and by seasons throughout the year. All parties agree that valid seasonally adjusted ratios can be developed for application in determining vehicle attendance. Determining instantaneous and total daily attendance at Oceano Dunes SVRA is complicated. Two entry points to the beach, various lengths of stay for day use visitors, and trips in and out of the SVRA by visitors patronizing local merchants add complexities to the accounting for vehicles.

In order to further clarify the understanding of visitor use patterns, State Parks will initiate in 1998 a new program of data collection. This program will consist of a series of surveys throughout the year, considering differences in season, holidays, day of week, OHV ratios to day use and camper vehicles as well as other referenced variables and will develop a statistically valid, mathematical formula for determining accurate counts of all vehicle types. This information will not only allow for better understanding, but also will allow for more effective management of the Park. The survey will be jointly scoped by State Parks and San Luis Obispo County staffs and will be conducted through contract by State Parks with a university or other mutually agreeable party expert in statistical data gathering and analysis.

## G. Thresholds

The establishment of data driven thresholds for carrying capacity evaluation factors is considered essential for triggering management actions in the SVRA. Monitoring programs described in this document will provide the data for analysis.

A range of management actions that may be implemented when thresholds are met or exceeded are described in the discussion sections for each factor elsewhere in this document.

Thresholds are established in this Day Use Carrying Capacity Study Amendment for the following monitored factors: Vehicular Accident Rate, Accident Response Time, and Natural Resource Habitat Conditions.

## 1. Vehicular Accident Rates

The threshold for vehicular accident rates is 5.05 per 10,000 visitors. This threshold establishes an upper limit at two standard deviations above the mean in consideration of accident data for the period 1986 - 1996.

## 2. Vehicle Accident Response Time

The threshold for vehicle accident response time is eight minutes. For 1996, the only full year in which this data has been gathered in the SVRA, the mean response time was 3.25 minutes. Emergency services agencies consider eight minutes to be a maximum acceptable emergency response time in urban areas. This threshold is established as being consistent with generally recognized emergency response time standards. This threshold may be lowered as more data is collected over time.

## 3. Natural Resource Habitat Conditions

Thresholds relative to habitat monitoring are contained and explained in the Oceano Dunes Habitat Monitoring System document, which accompanies this Day Use Carrying Capacity Study. In essence the results of all habitat-monitoring efforts are compiled into a mathematical matrix which summarizes a large volume of field data. Park management then utilizes this matrix in order to discern any significant ecological trends. The discernment of any significant negative trend will in and of itself be considered a threshold and as such trigger a response. The level of this response could range from further detailed study and analysis by State Park ecologists or outside contractors to immediate administrative actions which affect managerial change. Regardless of the action(s) taken, the goal will be to reverse the negative trend.

## H. Day use Carrying Capacity and Program Reviews

The implementation of strategies designed to reduce and minimize social and environmental impacts is derived through the collection and analysis of data, which is derived from the monitoring systems that are already in place at Oceano Dunes SVRA. The success of these management strategies are then measured and evaluated via outcome and long-term trend analysis.

Visitor accident rates, visitor accident response times, and habitat monitoring programs will be analyzed minimally once each year. Through the analysis of the data gathered on these carrying capacity factors comparisons can be made with previous years' data and trends can be determined on the observed changes.

State Parks will furnish the San Luis Obispo County Planning Department and the California Coastal Commission copies of all yearly studies by March 1st for the preceding calendar year.

Since meaningful change and trend determination can best be made only over a longer period of time, staff of California State Parks, San Luis Obispo County and the California Coastal Commission agree, after three years, to discuss and to review SVRA attendance, human and environmental impacts, and the effectiveness of SVRA management strategies in fulfilling Coastal Development Permit #4-82-300, Condition 3 (d), the establishment of OHV day use limits within Oceano Dunes SVRA. The staffs may meet more frequently if consideration of the monitoring data warrants such action. After the initial three-year review, the need for continued monitoring reporting and subsequent review meetings, if any, would be determined and jointly agreed upon.

## IV. Conclusions

Historically, issues concerning visitor use conflicts, safety, access, resource protection, infrastructure capacity, impacts on local communities and future expansion of the Off-highway Vehicle portion of the Oceano Beach State Vehicular Recreation Area have resulted in an on-going debate between various interest groups and public agencies. These concerns are derived from the long history (circa 1890-1982) of largely unregulated beach recreation along an expansive area of beach which now includes the Pismo State Beach and Oceano Dunes State Vehicular Recreation Area. Peak periods for these problems were typically experienced on the major three-day Holiday weekends. During these periods both the congestion, which occurred adjacent to the Pier and Grand Avenue entrances and the unregulated beach recreation from Grand Avenue to the now-open OHV area generated some adverse effects on the local communities. These impacts were felt most acutely by those residents living along the access corridors and/or residing in the beachfront homes. Additionally, impacts that occurred to the natural resources of the Park were the subject of significant environmental concern. Since the Department of Parks and Recreation has acquired the lands for Oceano Dunes SVRA, both the public and other governmental agencies have had numerous opportunities and forums in which to play a role in developing strategies and guidelines for managing the operations of this Park. Examples of these opportunities include:

- the public hearings held as a part of the General Plan process;
- the regularly held public Parks & Recreation Commission meetings;
- the public California Coastal Commission hearings which have been held regarding Coastal Development Permit 4-83-300 and its amendments;
- the public meetings held to discuss the General Plan Amendment which dealt with alternative access plans;
- the regularly- held public Off-Highway Motorized Vehicle Recreation Commission meetings;
- the numerous local civic meetings, e.g. City Council and San Luis Obispo County Board of Supervisors;

These meetings have dealt with a variety issues concerning ODSVRA, the most significant of which were probably those associated with the California Coastal Commission Coastal Development Permit 4-82-300. The hearings related to this permit involved a number of issues concerned with the Park's recreational activities, access, conservation/preservation of sensitive resources and land use conflicts. Through this permit process, the California Department of Parks and Recreation together with the staffs of the San Luis Obispo County Board of Supervisors, the California Coastal Commission and the California Department of Fish & Game co-developed a management program for ODSVRA that addressed the various issues from a "multiple land use" perspective. The result of that process was a significant increase in the level of beach user regulation, increased resource protection and access improvements along Grand and Pier Avenues.

This study represents a significant collaborative effort, which arose out of a determination by the Coastal Commission, (in the latter half of 1993), that it was necessary to address a portion of one condition of the original coastal development permit which had not yet been fulfilled. That condition (i.e. 3.B.) required that an OHV day use carrying capacity (limit) be established through consultation and agreement between the Executive Director of the Coastal Commission, DPR and the San Luis Obispo County Board of Supervisors. Since approximately March 1994 through the present, the staffs of those three agencies did meet and consult with one another, together established criteria for measuring the carrying capacity at ODSVRA and further agreed that those criteria should be assessed through a study. The staffs of all three pertinent agencies mutually agreed upon the methodology used to assess those specific criteria. Moreover, the actual implementation of that study was a product of the cooperative efforts of the staffs of those three agencies. The conclusions that were reached on assessing each of those criteria for determining the carrying capacity at ODSVRA follow:

## A. Visitor Characterization

One of the long- standing principal concerns that has been raised at ODSVRA has been the issue of visitor use compatibility. Specifically, do vehicles conflict with other uses within the Park? In their Condition Compliance report for Permit 4-82-300 dated December 2, 1993 the Coastal Commission staff state that ***"...vehicles have the potential to conflict with other uses within the State Vehicle Recreation Area (SVRA). Use of these vehicles on the beach conflict with day use recreationalists wanting to surf, fish, dig for Pismo clams, or walking or sitting on the dry sand beach."*** Based upon the evidence produced by the visitor day use survey this does not appear to be the case. Instead, the survey found that:

- Of all those surveyed about the importance of the use of a vehicle to their visit, fully 72% responded that its use was either very significant or extremely important to their visit.
- When the responses from just the pedestrians were analyzed, 58% responded that the use of a vehicle to their visit was either very significant or extremely important to their visit.

When visitors were asked to name the one principal recreational activity that they would participate in and then asked to assess the importance of the vehicle to their visit, the results were even more striking. The following table **(figure 53)** lists the principal recreational activity cited and then the proportion of those who felt that vehicle use was either very significant or extremely important to their visit.

It is noteworthy that even amongst many of those activities listed by the Coastal Commission staff report, several had significantly greater than 50% of their constituents citing the importance of the automobile as either very significant or extremely important to their visit.

# FIGURE 53

***Respondents by recreational type citing vehicle use as either "very significant" or "extremely important" to their visit***

| Recreational Type | % of Survey Respondents |
|---|---|
| OHV use | 93 |
| beach driving | 83 |
| fishing | 81 |
| sunbathing | 81 |
| camping | 79 |
| surfing | 75 |
| kite flying | 67 |
| beach combing | 65 |
| picnicking | 62 |
| swimming | 62 |
| sightseeing | 52 |
| clamming | 50 |
| horseback riding | 40 |
| walking | 39 |
| nature study | 25 |

Another issue related to visitor use is the concern over the segregation of visitors according to recreational activity preference. An analysis of the data collected in the survey indicates that a significant level of segregation of visitors (i.e. by their preferred activity) is already taking place. This fact seems to point to the success of the restrictions that are already in place, which in effect allow for such segregation to occur. (See Results section: 1. The influence of survey location on principal activity: and 2. The influence of survey location on the importance of the use of a vehicle to the visit:)

Based upon the data collected by the visitor survey, an overwhelming majority the Park users appear to appreciate and enjoy the use of a vehicle on the beach. Even when the data was segregated by location of survey, type of entry (i.e. pedestrian vs. vehicle) or recreational preference, the importance of vehicle use on the beach was still found to be very significant. Based upon these and other significant findings indicated by the data, the criterion of visitor interaction/compatibility has not even approached a level of concern, which would warrant the further restriction of vehicles within Oceano Dunes SVRA.

## B. Visitor Safety

Historically, the critics of ODSVRA have made claims that the Park is unsafe for its visitors. Usually, when this claim has been made, it has been done in a non- comparative fashion. This study made comparisons of the accident statistics of ODSVRA with other California OHV facilities, state and national parks. The results of those comparisons clearly illustrated that the accident rate of ODSVRA is significantly less than that experienced at most other recreation areas (i.e. both OHV and non-OHV parks). That analysis also revealed that the accident rate has steadily declined under the management of the OHMVR Division. Additionally, this study performed a comparative analysis of the crime statistics of ODSVRA with other similar parks and the adjoining community of Pismo Beach. For the sake of this comparison, this municipality is only noteworthy in that it adjoins ODSVRA; its crime statistics are only noteworthy in that they are probably representative of a typical small central California coast tourist town. The data collected clearly indicate that the typical visitor to ODSVRA is considerably less likely to be subject to, or be the victim of an arrest or crime. Additionally the typical Park visitor to ODSVRA is more likely to witness the presence of law enforcement personnel than a visitor or resident in the adjoining City of Pismo Beach, or at other similar recreational facilities. Based upon these findings the utilization of the criteria of visitor safety, as a means by which to further restrict visitor use at ODSVRA cannot be justified.

## C. Sensitive Natural Resources

An exhaustive analysis was performed in order to accurately assess the success of the maintenance staff of ODSVRA and the professional resources staff at DPR in meeting the mandates of permit 4-82-300 to protect the "sensitive resources" within the Park. An extensive collection of historic and present day aerial photos, ground photos, historic survey maps (circa 1870) and historic accounts were studied and carefully analyzed. Those analyses have revealed that the efforts to protect and enhance those resources labeled as "sensitive" in 1982 have been very successful. Not only have the protected areas witnessed an end to their long decline, but also have generally experienced a substantial improvement (i.e. 138% to 435% increase in vegetative cover) in the overall quality of their habitat. Particularly significant is the manner in which most of the protected areas are no longer fragmented. The net result of this positive change (i.e. more contiguous vegetation) is predictable via island biogeographic theory: one can expect higher species diversity, higher species richness, greater community resistance to permanent change (elasticity) and in general a healthier habitat for both the flora and fauna of the Park.

These protection and restoration efforts have taken place during a series of droughts so significant that they have shaken the basic climatological expectations of what is "average" for this State. Additionally, the size and scope of the restoration projects undertaken by ODSVRA is unparalleled by any other similar dune restoration project in California, if not the West Coast. Today, this program is based upon the experiences of the past at both ODSVRA and at other similar sites, and on the latest research involving restoration ecology. Goals that meet both the intent and letter of the pertinent mandates are established and prioritized. The resultant projects are then designed, implemented and monitored. The fact that these projects have ultimately been successful under such adverse conditions is true testimony to the tenacity, malleability and innovation displayed by the staffs at ODSVRA and DPR.

As a part of the legislated mandates the staffs of ODSVRA and DPR have instituted a program for monitoring the wildlife and its habitat within ODSVRA. Subsequent to baseline studies, additional research has been and is being performed in those areas where such needs have been identified. The research and monitoring of the Federally listed Snowy Plover is a product of this program and represents the second largest effort of its kind within the State. This program was proactive in that it was implemented years before it became apparent that the USFWS would require that ODSVRA develop a special program for the protection of this species. It is also noteworthy that this program has resulted in the transformation of an area which was noted in 1978 for having zero nesting snowy plovers, to one which today is recognized as one of the most significant (and successful) nesting areas in the state (41 nests in 1994). The information amassed through these efforts is currently being utilized by the staffs of DPR and the USFWS in the development of the first habitat management plan prepared for the Snowy Plover.

In summary, the efforts of the staff of the California Department of Parks and Recreation to meet both the letter and the intent of the original permit in protecting the sensitive resources has largely been a success. Evaluating the health of the sensitive resources as a criteria for establishing a day use OHV carrying capacity/limit has resulted in data which does not support the implementation of further restrictions on vehicle use within the Park.

## D. Sanitation

Utilizing visitor sanitation as a means by which to evaluate the OHV vehicle day use carrying capacity of ODSVRA was based upon concerns raised by the CCC staff in 1982 during the original permit application process. The data collected and analyzed for this study indicates that the problems of the past at ODSVRA as they relate to sanitation no longer exist. Instead the Park's sanitation facilities are operating significantly below their capacity even on the busiest of holiday weekends. Therefore, the data show that utilizing sanitation as a criterion to further limit vehicle access to the Park would be completely unwarranted.

## *E. Traffic Impacts on the Local Community*

Not unlike the above criteria, the issue of traffic impacts has been a concern based upon historical conditions. These specific concerns have been carefully addressed through the CEQA process, which accompanied the Pier Avenue widening project. In total the OHMVR Division of DPR has funded over $1,000,000.00 to the County of San Luis Obispo for this key project. Additionally since this issue first became a concern, a number of additional smaller projects/programs have been implemented:

- New entry kiosks at Pier and Grand were built for traffic control and visitor information;
- The number of vehicle lanes accessing each kiosk was increased for more efficient traffic flow;
- Staffing levels are carefully matched with the specific need and are adjusted regularly both on a seasonal and daily basis as needed;

Based upon field observations which have recorded the efficiency of the current operation and its impact on the traffic as it relates to the surrounding community, the use of this criteria would indicate that the Park is not at its carrying capacity even on the busiest of holiday weekends.

## V. Summary

Oceano Dunes SVRA and the surrounding environs are a much different place today than they were in the 1970's or even in 1982 when Coastal Development Permit # 4-82-300 was first issued. Today off- highway vehicle recreation is confined to an area within the Park that represents only approximately 10% of the former area once used by OHVs. Such use is restricted to approximately 3 miles of coastline where formerly 16 miles were once available. Activities within the Park are closely regulated in order to provide the visitor with a safe recreational experience and to protect the sensitive resources located therein. Through a number of controls and carefully orchestrated projects and programs the Park today has successfully addressed those issues which were once the center of controversy. In this study the mutually agreed upon criteria of visitor compatibility, safety, sanitation, environmental protection and traffic impacts (on the local communities) have been carefully analyzed with respect to assessing the OHV day- use carrying capacity of Oceano Dunes SVRA. The results of that assessment clearly show that the carrying capacity of Oceano Dunes SVRA as prescribed by the Park's General Plan is not being reached even on he busiest of holiday weekends. Based upon the findings and conclusions of this extensive research effort, it is our recommendation that the OHV day use carrying capacity of Oceano Dunes SVRA be established at those levels that were prescribed in the Park's General Plan.

# VI. APPENDICES

A. **Appendix A:** 1994 Visitor Survey/Questionnaire

B. **Appendix B:** Correspondence form San Jose State University researchers regarding efforts by CA DPR staff to protect the natural resources at Oceano Dunes SVRA

C. **Appendix C:** USFWS Biological and Conference Opinion for Issuance of a Permit for Maintenance of Beach Access Ramps, Oceano Pismo Dunes State Vehicular Recreation Area,....

D. **Appendix D:** Habitat Monitoring System, Oceano Dunes SVRA

# Appendix A:

## 1994 Visitor Survey/Questionnaire

Surveyor: _____ Questionnaire No. _____

# PISMO SVRA Survey Questionnaire

**Date:**_____ **Weather:**_____

**Day of the Week:** *(Circle One)* M T W TH F SAT SUN

**Time:** _____

**Location:** (*Check One*) PIER ___ GRAND ___ MIDRAMPS ___ OHV Area ___

Q-1. How is/did the respondent entering the Park? (Circle *one*)

1. BY VEHICLE
2. BY FOOT (*GO TO Q-4*)

Q-2. W hat type of vehicle is the respondent driving? (*Circle one*)

1. SPORTS UTILITY or JEEP
2. TRUCK
3. SEDAN
4. RV
5. VAN
6. OTHER: _____

Q-3. Is the vehicle 4 WD or 2WD? (*Circle one*)

1. 2WD
2. 4WD

***ASK THE RESPONDENT THE FOLLOWING QUESTIONS:***

Q-4. (*PIER AND GRAND ONLY*): Is this entry to the recreation area your first for today?

1. YES
2. NO

Q-5. What is your zip code? _____ *(Fill in)* Where is this? _____

Q-6. How many people are in your group? _____(_____)_(*Fill In*)

How many are under the age of twelve? _____(_____)

Q-7. Do any in your group have <u>any</u> form of physical disability?

1. YES
2. NO

Q-8. Are you here for day use only or do you plan on staying overnight in this recreation area?

1. DAY USE ONLY (*GO TO Q-9*)
2. OVERNIGHT USE (*GO TO Q-10*)
3. DAY USE BECAUSE NO CAMP SITES LEFT

Q-9. (*DAY USE ONLY*) How long do you plan on using the recreation area during this visit?

1. 1 HOUR
2. 2-3 HOURS
3. 4-5 HOURS
4. 6-8 HOURS
5. 8+ HOURS
6. NOT SURE

(*GO TO Q-11*)

Q-10. (*OVERNIGHT USE ONLY*) How long do you plan on using the recreation area during this visit?

1. 1 DAY
2. 2 DAYS
3. 3-5 DAYS
4. 6-10 DAYS
5. 10+ DAYS

**Q-11.** Have you been to this recreation area before?

1. YES
2. NO

**Q-12.** Within this recreation area where do you spend most of your time? (***Refer to Park map***)

1. NORTH OF GRAND AVENUE (*Non-vehicle area*)
2. BETWEEN GRAND AND PIER AVENUE (*Midramps area*)
3. BETWEEN PIER AND POST 2
4. BETWEEN POST 2 AND THE SOUTHERN BOUNDARY (*OHV Area*)
5. OTHER/UNKNOWN

**Q-13.** What activities do you plan on engaging in while using this recreational area ? (***Circle all that apply***)

| | | | |
|---|---|---|---|
| 1. | BEACH DRIVING | 10. | SWIMMING |
| 2. | OFF-HIGHWAY VEHICLE USE | 11. | SURFING |
| 3. | HIKING/JOGGING/WALKING | 12. | NATURE STUDY |
| 4. | PICNICKING | 13. | HORSEBACK RIDING |
| 5. | SIGHT-SEEING | 14. | CLAMMING |
| 6. | CAMPING | 15. | SKIN/SCUBA DIVING |
| 7. | BEACH COMBING | 16. | KITE FLYING |
| 8. | SUNBATHING | 17. | SAND PLAY |
| 9. | FISHING | 18. | OTHER: _____ |

**Q-14.** Of the above activities which were selected which is the ONE primary/most important activity? (***Place a checkmark by the one selected***)

**Q-15.** If this recreational area were not available for use, would you go elsewhere for these activities?

1. YES
2. NO (*GO TO Q-18*)

**Q-16.** Where else would you go for these activities? (*Name the destinations*)

1. _____
2. _____
3. _____

**Q-17.** How well would that alternative(s) fulfill your recreational needs?

1. VERY WELL
2. FAIR LY WELL
3. POORLY or NOT AT ALL

**Q-18.** How important is the ability to drive your vehicle on the beach to your visit to this recreation area?

1. NONE (Doesn't affect visit) WHY?
   _____
2. MINIMAL (Has only a minor affect on the visit)
3. MODERATE (Would change some recreational plans/opportunities)
4. VERY SIGNIFICANT (Would significantly alter recreational opportunities)
   WHY?_____
5. EXTREME (Such ability is critical to your use of this recreation area)
   WHY?_____

**Q-19.** How many all-terrain vehicles (e.g. ATV's/three-wheelers, quads, motorcycles, sand rails, etc.) did you bring with you? _____(_____) (Fill in no.)

**Q-20.** How many ATV riders are in your group? _____(_____) (*Fill in no.*)

***COMMENTS:***

_____
_____
_____

# Appendix B:

**Correspondence form San Jose State University researchers regarding efforts by CA DPR staff to protect the natural resources at Oceano Dunes SVRA**

SJSU SAN JOSE STATE UNIVERSITY

A campus of The California State University

College of Science • Department of Biological Sciences
One Washington Square • San José, California 95192-0100 • 408/924-4900 • FAX 408/924-4840

February 5, 1995

We have conducted research at Pismo Dunes for the past 5 years. This initially involved a year-long survey of the fauna of Oso Flaco Lake, one of the last intact freshwater ecosystems remaining along the California coast. Before State Parks took over the management of Pismo Dunes, Oso Flaco Lake was a major staging area for off-highway vehicle recreation and was largely overrun by unmanaged vehicle traffic. With the formation of the Pismo Dunes State Vehicular Recreation Area (PDSVRA) in the early 1980's, vehicle access to Oso Flaco Lake, the dunes surrounding the lake, and all of the dunes extending south of the lake was restricted.

In 1989, the Off-Highway Vehicle (OHV) Division of the California Department of Parks and Recreation initiated the biological survey to evaluate the Oso Flaco Lake area so that the site could be appropriately protected and managed. Through that survey we documented over a hundred and fifty species of birds, a dozen reptile and amphibian species, and numerous mammal species. Some of these species are listed as threatened or endangered by either the state or federal government.

Our study clearly demonstrated the biological importance of the Oso Flaco Lake area and the OHV Division quickly acknowledged this fact. In order to ensure the preservation of Oso Flaco Lake the OHV Division entered a cooperative agreement with The Nature Conservancy (TNC) allowing TNC to assume primary responsibility for the management of the Oso Flaco Lake area as part of the greater Nipomo Dunes Preserve.

Our continued presence at Pismo Dunes resulted from an offshoot of this original research project. During the spring of our year-long inventory we observed endangered California Least Terns at Oso Flaco Lake. After an extensive search of the nearby dunes we located a Least Tern breeding colony within the boundaries of the vehicle riding area.

We found these nests on the Friday of the fourth of July weekend which is one of the heaviest use weekends at Pismo Dunes. By the next day the Staff at Pismo Dunes had managed to gather a large work crew and enough materials to build a mile of fence that protected the entire breeding colony from vehicle and pedestrian traffic.

The following year we monitored breeding terns at Pismo Dunes and developed new techniques for protecting isolated nests with small single-nest exclosures, similar to those used to protect endangered Piping Plovers on the east coast and Snowy Plovers along Monterey Bay. We also found several Snowy Plover nests within the OHV open riding area. We did not expect that the OHV Division would provide the resources to protect these nests because Snowy Plovers were not at that time listed as a threatened or endangered species.

To our surprise, and satisfaction, the supervising rangers at Pismo Dunes took the initiative to protect the Snowy Plover nests, simply because they recognized

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# Appendix C:

**USFWS Biological and Conference Opinion for Issuance of a Permit for Maintenance of Beach Access Ramps, Oceano Pismo Dunes State Vehicular Recreation Area,....**

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Ventura Field Office
2493 Portola Road, Suite B
Ventura, California 93003


January 25, 1996

DEPT. PARKS & RECREATION
PISMO DUNES DISTRICT
JAN 26 1996

David J. Castanon
Chief, North Coast Section
Department of the Army
Los Angeles District, Corps of Engineers
300 North Los Angeles Street
Los Angeles, California 90012

Subject: Biological and Conference Opinion for Issuance of a Permit for Maintenance of Beach Access Ramps, Pismo Dunes State Vehicular Recreation Area, San Luis Obispo County (Corps of Engineers File No. 95-50035-TAW) (1-8-95-F/C-17)

Dear Mr. Castanon:

This biological and conference opinion responds to your request for formal consultation with the Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). Your initial request was dated February 13, 1995. The information necessary to initiate formal consultation, dated March 17, 1995, was prepared by the California Department of Parks and Recreation and was received March 20, 1995. At issue are the effects of the proposed beach access ramp maintenance on the federally endangered California least tern (*Sterna antillarum browni*) and the threatened western snowy plover (*Charadrius alexandrinus nivosus*), and on proposed critical habitat for the western snowy plover.

This biological opinion was prepared using information from the following sources: the information prepared by the Pismo Dunes State Vehicular Recreation Area (Pismo Dunes SVRA) and provided with your letter dated February 13, 1995, requesting formal consultation; the information prepared by Pismo Dunes SVRA and provided with your letter dated March 20, 1995; informal consultation between our staffs; discussions with staff from Pismo Dunes SVRA; and our files.

## Consultation History

The Service provided a draft opinion to the U.S. Army Corps of Engineers (Corps) and Pismo Dunes SVRA on July 31, 1995. Pismo Dunes SVRA provided comments on the draft opinion on September 22, 1995, and met with the Service and the Corps on December 6, 1995, to discuss completion of the consultation.

Biological and Conference Opinion

It is the biological and conference opinion of the Service that the proposed action is not likely to jeopardize the continued existence of the California least tern or the western snowy plover, or result in the adverse modification of proposed critical habitat for the western snowy plover.

Description of the Proposed Action

The Corps proposes to issue a Regional General Permit to Pismo Dunes SVRA for activities associated with the maintenance of two sand ramps. Pismo Dunes SVRA has applied for this permit to maintain recreational access, throughout the year, for users of off-highway vehicles (OHVs), two-wheel drive vehicles, four-wheel drive vehicles, and motorcycles. The sand ramps are located at the western terminus of Grand Avenue in Grover Beach, and at the western terminus of Pier Avenue in Oceano. Pismo Dunes SVRA encompasses beaches and undeveloped dunes from Grand Avenue to approximately two kilometers south of Oso Flaco Creek. These beaches and dunes provide nesting habitat for California least terns; nesting, foraging, and wintering habitat for western snowy plovers; and have been proposed as critical habitat for the western snowy plover.

Maintenance of the sand ramps involves relocation of wind-blown sand from the top, or street end, of the ramp to the bottom, or beach end, of the ramp. Heavy equipment is used to move the wind-blown sand. Maintenance will occur approximately three times per week during the spring, [illegible]e per week during the summer, and once per week during fall and winter. The Corps [illegible]cipates that each maintenance action will move about 100 cubic yards of sand during the spring months and 10 to 50 cubic yards during the remainder of each year. About 75% of the sand will be deposited seaward of the high tide line (+6.8 feet mean lower low water), and the remaining 25% will be deposited above the high tide line. Work is expected to require from one to six hours each time maintenance is performed.

Pismo Dunes SVRA provides a variety of recreational opportunities involving vehicle use. These activities include driving OHVs over the beach and dunes, and car-camping on the beach. The beach within the Pismo Dunes SVRA also provides parking for traditional beach users such as surf fishermen, sunbathers, and people walking dogs. Pismo Dunes SVRA estimates that 70% of visitors require maintained sand ramps to gain access. These users include drivers of two-wheel drive vehicles and users towing trailers. The sand ramps also provide vehicle access to Pismo Dunes SVRA personnel involved in safety, law enforcement, and other management activities. In addition to conducting these activities throughout Pismo Dunes SVRA, these personnel also provide law enforcement and safety services for the portion of Pismo State Beach which extends north from Grand Avenue.

The sand ramp maintenance activities for which Pismo Dunes SVRA is seeking authorization from the Corps therefore enables 70% of Pismo Dunes SVRA visitation, and all management activities requiring the use of vehicles for Pismo Dunes SVRA and Pismo State Beach. The

Corps, Pismo Dunes SVRA, and the Service agree that the proposed action includes these recreational and management activities. Pismo State Beach, Pismo Dunes SVRA, the area open for recreational vehicle use (referred to as the ride area), areas closed to vehicle use, and the locations of the sand ramps are shown on the enclosed map labeled Figure 1.

Maintenance of the sand ramps, and the vehicle use facilitated by that maintenance activity, have occurred for at least the last 50 years without authorization from the Corps (Corps 1995). Several safety and resource management measures have been implemented by Pismo Dunes SVRA during this time. These ongoing measures are described in the information provided with correspondence from the Corps regarding this consultation and are thus considered to be part of the proposed action. These measures include the following:

1. Rules governing recreational activities at Pismo Dunes SVRA include the following:

   a) a speed limit of 15 miles per hour is in effect for the beach and for areas within 50 feet of any camp or group of people;

   b) motor vehicles must stay out of vegetated areas;

   c) camping is allowed only on the open dune areas and beach south of Mile Post 2 and campers are required to pack out all trash (please refer to the enclosed map for the location of Mile Post 2);

   d) OHV use is restricted to the area south of Mile Post 2; all OHVs must be transported to this point before off-loading; and

   e) leash laws for dogs are enforced.

2. Both sand ramps are inspected for nesting sites before any maintenance activities are performed. If nests are found, maintenance is postponed until such activities will not disturb the nests.

3. Beach raking has been discontinued and is not proposed to be resumed.

4. Pismo Dunes SVRA has an active public education and interpretive program designed to educate users and the communities surrounding the Pismo Dunes SVRA regarding the rules governing recreational use and conservation of the area's natural resource values. This program includes use of interpretive signs to delineate restricted areas and distribution of two interpretive publications to each vehicle entering Pismo Dunes SVRA. These publications, The Pismo Dunes Forum and The Green Sticker Vehicle Extra, are also given to local chambers of commerce and numerous OHV groups.

5. Approximately 2000 acres of Pismo Dunes SVRA have been fenced and are managed for

non-motorized vehicle recreational use and resource management. This area includes the beach and dunes south of the southern riding boundary, Oso Flaco Lake and the surrounding dunes, an unquantified number of vegetated areas throughout the OHV riding area, and the coastal dune scrub area inland of the OHV riding area. These areas are shown on the enclosed map labeled Figure 2.

6. Pismo Dunes SVRA implements a western snowy plover and California least tern monitoring and management program during the nesting season. This program includes the following elements:

   a) Western snowy plover and California least tern monitoring efforts include conducting censuses of adult and juvenile birds, locating and monitoring nests, and collecting behavioral observations.

   b) Four large exclosures are established before the start of the western snowy plover nesting season. These exclosures are referred to as North Grand, Dune Preserve or Arroyo Grande Creek, Milepost 8, and South Riding Boundary. Their locations and approximate dimensions are shown on Figure 2. These exclosures are established through placement of interpretive signs and fencing. The North Grand exclosure is outside of Pismo Dunes SVRA and therefore does not provide protection from recreational vehicle use. Rather, this exclosure protects any western snowy plover nests within it from impacts associated with more traditional recreational beach use such as walking and sunbathing. Some of these activities may be pursued in the vicinity of the North Grand exclosure by people who have parked on the beach, and thus have been facilitated by maintenance of the sand ramps.

   c) Individual nest exclosures are constructed around western snowy plover and California least tern nests found outside of the four larger exclosures. Placement of these individual exclosures has been authorized by Permit PDSVRA, issued by the U.S. Fish and Wildlife Service. This permit also specifically describes the materials and methods to be used for constructing the individual nest exclosures.

In addition to continuing the actions described above, Pismo Dunes SVRA has agreed to prepare and implement a western snowy plover and California least tern management plan. The goal of the management plan, as discussed with Pismo Dunes SVRA and the Corps, will be to ensure that existing habitat values for western snowy plovers and California least terns are protected and enhanced within the context of fulfilling the mission of this State Recreation Area to provide vehicular recreational opportunities to the people of California. The plan's long-term management goal will be to achieve sustainable populations of the California least tern and western snowy plover by preserving core areas for these species within Pismo Dunes SVRA (Pismo Dunes SVRA 1995).

Corps, Pismo Dunes SVRA, and the Service have agreed that this management plan should dynamic document that is updated as needed to reflect any new information regarding the use of the Pismo Dunes SVRA by California least terns and western snowy plovers, changes in management techniques and strategies, and the success or failure of individual management measures. The Corps and Pismo Dunes SVRA have also agreed that the management plan and subsequent revisions will be completed in cooperation with the Service. The Service will provide guidance, information as requested, and final approval of the management plan and subsequent revisions.

Effects of the Proposed Action on the Listed Species

**Species Accounts**

Western snowy plover

The Pacific coast population of the western snowy plover was federally listed as threatened on March 5, 1993; a recovery plan has not been prepared. The final rule listing the western snowy plover as threatened describes the biology and reasons for the decline of the coastal population (58 FR 12864). On March 2, 1995, the Service published a proposed designation of critical habitat for the western snowy plover (60 FR 11768). This proposal describes physical and biological attributes that are essential to the conservation of the species, activities that could ersely affect proposed critical habitat areas, and the specific areas proposed to be designated itical habitat. The area identified in this proposed rule as CA-12, Pismo Beach/Nipomo Dunes includes Pismo Dunes SVRA.

For all areas of critical habitat proposed for the western snowy plover, these physical and biological features and primary constituent elements are provided or will be provided by intertidal beaches (between mean low water and mean high tide), associated dune systems, and river estuaries. Important components of the beach/dune/estuarine ecosystem include surf-cast kelp, sparsely vegetated foredunes, interdunal flats, spits, washover areas, blowouts, intertidal flats, salt flats, and flat rocky outcrops. Several of these components (sparse vegetation, salt flats) are mimicked in artificial habitat types used less commonly by snowy plovers (i.e., dredge spoil sites and salt ponds and adjoining levees). Functional suitability of areas containing the features listed above is also contingent upon isolation from human disturbance and predation. These attributes are considered essential to the conservation of the coastal population of the western snowy plover (60 FR 11768).

The western snowy plover is a small shorebird that forages on invertebrates in areas such as intertidal zones and wrack lines, dry sandy areas above the high tide line, salt pans, and the edges of salt marshes. The Pacific coast population nests near tidal waters along the mainland coast and on offshore islands from southern Washington to southern Baja California, Mexico. Most nesting occurs on sand spits and on unvegetated, or moderately vegetated, dune backed beaches. Other less common nesting habitats include salt pans, dredge spoils, and salt pond levees. Nest site

fidelity is common. During the non-breeding season western snowy plovers may remain at breeding sites or may migrate to other locations. Most winter south of Bodega Bay, California, and many birds from the interior population winter on the central and southern coast of California.

The Pacific coast population of the western snowy plover has suffered widespread loss of nesting habitat and has experienced reduced reproductive success at many nesting locations. Factors resulting in loss of nesting habitat include urban development and the encroachment of European beachgrass (*Ammophila arenaria*). Reduced reproductive success is linked to disturbance from human activities. Activities such as walking, jogging, exercising pets, horseback riding, and off-road vehicle use may crush and destroy nests. These activities may also flush adults off nests and away from chicks, and thus interfere with essential incubation and chick rearing behaviors.

Pismo Dunes SVRA lies within a large beach and dune complex which extends from the north end of Pismo State Beach to Mussel Point in Santa Barbara County. This area, frequently referred to as Pismo and Nipomo Dunes, is one of the three largest beach and dune complexes along the central California coast. Censuses conducted during the winter of 1993 and 1994 counted a maximum of 419 wintering and migrating western snowy plovers, and 128 nests were found during the 1994 nesting season within the Pismo and Nipomo Dunes complex (Perry 1994). Western snowy plover nesting has been monitored within Pismo Dunes SVRA for the past three nesting seasons. Pismo Dunes SVRA monitoring methods and results are described in Burton (1993, 1994a, 1994b). Thirty-five nests were estimated in 1992, two of which were observed or presumed to have hatched eggs. In 1993, 5 of the 16 nests found were believed to have hatched eggs. Thirty-three nests were detected in 1994, 11 of which were either observed or presumed to have hatched eggs. In 1995, 31 nests were found, with 10 of these hatching eggs. Nesting season counts of adults, juveniles, and chicks are not provided in these reports. Late season counts taken in 1994 and 1995 tallied 117 and 110 western snowy plovers, respectively.

California least tern

The California least tern was federally listed as endangered in 1970. Details of the life history, biology, and reasons for decline of the California least tern are contained in the recovery plan for this species (Service 1980). A more recent discussion of the biology, distribution, and status of the California least tern is found in Fancher (1992).

The California least tern is a migratory seabird that winters in Mexico and Central America, and nests colonially along the coast of California and Baja California, Mexico. Historically, California least terns nested primarily on sandy beach, dune, and sand spit areas. California least terns forage on small fish from nearshore waters, estuaries, bays, and coastal lakes. Proximity to foraging areas is thought to be an important attribute of nesting areas. Of the 42 California least tern nesting colonies identified in California since 1978, 32 are located in the Southern California Bight, 20 of which are found in San Diego County. Ten nesting colonies have been identified north of Point Conception; five of these are in northern Santa Barbara and southern San Luis Obispo Counties, and five are in San Francisco Bay.

espread loss of nesting habitat, introduction and concentration of urban-adapted predators, disruption of foraging areas are the primary factors contributing to the decline of this species. Recovery efforts initially focused on securing nesting sites. Current recovery efforts emphasize management of the remaining nesting areas, especially with respect to minimizing human induced disturbance and controlling predation on California least tern colonies.

The nesting colonies in northern Santa Barbara and southern San Luis Obispo Counties constitute a relatively small portion of the state-wide population. However, they represent the only currently active nesting areas between Point Conception and San Francisco Bay, and are characterized as Key Habitat Units, defined as major areas of importance for recovery of this species, in the California Least Tern Recovery Plan. The Oso Flaco Lake area is identified as one of these Key Habitat Units. The Service is unaware of data indicating California least terns nested within Pismo Dunes SVRA prior to 1990. The degree to which the lack of data reflects an absence of nesting California least terns within the Pismo Dunes SVRA prior to 1990, or the extent to which the lack of data is an artifact of survey effort is unknown. Information regarding survey methods and results within Pismo Dunes SVRA since 1990 can be found in Dougherty (1990) and Burton (1991, 1993, 1994a, and 1994b). Nest numbers detected each season since 1990 have ranged from zero to six, and numbers of fledglings produced has ranged from zero to four. These nests have been dispersed throughout the dunes within the Pismo Dunes SVRA.

**Analysis of Effects**

enance of the sand ramps and the resulting use of vehicles within California least tern and western snowy plover habitat could adversely affect individuals of both of these species. These adverse effects could result in both direct and indirect take of California least tern and western snowy plover adults, chicks, and eggs.

Maintenance of Sand Ramps

Pismo Dunes SVRA will continue to avoid conducting sand ramp maintenance activities when disturbance to western snowy plovers nesting on or in the immediate vicinity would occur. Consequently, these activities are not expected to result in take of nesting western snowy plovers or their nests. However, western snowy plover chicks and non-nesting western snowy plovers could be crushed or buried as sand is moved by heavy equipment from the ramp to the beach. These activities and the associated noise could also disturb foraging and roosting western snowy plovers in the immediate vicinity of the sand ramps. In some instances such disturbance is expected to temporarily flush western snowy plovers and result in only minor harassment. In other cases such disturbance could interfere with the metabolism and thermoregulation of western snowy plover chicks and migrating or wintering adults such that starvation results, or such that egg production is impaired during the subsequent nesting season. However, available information regarding the energetics of western snowy plovers is inadequate to assess the likelihood that such harm would result. Expansion of the temporal avoidance measures already being implemented by Pismo Dunes SVRA to include postponement of maintenance activities until potentially

energetically stressed western snowy plovers are absent from the immediate vicinity of the sand ramps could avoid this impact.

The proposed redistribution of wind-blown sand will maintain sand ramps that were existing at the time Pismo Dunes SVRA was proposed as critical habitat for the western snowy plover. No new structures or changes in beach topography or character are proposed. Also, the maintenance activities will not involve imported materials or degradation of the native beach sand. As a result, these activities are not expected to result in adverse modification of proposed critical habitat for the western snowy plover.

The habitat in the vicinity of the sand ramps appears to be unsuitable for California least tern nesting, and no California least terns are known to have nested on this portion of the Pismo Dunes SVRA. Consequently, adverse effects to California least terns resulting from the maintenance activities are not expected.

Vehicle Use Within the Ride Area

As discussed in the description of the proposed action, impacts associated with the 70% of the vehicles using Pismo Dunes SVRA that require maintained sand ramps are considered in this biological opinion. The impacts associated with the 30% of vehicles that do not require maintained sand ramps to gain access to Pismo Dunes SVRA are identical to those associated with the 70% that do. As a result, it is infeasible to determine which impacts result from the vehicles requiring maintained sand ramps, which impacts result from recreational activities facilitated by the access provided by maintained sand ramps, and which impacts result from vehicle use and recreational activities that can, or do occur independently of maintained sand ramps. To avoid confusion, the Corps, Pismo Dunes SVRA, and the Service have agreed to address impacts associated with all vehicle use and associated recreational activities in this biological opinion.

Western snowy plover and California least tern nests that are established outside protected areas could be crushed by vehicles before they are detected or before individual nest exclosures can be constructed. Similarly, recreational activities facilitated by vehicle access to the beach, such as camping, sunbathing, and walking, could directly destroy western snowy plover and California least tern nests before they can be protected. Measures are available to reduce the likelihood of direct nest loss from crushing. Such measures include increasing, or better distributing through time, efforts to locate and protect nests. Also, the management plan will provide a means of evaluating and improving the effectiveness of the larger exclosures to minimize nest loss.

California least tern and western snowy plover nest loss could occur as a result of repeated disturbance of incubating adults. Continued or frequent disturbance could cause nests to be abandoned, or could interfere with incubation such that eggs become buried by sand or fail to hatch because of exposure to cold. Disturbance of incubating western snowy plovers and California least terns could result from vehicle use near nests, and from other types of recreational

facilitated by vehicle access to Pismo Dunes SVRA such as camping, sunbathing, and surf fishing.

The recreational use of Pismo Dunes SVRA facilitated by vehicle access could increase the number of scavenging species that also prey on western snowy plover and California least tern nests. For example, trash left on the beach could attract American crows, gulls, coyotes, and other opportunistic predators. Increased use of the beach by such predators would be expected to increase the predation pressure on nesting California least terns and western snowy plovers. Pismo Dunes SVRA already reduces this threat by requiring all campers to pack out their trash, providing covered trash receptacles, and by picking up trash left on the beach .

Vehicle use on the beach and dunes, and the other recreational activities facilitated by vehicle access, could result in mortality of western snowy plovers and California least terns. Biologists studying western snowy plovers and piping plovers, a behaviorally and ecologically similar species found on the east coast, have noted that adults of these species appear unresponsive to approaching vehicles until the vehicles are almost upon the plover (Persons 1995, Flemming 1988). The lack of a flight response to oncoming vehicles may increase the risk that western snowy plovers will be struck or crushed by vehicles, especially vehicles moving at faster speeds.

The Service is not aware of any information regarding the response of adult western snowy plovers to vehicles at night. However, in 1993 two adult western snowy plovers were crushed by terrain vehicles conducting safety patrols on the beaches of Vandenberg Air Force Base at night. Adult California least terns are expected to flush in response to oncoming vehicles; thus the risk of direct injury or mortality from collisions with vehicles is likely to be low. As with adult western snowy plovers, the Service is not aware of any information regarding the response of nesting or roosting California least terns to vehicles at night. Measures available to reduce the risk of vehicles striking or running over adult western snowy plovers include establishment and enforcement of speed limits. Speed limits are already in effect for portions of Pismo Dunes SVRA. Any impacts to western snowy plovers and California least terns associated with vehicle activity as night can be addressed through the management plan.

A common response of both western snowy plover and California least tern chicks to threat or disturbance is to stand or lie motionless on the sand. This behavior, combined with the cryptic coloration of California least tern and western snowy plover chicks, can render avoidance difficult. People moving through habitat quickly, such as vehicle drivers, or individuals untrained and unpracticed in detecting the chicks of these species, are unlikely to see and avoid running over or stepping on California least tern and western snowy plover chicks. As a result, western snowy plover and California least tern chicks within areas open to recreational use could be crushed. Plover chicks may also become trapped in tire tracks which could reduce the opportunity to escape threats (Melvin 1994).

California least tern chicks are semi-precocial, are fed by their parents, and fledge in about 22 d California least tern chicks remain in the nest for a day or two after hatching and then begin

move around the area. Depending on the extent of the protected area around each nest, the location of the nest relative to other protected areas, and the behavior of the individual California least tern broods, the exclosures used to protect nests may also afford protection to California least tern chicks. However, monitors at Pismo Dunes SVRA have observed California least tern chicks outside of protective exclosures in the ride area (Burton 1991).

The precocial nature of western snowy plover chicks increases the likelihood, relative to California least tern chicks, that they will be crushed by vehicles using the beach and dunes. Western snowy plover chicks can leave the nest to forage within a few hours after hatching. Fledging occurs about 31 days after hatching, and broods rarely remain in the immediate vicinity of the nest during that time. As a result, the flightless chicks are likely to leave the confines of protective exclosures rendering them vulnerable to vehicle traffic for most of the period between hatching and fledging. Western snowy plover chicks have been observed, and one dead chick has been found, in the riding area (Burton 1993).

The locations where western snowy plover chicks forage at Pismo Dunes SVRA are not known. However, the Service's observations of western snowy plover chicks in other areas of their range indicate that they frequently, and may prefer to, forage on the invertebrates associated with surf-cast kelp along the wrack line. None of the protected areas within Pismo Dunes SVRA encompass this type of habitat, and the portion of the wrack line that is partially protected (south of the ride area but open to other types of recreational use) is not contiguous with any of the er exclosures. Consequently, western snowy plovers and their chicks must traverse areas ject to recreational vehicle use to reach this habitat, and remain vulnerable to vehicle traffic while foraging.

The types of recreational activities that could disturb nesting western snowy plovers and California least terns could also disturb brooding western snowy plovers, California least terns, and their chicks. Such harassment could cause or contribute to chick mortality by interfering with essential chick rearing behaviors or by causing intolerable stresses directly to the chicks. For example, disturbance that interferes with foraging could result in the starvation of western snowy plover chicks. Lethal exposure to wind and cold temperatures could result from disturbance that interferes with brooding by western snowy plover and California least tern adults.

Little information is available regarding western snowy plover chick survival to the fledgling stage within Pismo Dunes SVRA. Fledgling counts have been used as an indicator of fledging rates; 38 and 26 fledglings were counted late in the 1993 and 1994 nesting seasons, respectively (Burton 1994a, 1994b). However, unless chicks are banded to identify their natal site, fledgling counts are not reliable estimators of recruitment from a particular area, and the utility of such data as indicators of geographically specific fledging rates decreases as the season progresses.

In the absence of data regarding chick survival, fledging rates, and the interactions between western snowy plover chicks and vehicles, the Service is unable to assess the extent to which take of western snowy plover chicks may be occurring as a result of vehicle use. We are therefore

able to fully evaluate the impacts of Pismo Dunes SVRA management on recruitment into the population. If management measures enhance hatch rates but none of the chicks are recruited into the population, Pismo Dunes SVRA could be functioning as a population sink. Alternatively, high hatch rates coupled with high fledge rates could render Pismo Dunes SVRA a source area for the population. These two scenarios have radically different implications regarding the effects Pismo Dunes SVRA management practices may have on the conservation and recovery of the western snowy plover. Pismo Dunes SVRA has agreed to address this issue through appropriate study and subsequent management actions if needed. Development of studies and implementation of appropriate management actions will be coordinated through the management plan. HMP

The California least tern fledgling counts described in monitoring reports for Pismo Dunes SVRA provide useful estimates of fledging rates (Burton 1991, 1993, 1994a, and 1994b). However, the variation in both hatch rates and fledging rates across years precludes conclusions regarding the effects of recreation and resource management practices on recruitment into the California least tern population from Pismo Dunes SVRA.

As described in the discussion of the potential impacts of maintenance activities, disturbance to migrating and wintering western snowy plovers could interfere with metabolism and thermoregulation such that starvation results, or egg production is impaired during the subsequent nesting season. Potential sources of such disturbance include camping, walking, unleashed dogs, riding of horses, vehicle use, and other recreational activities requiring or facilitated by vehicle ess.

Vehicle Use Outside the Ride Area

Vehicle use outside of the ride area could have many of the same impacts on western snowy plovers and California least terns as vehicle use within the ride area. These adverse effects include destruction of nests, interference with incubation, running over chicks and adults, disturbing brooding and foraging behaviors, and disturbing energetically stressed western snowy plovers. These impacts are described in more detail above. Measures are available to avoid most of these impacts and to minimize those that remain. These measures include restricting vehicles to the hard-packed wet sand, or as close as possible to the hard-packed wet sand during high tides, instituting a speed limit, and ensuring that all personnel driving vehicles are trained to recognize and avoid western snowy plovers.

The Service believes that the impacts described above are not likely to jeopardize the continued existence of the western snowy plover or the California least tern, or result in the adverse modification of proposed critical habitat for the western snowy plover. We present this conclusion for the following reasons:

1. Pismo Dunes SVRA will continue to implement measures that reduce impacts to nesting western snowy plovers and California least terns. Pismo Dunes SVRA will also develop and implement a management plan that will improve the effectiveness of ongoing western

snowy plover and California least tern conservation efforts. Through this management plan, potential impacts to western snowy plovers and California least terns will be assessed and mitigated if appropriate.

2. The existing condition of western snowy plover habitat within the project area is not expected to be degraded further by the continuation of those portions of the proposed action that have been ongoing. Those aspects of the proposed action that are new, such as development and implementation of the management plan, will improve the quality of western snowy plover habitat within Pismo Dunes SVRA.

Cumulative Effects

Cumulative effects are those impacts of future State and private actions that are reasonably certain to occur in the project area. Future Federal actions will be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project.

The Service is aware of other projects currently approved or under review by other State, county, or local authorities that may adversely affect western snowy plovers and California least terns. These projects involve coastal access, development, and other potential sources of disturbance to western snowy plovers and California least terns. The impacts of most of these projects on the survival and recovery of the western snowy plover and California least tern will be addressed through the section 10(a)(1)(B) permit process. We do not anticipate that the sand ramp maintenance and the resulting vehicle access, considered together with those non-federal actions, would significantly impair the survival or recovery of western snowy plovers and California least terns.

Incidental Take

Section 9 of the Endangered Species Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this incidental take statement. The measures described below as reasonable and prudent measures and terms and conditions to reduce take are non-discretionary, and must be undertaken by the agency or made a binding condition of any grant or permit, as appropriate.

The Service anticipates the following forms of take:

1. Three (3) western snowy plover nests per year, including all eggs therein, in the form of direct mortality through crushing as a result of vehicle use or recreational activities facilitated by vehicle access; or in the form of indirect mortality through abandonment, inadequate incubation, or burial by sand as a result of disturbance associated with vehicle use or recreational activities facilitated by vehicle access. The Service estimates that this taking would affect a maximum of nine (9) eggs.

2. Three (3) western snowy plover chicks per year in the form of direct mortality through crushing as a result of vehicle use or recreational activities facilitated by vehicle access.

3. One (1) western snowy plover adult per year in the form of direct mortality through crushing as a result of vehicle use or recreational activities facilitated by vehicle access.

4. All western snowy plover broods and the attending adults in the form of harassment by flushing broods out of suitable habitat, by interfering with foraging, or by interfering with distraction behaviors or other essential chick rearing behaviors.

5. One (1) California least tern nest per year, including all eggs therein, in the form of direct mortality through crushing as a result of vehicle use or recreational activities facilitated by vehicle access; or in the form of indirect mortality through abandonment, inadequate incubation, or burial by sand as a result of disturbance associated with vehicle use or recreational activities facilitated by vehicle access. The Service estimates that this taking would affect a maximum of three (3) eggs.

6. One (1) California least tern chick or adult per year in the form of direct mortality through crushing as a result of vehicle use or recreational activities facilitated by vehicle access.

7. One (1) California least tern brood and the attending adults per year when total nests equal five or less, or two (2) broods and the attending adults per year when total nests equal six or more, in the form of harassment by flushing broods out of suitable habitat, by interfering with foraging, or by interfering with defensive behaviors or other essential chick rearing behaviors. The Service estimates that this taking would affect a maximum of either three chicks and two adults or six chicks and four adults yearly.

This biological opinion does not exempt from the prohibitions of section 9 of the Act any form of take that is not incidental to vehicle use or recreational activities facilitated by vehicle access in accordance with the project description provided by the Corps and Pismo Dunes SVRA.

If the incidental take anticipated by this biological opinion is met, the Corps shall immediately notify the Service in writing. If the incidental take anticipated by this biological opinion is exceeded, the Corps shall notify Pismo Dunes SVRA to immediately cease the activity resulting in

take and shall reinitiate formal consultation with the Service.

**Reasonable and Prudent Measures**

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize incidental take:

1. Maintenance of the sand ramps shall occur when the maintenance activities will not result in the destruction of western snowy plover nests, or disturbance to western snowy plover chicks and adults.

2. Direct and indirect take of the nests, chicks, and adults of western snowy plovers and California least terns shall be minimized by enforcing existing rules governing recreational activity within Pismo Dunes SVRA, by establishing protected areas in anticipated and observed western snowy plover and California least tern nesting areas, and by establishing rules governing the use of vehicles by Pismo Dunes SVRA personnel on the beach outside the ride area.

3. A management plan shall be developed to assess, avoid, and mitigate if appropriate, potential sources of take of western snowy plovers and California least terns, and to improve the effectiveness of existing western snowy plover and California least tern protection measures.

**Terms and Conditions**

In order to be exempt from the prohibitions of section 9 of the Act, the Corps is responsible for compliance with the following terms and conditions which implement the reasonable and prudent measures described above. Terms and conditions 1, 2a through 2e, 3a through 3d, and 3f through 3i were contained in Pismo Dunes SVRA's original description of the proposed action, or were developed with the Corps and Pismo Dunes SVRA during consultation, and are modified herein by the Service.

1. To implement reasonable and prudent measure number 1, the following term and condition is established:

   On the day that sand ramp maintenance activities are scheduled, the sand ramps and surrounding area shall be surveyed for western snowy plover nests and chicks throughout the nesting season (March 1 through September 30). If western snowy plover nests or chicks are found, maintenance shall be postponed until the nest has hatched, or disappeared, and the chicks have left the area. These surveys shall be conducted by a qualified monitor with experience locating and monitoring western snowy plover nests and chicks. This monitor shall have the authority to determine the limits of the area around each sand ramp to be surveyed, and when maintenance activities may proceed.

To implement reasonable and prudent measure number 2, the following terms and conditions are established:

a. Four large, fenced exclosures shall be constructed prior to the western snowy plover nesting season. These exclosures shall be placed in the locations depicted, and, unless unpredictable natural conditions necessitate modifications, be no smaller than the dimensions described, on the enclosed map labeled Figure 2. These exclosures shall remain in place until after the conclusion of the western snowy plover nesting season.

b. Pismo Dunes SVRA shall be searched for western snowy plover and California least tern nests throughout the nesting season. Individual nest exclosures shall be constructed around all California least tern nests located outside of the exclosures described. Individual exclosures shall be constructed around all western snowy plover nests within the ride area under all circumstances and outside the ride area when the area is used by more than several people for nonvehicle recreation on a regular basis. Whether or not it is appropriate to construct individual exclosures for western snowy plover nests in other areas within Pismo Dunes SVRA outside the ride area and which receive little nonvehicle recreational use shall be evaluated on a case by case basis. A protocol for construction of exclosures in these areas shall be part of the resource management plan. The individual nest exclosures shall be constructed as specified by Service Permit PDSVRA.

c. A minimum of 2000 acres of Pismo Dunes SVRA shall be fenced and managed for non-motorized vehicle recreational use and resource management. This acreage shall include the area depicted on Figure 2.

d. Pismo Dunes SVRA shall continue to enforce the following rules governing recreational beach use:

(1) Vehicles shall not travel at speeds in excess of 15 miles per hour on the beach.

(2) Motor vehicles shall stay out of vegetated areas and exclosures.

(3) Camping shall be allowed only on the open dune areas and beach south of Mile Post 2. Campers shall pack out all trash.

(4) OHV use shall be restricted to the area south of Mile Post 2; all OHVs shall be transported to this point before off-loading.

(5) Leash laws for dogs shall be enforced; during western snowy plover breeding season, all dogs shall be leashed when on dry sand.

e. To enhance compliance with the western snowy plover and California least tern protection measures, Pismo Dunes SVRA shall continue the ongoing public education and interpretation program. This program shall include distribution of educational materials, placement of interpretive signs, and outreach to the surrounding community and user groups. These efforts shall emphasize the biology and status of the western snowy plover and California least tern, and the importance of complying with the rules that provide protection to these species.

f. Pismo Dunes SVRA vehicles used for routine enforcement and management activities outside of the ride area shall be restricted to the hard-packed wet sand, or shall stay as close to the wet sand as possible during high tides, and shall avoid driving along the wrack line if possible. All Pismo Dunes SVRA personnel engaged in such activities within or outside of the ride area shall be trained to recognize California least tern and western snowy plover adults and chicks, and shall be provided with instruction regarding the measures implemented by Pismo Dunes SVRA to protect these species. Such instruction shall include the following elements:

(1) a description of the Endangered Species Act and the prohibitions against take contained within section 9 of the Act;

(2) a description of California least tern and western snowy plover use of Pismo Dunes SVRA's beaches and dunes; and

(3) a discussion of the relevant parts of this biological opinion.

3. To implement reasonable measure number 3, the following terms and conditions are established:

a. Pismo Dunes SVRA shall prepare and implement a management plan to guide monitoring, research, and management measures for western snowy plovers and California least terns. The goal of the management plan shall be to enhance the quality of western snowy plover and California least tern habitat within Pismo Dunes SVRA.

b. The management plan shall include a western snowy plover and California least tern monitoring protocol that addresses the following:

(1) The methods to be used to locate and monitor western snowy plover and California least tern nests, including the frequency with which each portion of Pismo Dunes SVRA is to be surveyed, shall be specified. Surveys of each area shall be evenly distributed through time until the data collected indicate a different strategy is appropriate. *A priori* criteria for determining

the fate of each nest shall be described. The data to be collected during the nest monitoring effort shall be described, and shall include information regarding the location of each nest, and the proximity of each nest to large protected areas, vegetated areas, the wrack line, and other relevant features of the habitat.

(2) The frequency with which western snowy plover adults, juveniles, and chicks are to be counted and the census techniques to be used shall be specified. Censuses shall occur throughout the nesting season. And,

(3) Interim reporting requirements shall be specified. Copies of interim reports shall be provided to the Service for at least the first year.

c. The management plan shall include a plan for assessing California least tern and western snowy plover chick survival and recruitment into western snowy plover and California least tern populations from Pismo Dunes SVRA. This plan may consist of soliciting research proposals, may specify a specific course of research to be conducted, or may propose other methods to ensure that an appropriately designed study is developed and conducted. In the case of California least terns, the monitoring protocol required by item 3.b.1 may be sufficient. In subsequent years, the management plan shall be revised to provide for implementation of measures determined to be necessary as a result of information produced by the study of chick survival.

d. The management plan shall provide for the assessment, and enhancement, if appropriate, of western snowy plover and California least tern habitat south of the ride area. This assessment shall include an examination of existing recreational use, including horseback riding and hiking, and the associated impacts to western snowy plovers and California least terns, and an evaluation of individual nest exclosures as potential attractants for avian predators.

e. The management plan shall provide for the study of the responses of western snowy plovers and California least terns to vehicle activity at night. In subsequent years, the management plan shall provide for the implementation of measures determined to be appropriate as a result of information produced by this study.

f. The management plan shall describe all other Pismo Dunes SVRA management activities that may be of consequence to western snowy plovers and California least terns and shall evaluate the potential benefits or impacts of these activities to these species. Management activities to be addressed include activities associated with monitoring other natural resources in western snowy plover and California least tern habitat, the ongoing revegetation program, and the type and maintenance of trash receptacles on and near the beach.

g. The management plan shall enumerate and describe all management actions to be implemented to benefit western snowy plovers and California least terns within the coming calendar year. The dates each action is to occur, or be initiated, shall be specified. The management plan shall also identify any actions that are anticipated to be implemented in the future, but will not be initiated in the coming calendar year. Target implementation dates shall be provided for those future actions. Implementation of items 3.e. and 3.f. above may be included among these future actions.

h. The management plan shall provide a summary, and assess the effectiveness, of western snowy plover and California least tern management actions implemented in the previous year including all monitoring and research efforts. Copies of full monitoring and research reports shall be provided to the Service under separate cover prior to submittal of the management plan or shall be included as appendices to the management plan.

i. A draft and final management plan shall be provided to the Service for review and approval by February 1 and March 1, 1996, respectively. The plan shall be updated annually until the Service and Pismo Dunes SVRA agree that less frequent updates are adequate. Updated plans shall be provided to the Service for review and approval by November 1 of each successive year until annual updates are discontinued.

**Disposition of Sick, Injured, or Dead Specimens**

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Service's Division of Law Enforcement in Torrance, California, at (310) 297-0062, and to the Ventura Field Office at (805) 644-1766. Written notification must be made within five calendar days and include the date, time, and location of the discovery of the animal, and any other pertinent information. The notification shall be sent to the Service's Torrance office with a copy to the Ventura Field Office. Dead animals and crushed eggs may be marked in an appropriate manner, photographed, and left on-site. Injured animals should be transported to a qualified veterinarian. The Service must be contacted regarding the final disposition of any such animals prior to effecting the final disposition.

Conservation Recommendations

In furtherance of the purposes of sections 2(c) and 7(a)(1) of the Act that mandate Federal agencies to utilize their authorities to carry out programs for the conservation of listed species, we recommend that the Corps encourage Pismo Dunes SVRA to implement the following actions:

1. Pismo Dunes SVRA should expand efforts to conserve nesting western snowy plovers and California least terns by increasing the size and numbers of areas in which recreational

activities are prohibited during the nesting season. The increases in protected areas that should be considered include the following:

a. expansion of the North Grand, Dune Preserve, and Milepost 8 exclosures to the water;

b. expansion of the Milepost 8 exclosure to be contiguous with the South Riding Boundary exclosure and the protected area south of the riding area;

c. expansion of the Dune Preserve exclosure to the southern boundary of the Dune Preserve and to include an equal area to the north of Arroyo Grande Creek;

d. establishment of one or more additional exclosures north of Pier Avenue; and

e. maintenance of exclosures throughout the year to provide undisturbed areas for migrating and wintering western snowy plovers.

2. Pismo Dunes SVRA should continue to provide State leadership for efforts to develop a Habitat Conservation Plan for the whole of the Pismo and Nipomo Dunes.

3. The management plan required by terms and conditions 3.a through 3.i should address the conservation needs of all the sensitive habitats and species within Pismo Dunes SVRA in a comprehensive and integrated manner. The plan should specifically address the needs of candidate species, and should provide for regular surveys for candidate plants.

The Service requests notification of the implementation of any conservation recommendations so we can be kept informed of actions that either minimize or avoid adverse effects, or that benefit listed species or their habitats.

Conclusion

This concludes formal consultation and conference on the maintenance of sand ramps and the associated use of vehicles on the beaches and dunes within Pismo Dunes SVRA. You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if critical habitat for the western snowy plover is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary. After designation of critical habitat for the western snowy plover and subsequent adoption of this conference opinion, reinitiation of formal consultation is required if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion; 3) the agency action is subsequently modified in a

manner that causes an effect to a listed species or critical habitat that was not considered in this biological opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action (50 CFR 402.16). Any questions or comments should be directed to Trudy Ingram of the Service's Ventura Field Office at (805) 644-1766.

Sincerely,

Diane K. Noda

Diane K. Noda
Field Supervisor

Enclosure

# Appendix D:

## Habitat Monitoring System, Oceano Dunes SVRA

# HABITAT MONITORING SYSTEM
# OCEANO DUNES SVRA

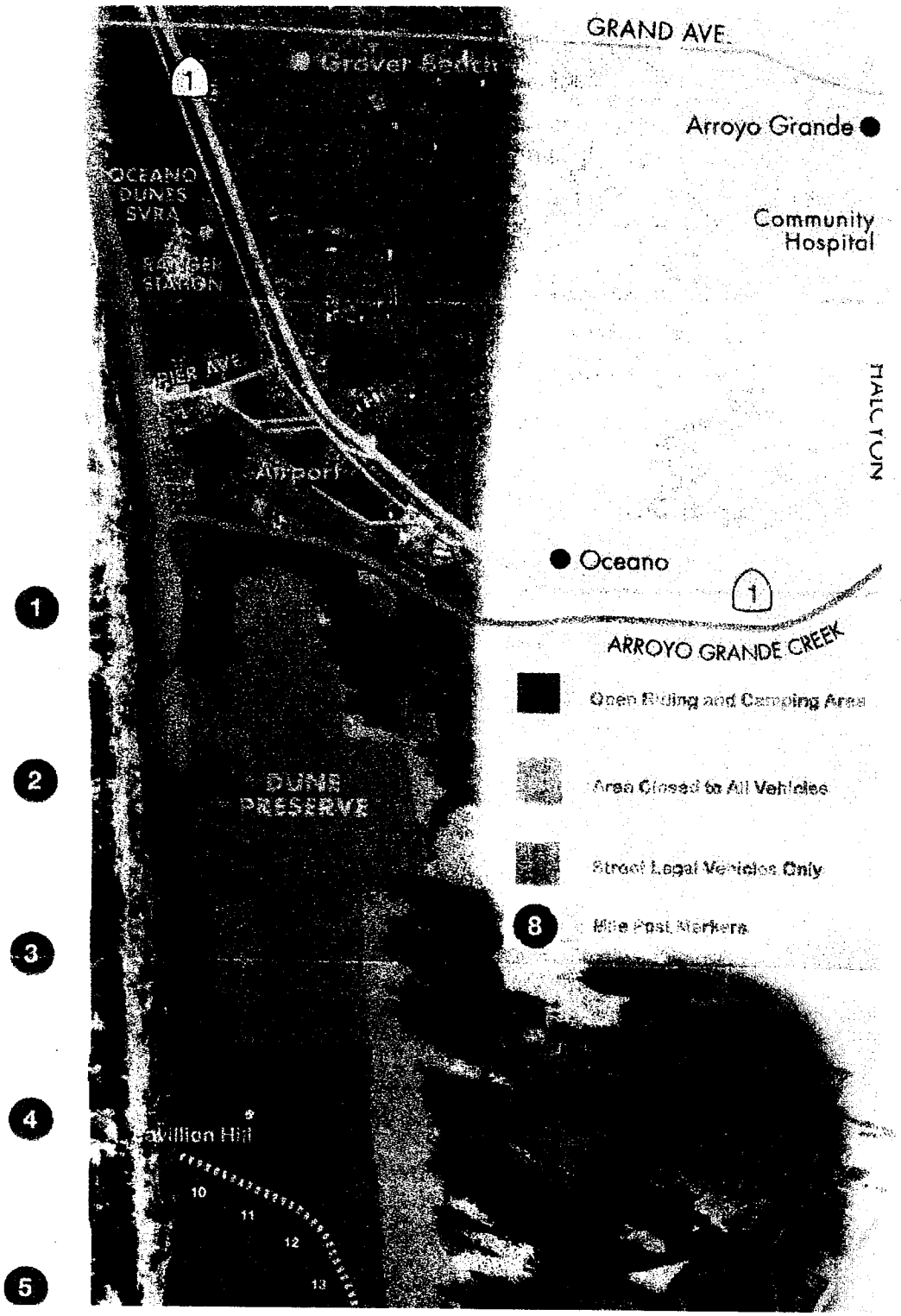
## OFF HIGHWAY MOTOR VEHICLE RECREATION DIVISION

## DEPARTMENT OF PARKS AND RECREATION

September 24, 1997

Approval

Clifford R. Glidden
Deputy Director, Dept. Parks and Recreation
OHMVRD


GRAND AVE.
Grover Beach
Arroyo Grande
Community Hospital
OCEANO DUNES SVRA
RANGER STATION
PIER AVE.
Airport
Oceano
1
ARROYO GRANDE CREEK
Open Riding and Camping Area
Area Closed to All Vehicles
Street Legal Vehicles Only
Mile Post Markers
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# GENERAL INTRODUCTION

Since the establishment of State Vehicular Recreation Areas (SVRAs) devoted primarily to vehicular recreation, the California Department of Parks and Recreation (CDPR) has managed these units in accordance with the Department's Resource Management Directives (CDPR 1979). These directives outline the policies by which the Department carries out its resource stewardship mission: to make every reasonable effort to protect and pass on, unimpaired, the resources entrusted to the Department. The Resource Management Directives require the Division to: protect against accelerated erosion, promptly rehabilitate severely eroded lands, limit areas utilized for unrestricted Off-Highway Vehicle (OHV) recreation, and protect its lands from significant ecological damage or deterioration. Specific biological provisions outline management programs designed to work with the natural processes of vegetation succession, to control the spread of noxious and invasive weeds, and to protect the natural wildlife habitat.

The founding of the State Park Off-Highway Motor Vehicle Recreation Division (OHMVRD) was in response to demand from OHV enthusiasts for increased opportunities, their willingness to support a state sponsored off-highway vehicle recreation program, and environmental concerns related to this recreational activity. Legislative mandates passed in 1987 (Garamendi 1987) required the Division to establish both soil loss standards and wildlife habitat protection programs for each of the SVRAs. These programs are the cornerstone of the OHV Program's resource management effort. Wildlife habitat monitoring within areas under the jurisdiction of the California State Parks is also a part of the Department's Performance Based Budgeting goals. This document and the plan which it describes is principally focused on wildlife habitat monitoring. Soil loss standards and monitoring are addressed in the "Soil Conservation Guidelines/Standards for Off-Highway Vehicle Recreation Management" document.

Natural ecosystems and the wildlife habitats of which they are comprised are a complex interaction of both abiotic, biotic, socio-cultural, and management practices. Abiotic components include amongst others climate, storm events, hydrology, soils, geologic processes, and wildfire. Biotic components encompass the flora and fauna of the area. Socio-cultural components are typically viewed as representing human impacts on the quality of air, water and soil; as well as visitor use, and development outside State Park lands. Management practices may include development on State Park lands, prescribed burning, managed grazing, soil stabilization, revegetation, manipulating composition of vegetative species, and rest.

Due to the varied nature and complexity of these many factors, the scientific community's level of understanding is in a continual state of growth and refinement. Similarly, the techniques utilized to monitor the "health" of an ecosystem are typically complex, not necessarily standardized and also in a continual state of refinement. Therefore, this Habitat Monitoring System (HMS) has been developed in a manner emphasizing a broad range of scientifically accepted techniques and measures which are appropriate for the unique habitats found within the SVRA's of the California Off-Highway Motor Vehicle Recreation Division. In order to keep

pace with this evolving science, resource specialists will continually review protocols and make refinements, thereby improving both the effectiveness and precision of this program.

## PAST MONITORING

**Baseline Studies**

In accordance with the Off-Highway Motor Vehicle Recreation Act of 1987 (Garamendi 1987) a detailed wildlife and habitat inventory and monitoring plan was developed for each SVRA Unit. This work was conducted by Dr. Michael Kutilek from San Jose State University for Carnegie, Hollister Hills, Hungry Valley, Oceano Dunes, and Ocotillo Wells State Vehicular Recreation Areas between 1989 and 1991 (Kutilek *et al.* 1991). Dr. Daniel Anderson from the University of California Davis, completed work for Prairie City SVRA in 1993 (Anderson and Hogan 1993). These reports gave a thorough base-line inventory of the units and recommended future monitoring procedures and strategies. Parameters measured in these inventories included vegetation and abundance of small and large mammals, reptiles, amphibians, and birds. Monitoring plots were established in OHV riding areas and areas protected from OHV recreation (controls) in every major plant community or habitat type found in the units. In this way, a valid comparison could be made of the effect of OHV recreation on the habitat regardless of changes in weather (drought, temperatures, etc.) or natural episodic wildlife population fluctuations. Depending on the size of the individual park units and the number of different vegetation communities, a high of 99 monitoring stations (Hungry Valley) and a low of 21 monitoring stations (Prairie City) were established and inventoried.

The primary recommended means for continued habitat monitoring was to compare detailed aerial photography of each of the SVRA Units every two years. This was seen as the most economical and practical way to identify changes in vegetation cover, density, and any increase of bare ground and disturbance associated with OHV recreation. Continued vegetation monitoring was recommended on a smaller subset of monitoring stations in order to provide detailed information about changes in cover and diversity of undergrowth species and changes in species diversity and vigor.

The optimum time for field monitoring is during the active part of the growing season. It is during this time that the animals are most active. In the desert (Ocotillo Wells) this can be as early as February. Monitoring temperate coastal areas like Oceano Dunes can begin as early as March depending on average winter temperatures. Typically, low elevation sites in central California (Hollister Hills, Carnegie, Prairie City) need to be monitored in late April and early May. Higher elevation sites like Hungry Valley should be monitored in late May or early June.

From a management standpoint, it was also recommended that accurate monthly records be kept of the number of vehicles and visitors that use each park. In this way, any changes or trends in the use of OHVs or in the use of different areas of the SVRA unit could be documented. These trends might then be correlated with trends in the diversity and abundance of vegetation and wildlife. In addition, it was determined that records of local weather variables (temperature,

precipitation, etc.) could prove valuable in further understanding observed trends in plant and animal abundance and health.

**Focused Studies and Monitoring**

In addition to the initial baseline work performed by Kutilek and Anderson, a number of focused studies and associated monitoring have been performed at the various SVRAs. Although much of this work has been an outgrowth of these initial studies and their recommendations, an even greater amount has originated from needs which have been identified by the Off-Highway Motor Vehicle Recreation Division's resources staff. These focused studies represent all aspects of park unit planning and management and include environmental impact reports, masters theses, inventories of sensitive and threatened plants and animals, and studies of the impacts of OHVs on biotic and abiotic resources. The most obvious studies of this type have been those initiated for species of special concern. Some examples of these studies follow. (For copies of the various focused studies please refer to each District.)

Each of the Division's SVRAs have general development and management plans and/or Environmental Impact Reports (EIR) associated either with the initial plans or proposed park acquisition/expansion plans: Oceano Dunes (CDPR 1975, CDPR 1978b), Hollister Hills (CDPR 1978a, CDPR 1988, Harvey & Associates 1989, LSA 1996), Hungry Valley (CDPR 1981, 1982a), Carnegie (San Joaquin County 1976, CDPR 1982b), Ocotillo Wells (CDPR 1982c, CDPR 1986), and Prairie City (ECOS, Inc. 1991, CDPR 1991a).

Early in the development of Carnegie SVRA the Department of Parks and Recreation (CDPR 1980) inventoried the plant communities and the rare and endangered plants and animals. In 1989 the Division contracted with Dr. Michael Barbour at the University of California, Davis to study the oak woodland and other plant communities at Carnegie and recommend management procedures (Barbour *et al.* 1990). Recently, a focused survey of the California red-legged frog and tiger salamander was conducted at both Carnegie and Hollister Hills SVRA's (Wone and Beauchamp 1995a,b). Hollister Hills SVRA is the site of two important OHV/wildlife impact studies: a comparison of low and high-use sites for vegetation and wildlife diversity and abundance (Jones and Kutilek 1988) and the responses of black tailed deer to off-highway vehicles (Ferris and Kutilek 1989).

A baseline wildlife survey of Hungry Valley SVRA was conducted by CDPR in 1983 (Shaub and Fong 1983). Three cultural preserves, an oak preserve, and a special grassland management area were created at Hungry Valley as a result of resource protection studies (CDPR 1981). Hungry Valley SVRA was the site of an in-depth masters thesis studying land use changes and vegetation trends over the last 40 years, and recent impacts of off-highway vehicle use on the landscape (Fridell 1990). This study demonstrated the usefulness of aerial photography interpretation, and pioneered the application of Geographical Information Systems (GIS). Manning and Barbour (1989) conducted a detailed inventory and developed management strategies for the special grassland management area that comprise the northern quarter of Hungry Valley.

Due to the rich and diverse plant and animal life at Oceano Dunes SVRA, several focused studies have been conducted on the plants and animals: an analysis of OHV damage on the distribution and status of endangered native vascular plants (McCoy 1980); a report on the Nipomo Dune Complex and the unique associated wetlands (Kutilek et al. 1991a); a focused inventory of birds, amphibians and reptiles at Oso Flaco Lake (Burton and Kutilek 1991a); an analysis of the Oceano Dunes vegetation islands (Hazebrook and Holland 1995); small mammal (rodent) movement and migration between the vegetation islands (Harding-Smith 1995); and several monitoring reports on the abundance of the threatened Western Snowy Plover and endangered California Least Tern (Burton 1990, Burton and Kutilek 1991b, 1993, 1994, Burton *et al.* 1994, 1995, Perry 1992, 1994, 1995, 1996). The Western Snowy Plover and California Least Tern studies represent one of the most detailed and comprehensive analyses to date in central California on these sensitive species and provides the scientific basis for the Oceano Dunes Draft Habitat Management Plan (HMP) for the Western Snowy Plover and the California Least Tern (CDPR 1996). Oceano Dunes is also the site of state-of-the-art dune stabilization utilizing native vegetation (Layne and Bros 1992, Hallock & Anderson 1991, Sellery et al. 1983).

Ocotillo Wells SVRA was the site of two important studies analyzing the impact of OHVs on desert vegetation: the impact of off-highway vehicles on perennial desert vegetation (Kakiba and Vogl 1986); and a masters thesis that studied the effects of off-highway vehicles on vegetation and landforms (Pudoff 1992). The Pudoff thesis expanded on Fridell's Hungry Valley aerial photography work and further refined GIS technology and procedures. The proposed endangered flat-tailed horned lizard, *Phrynosoma mcallii*, has been monitored continuously since 1990 (Wone *et al.* 1991, Wone and Beauchamp 1994, 1995, 1996, 1997). Wone and Beauchamp's work represents one of the largest and continuous body of field-collected, scientific information identifying the occurrence and distribution of the flat-tailed horned lizard in the California's Sonora Desert region.

Prairie City SVRA has many central valley vernal pools. Several focused studies have been conducted on this important natural resource. Initial work on the vernal pools was conducted by U.C. Davis researchers (Simovich and Fugate 1990) who were searching for the sensitive spadefoot toad and eubranchiopod crustaceans. This work was followed by a more detailed analysis by Jones & Stokes (1994). Several species of fairy shrimp have been recently classified as endangered by the Fish and Wildlife Service, two of which have been found at Prairie City SVRA. The Division has recently conducted a wetland delineation (EDAW 1996), and a detailed spring 1996 vernal pool survey was conducted by Michael Brandman Associates (1996) as a basis for proposed development and mitigation purposes.

## HABITAT COMPONENTS

Habitat monitoring is more than just sampling the plants and animals. Habitats consist of the complex interaction of biotic, abiotic, socio-cultural, and management practices. Each of these components can be further broken down into smaller individual factors. These components and their constituent factors are displayed in Figure 1 and are given further attention in the

accompanying checklists (Figures 2, 3, & 4). The checklist specifically lists those factors which should be monitored in order to effectively assess habitat health. When compiling information for the checklists, the source of the information should also be noted.

### *Biotic Component*

The biotic component is comprised of the flora and fauna found in the SVRA. Most of the field work associated with this monitoring program centers around properly sampling the biotic component. The checklist for the biotic component is the "Habitat Matrix" (Appendix 1), which specifically details the data which will be collected for the final analysis. The Habitat Matrix will be tailored to each SVRA, but will include monitoring of native, threatened & endangered, and exotics species of both Flora and Fauna, as well as the overall health of different habitat communities. Each type of monitoring will include a control factor, where possible, in order to asses OHV impacts. The Habitat Matrix is designed as a tool to alert management to problem areas within each SVRA. A more detailed description of the habitat matrix and its constituent components is covered in the data analysis and interpretation section of this report.

### *Abiotic Component*

The abiotic component consists of the non-living parts of the habitat. These include meteorology, hydrology, fire, and soil. Meteorology encompasses all aspects of weather: wind, rain, storms, humidity, and temperature. Hydrology typically refers to sources of water and their magnitude (e.g. frequency of flood). Fire is also an abiotic factor when not intentionally set for reasons of resource management. The last factor, soil, typically consist of monitoring for loss. Data collection of these factors is outlined in the checklist (Figure 2).

#### Meteorology

Meteorology encompasses all aspects of weather: wind, rain, storms, humidity, tides, and temperature. Whenever possible, meteorological information is taken from within the SVRA unit. Weather data from as close to the SVRA as possible is also acquired via the National Weather Service and local county/agency measuring stations. The most important meteorological information is daily and monthly summaries of precipitation, temperature, and wind speed/direction. Information on specific or unusual storm events is collected by the SVRA staff and checked with National Weather Service data. For example, wind, storm, and tide records are critical at Oceano Dunes SVRA when assessing Least Tern or Snowy Plover nesting successes. Similarly, a one inch rainfall in the early spring at Ocotillo Wells can result in an almost immediate bloom of the desert ephemeral flora which in turn can strongly affect insect (ant) and reptile (flat-tailed horned lizard) populations. The frequency and intensity of rainfall events are directly related to specific washouts and significant periods of accelerated erosion.

#### Hydrology

Hydrological factors include local watershed reservoir reports, river and stream flow rates and magnitudes, flood events, and groundwater levels. Factors should be recorded as monthly sums. Information from any body of water, aquifer, stream, or river which affects the SVRA needs to be considered. Groundwater levels should be noted, particularly as they may relate to local pumping, wells and regional drought. For example, the wetlands and vegetation islands at Oceano Dunes are strongly impacted by the amount of water released from upstream reservoirs, or by ground water level fluctuations related either to water being backed-up behind the sand barriers of Arroyo Grande Creek and Oso Flaco Creek, or being pumped by local farmers to irrigate their crops. Reports of reservoir levels and stream gauges are obtained from the appropriate jurisdictional agencies (e.g. County, Army Corps, DWR, BOR, etc.).

**Natural Fire**

The Natural Fire section consists of a brief summary of any fires affecting the SVRA which were not intentionally set for management purposes. Wildfire burn information will be obtained from the CDF or local fire prevention agencies. Prescribed burn information will be listed on the Socio-cultural checklist. The effects of any natural fires on the park will be noted such as, damage to structures, damage to habitat types, cause of fire, etc. Additionally specific characteristics of the fire should be noted, such as the intensity, duration and speed of the fire, and location of "hot spots". Factors that affect these characteristics (e.g. fuel load, wind speed and direction) may also be noted.

**Soils**

The Soil section will contain any data sheets or reports from the Soil Standards Guide regarding trails and a brief summary of any erosion repair projects within the SVRA. The management and prompt control of soil erosion is an essential policy of the OHMVR Division. This mission is summarized in Soil Conservation Guidelines/Standards for OHV Recreation Management (CDPR 1991b). Soil erosion is monitored in two ways: the comparison of aerial photographs every two years, and the soil erosion trail inventory (OHMVRD 1996). Aerial photography analysis provides a baseline for identifying new areas of erosion or disturbance. The soil erosion trail inventory from the Soil Conservation Guidelines entails an annual inventory of the trails and routes of each SVRA.

### *Socio-Cultural Component*

The socio-cultural component is comprised of human-related factors that have an impact on the SVRA. These factors include air, water and soil quality, visitor use, and development outside the park. All of these factors will have some effect on the biotic and abiotic components. In order to determine which of these factors are causing changes in the habitat, records will be maintained so comparisons over time can be made. These records will be maintained by utilizing the checklist which follows (Figure 3). The Socio-cultural Checklist consists of five parts.

Information for parts I and II, air and water quality, can be obtained from the local Air Quality Management District/Board (AQMD/AQMB) and local water districts. Periodic in-house checks of the quality of surface waters located in the SVRA would also provide valuable information. Assistance for the standardization of assessment techniques can be obtained from the appropriate local water districts.

The third part, soil quality, consists of noting any unusual or significant changes in soil quality. For example, any chemical spills or fuel leaks due to accidents or natural causes.

The fourth part, visitor use, includes noting special events. Knowing when special events occurred can explain spikes in visitor numbers or air quality changes. Visitor use data will be obtained from visitor services or the local ranger station.

The fifth part, development, is a summary of any development (i.e. construction-related) outside the SVRA. Development outside the SVRA can affect water sources which supply the SVRA and may lead to increased erosion problems. Knowing where and when development is occurring should allow the resource manager to better assess the degree of local habitat loss, which in turn may result in higher levels of observation of animals in the park over the short term, but fewer observations over the long term. Taken together this could help explain observed population and/or habitat changes. For example, animals are often locally displaced by the grading done in advance of construction (e.g. snakes, rabbits, mice, etc.) which may result in temporary higher incidences of observation in the park. Information for outside development can be obtained from local planning agencies, as well as direct observation.

### *Management Practices Component*

Management practices can vary from park to park. Some management practices which should be recorded include: prescribed burns, grazing, soil stabilization, revegetation projects, periods of rest for a particular area (i.e. fallow fields), or development in the park. Examples are listed on the checklist with data that should be collected (Figure 4). For any management practice, any significant changes in the SVRA due to that practice should be noted.

## BIOTIC INVENTORY METHODS

Ecological monitoring is a systematic survey repeated over time in an effort to detect changes or trends in plant and animal populations. Monitoring provides an early warning of potential problems on the land so the problems can be corrected before they become significant. The purpose of an ecological monitoring program is not necessarily to be exhaustive by recording every plant or animal species, but to obtain information on representative organisms as indicators of environmental health and possible significant ecological changes. Properly orchestrated, a monitoring program will have many positive outcomes. Foremost amongst these, is the development of information which is useful to the resource management staff for

formulating objectives and decisions which are essential to the management of the area's natural resources and recreational opportunities. The United States EPA (1980) has specifically recognized that the assessment methodologies of a good monitoring program need to fulfill the following management criteria.

- The assessment method should document and display data in a manner which allows the manager to compare local conditions and events with surrounding regional conditions and events.
- The assessment method should have the capability of documenting present changes in habitat quality, as well as the capability to identify trends which may be occurring over time.
- The assessment method must be sensitive enough to identify differing types and magnitudes of impacts ranging from enhancement to no impact to negative impact.
- The assessment method should generate data with biological validity, but in units readily understood by both the public and managers. These data should be amenable to integration with data from other disciplines, such as socioeconomic analyses.
- The assessment method must be practical to implement. Data availability, time, and monetary constraints must be considered in the practical application of any method.
- The assessment method should be complete and self-contained yet be capable of being improved through the incorporation of new knowledge and techniques as the state-of-the-knowledge advances.

It is intended that the HMS program be sensitive enough to identify ecosystem trends. The intent of this program is not to be the "end all" of habitat monitoring, but is designed to be robust, allowing the resource manager to add or subtract measures based upon usefulness or need without affecting the overall ability of the program to monitor the health of the park. As such, this program can easily be integrated with other habitat monitoring programs (e.g., such as those utilized by other public agencies), thereby increasing the distribution of information and its overall usefulness.

The monitoring methods listed below in the Vegetation and Wildlife sections are examples and guidelines and will not necessarily be followed in each park unit. Habitats and species vary with each park unit so the methodology used will be chosen according to the needs of each park. The timing of monitoring suggested here will have to vary with each park because of varying elevations and the onset of seasons.

When monitoring biotic factors, there are two fundamental biological assessment methods employed in the monitoring program: 1) assessment through *population estimation*, and 2) assessment through *habitat quality*. In addition to the two fundamental biological assessment methods, there are two levels of monitoring: 1) qualitative and 2) quantitative.

**Population Estimation**

Population estimation includes both direct and indirect approaches. Direct population monitoring involves a census or a count of individuals within a specific area (Overton and Davis

1969). Threatened or endangered plant species and critical vegetation communities are usually measured by the direct method. Indirect species population estimation and monitoring is accomplished by sampling and estimation techniques. Animal species typically do not easily lend themselves to direct population estimation. This is often due to their mobility, secretive behavior, or plant community characteristics which make direct observation difficult. As a result of these challenges which are encountered for most animal species, indirect methods of population estimation are employed. Examples of indirect methods are radio telemetry, time-area counts, calls, bait, or the measurement of some other parameter (e.g., pellet group counts).

#### Habitat Quality Estimation

Habitat is the place occupied by a specific population within a community of populations (Smith 1974). Habitat can be characterized by a dominant plant form, indicator species, or some physical characteristic (Ricklefs 1973). Each species requires a particular habitat to supply its space, nutrients, and cover needs. Attempts to quantify habitat quality or trend involves the use of an indice, applied at the individual, population or community level. Various forms of diversity indices, particularly the Shanon-Weaver Diversity Index (SDI), are used to characterize habitats. Such indices account for both number of species and numbers of individuals of each species present. The SDI model is perhaps the most versatile and comprehensive index available.

#### Qualitative Monitoring

The qualitative level of monitoring involves descriptive information without the potential for statistical analysis. The results from this level of monitoring can serve as a "red flag" to alert management to problem areas, which can then lead to more intensive or quantitative monitoring. Examples of qualitative monitoring are, presence/absence, occurrence mapping, photoplots, stewardship integrity monitoring, and ocular estimates of density or size classes.

#### Quantitative Monitoring

Quantitative monitoring involves taking measurements which can be used in statistical analysis. The methodology used in quantitative monitoring is repeatable by different individuals and can be used to evaluate the effects of management. Quantitative monitoring can also provide valuable information on basic biology and population status. Examples of quantitative monitoring are, line transects, counting all individuals of a population, or demographic studies.

### *Vegetation*

#### Aerial Photography

The primary advantage of the aerial photography method of habitat monitoring is its ability to quickly discern gross trends and changes in habitat coverage. It is the long-range intention of the Division to combine this tool with a comprehensive geographic information

system (GIS) program. Fine tuning the accuracy and precision of the GIS program over the last 10 years has been an arduous process. However, the aerial photography library has been regularly updated and analyzed for each unit every two to three years by OHMVR resource ecologists. This information can be digitized to obtain accurate cover/bare ground estimates. Aerial photography flights are usually flown during the active growing season utilizing black and white, color, and occasionally infrared film.

**Permanent Transects**

Physically measuring vegetation in a quantitative manner on a permanent transect is the most precise method to determine vegetation cover. The results obtained from this methodology are typically more consistent than visual estimates, especially when different people over a period of years conduct the measurements (Kutilek pers com.). The primary methodology utilized for vegetation monitoring of permanent transects by Kutilek and Anderson was a combination of point intercept (Mueller-Dombois and Ellenberg 1974) and line intercept techniques (Brower and Zar 1984). These procedures were used to measure species cover and density, shrub and tree canopy layers, and ground cover in a simple and efficient manner. Annual grassland sites are typically measured utilizing only the point intercept technique.

The Kutilek and Anderson transects were identified using a stratified random design (Krebs 1989). This works well for characterizing the broad vegetation community descriptions of an entire SVRA, however, there are many local sensitive and unique vegetation associations which may not be detected. It then becomes necessary to further stratify and establish more specific local transects. Local transects and plots are established by the resource ecologist primarily to monitor threatened or endangered plants, sensitive local vegetation associations, noxious weeds, and the effects of recreation and management activities on particular resources. To improve precision and gain even more information concerning herbaceous layer composition and diversity, square or rectangle quadrats are often utilized in conjunction with the line transect. The size of the quadrat varies according to the type of vegetation being measured. Optimum quadrat size is determined by developing a species/area curve (Cain and Castro 1959). A single rare plant or local assemblage of individual plants or seedlings can be monitored using a square meter or larger quadrat. Annual grassland vegetation is most often measured with a series of 10 randomly placed 1/10 $m^2$ quadrats (20cm X 50cm) along a 30 meter transect. To accurately measure the effect of management practices (fire, herbicide, grazing, mowing, etc.) on a grassland, the quadrats are placed on the same spot of the transect where they were originally placed.

Wildlife and abiotic information can also be collected along the permanent transects. These include soil surface cover (litter), soil capping, burrowing signs, animal scat, insect signs, recent disturbance, and soil erosion class. The Division utilizes geographical positioning system (GPS) units for establishing and locating all permanent transects and monitoring stations. This tool is extremely useful in locating a transect location in rough terrain or dense vegetation.

**Permanent Photographic Record**

A permanent photographic record, utilizing a 35 mm camera with color film, is a useful qualitative technique to measure habitat change and trend. Typically at each permanent transect marker, at least two photographs are taken. The first photograph shows a recognizable permanent feature (the transect marker post, horizon, large rock, tree, shrub, etc.). The second photograph records the starting point of the transect, usually taken from approximately 4 feet above the ground with the view of the surface directly below. Occasionally, photographs are taken in the cardinal directions at the center of each permanent monitoring station. Special photographic reference sites are also established to document special habitats, specific plant species, or plant associations. In some situations where accurate cover estimates are difficult to measure, color 35 mm photographs are taken of a quadrat or plot.

#### Mapping

Detailed site mapping is also an important and extremely effective way to monitor the change in vegetation. The field ecologist can use the natural vegetation inventory form CDPR 528C for this purpose. The form has a square grid pattern that is utilized to accurately draw any size quadrat or staked plot. In a desert environment this inventory form can duplicate a 100 $m^2$ plot. In a grassland the ecologist can estimate cover and species composition in 1/10 $m^2$ or 1 $m^2$ quadrats utilizing the grid pattern. Mapping can be a primary technique for charting the long-range trend of rare and endangered plants and determining the possible threats to these species. GPS and GIS can also be utilized for mapping.

#### Other Plants and Habitats

The techniques utilized to monitor unusual habitats, threatened, endangered, and species of special concern, will be specifically developed with that species or habitat in mind. Monitoring procedures will follow the protocols (if any) developed by experts and the regulatory agencies which have jurisdiction over such species (e.g. US Fish and Wildlife Service, California Fish and Game, etc.).

### *Wildlife*

#### Herptiles

Herptile surveys are typically conducted every two years in the early spring. Amphibians and reptiles are initially inventoried with visual encounter surveys (VES) (Crump and Scott 1994). The VES are conducted in appropriate habitat types in both OHV-use and non-use sites (Kutilek et al. 1991). Typically each area is searched for 1 man-hour during the peak condition or activity period (late winter and early spring for amphibians, and summer months for reptiles) by turning over rocks, logs, and other debris to look for herptiles beneath. Areas searched include moist areas, ponds, large pools, and areas around the bases of shrubs and trees. Herptiles are further sampled utilizing pitfall trap arrays established in habitats both in OHV and non-OHV recreation areas. Breeding ponds, pools, and springs are dipnetted for larvae. Incidental information gained from acoustic monitoring and night spotting is also added to the data base.

Appropriate collector's permits from both the State Department of Fish and Game and the United States Fish and Wildlife Service are necessary to conduct herpetile sampling.

**Birds**

There are different methods for doing bird monitoring surveys, the methodology listed here is meant to serves as a guide. Bird monitoring can be conducted twice a year in the spring and fall when the birds are most active. Typically, birds are monitored utilizing the variable circular plot technique (Reynolds *et al.* 1980, Jones and Kutilek 1988) in selected habitat types in both OHV-use and non-use sites (Kutilek *et al.* 1991). Monitoring is not conducted in heavy fog or severe wind. The observer walks to the center of each established plot and with the aid of binoculars, records the species of all birds that flush during the approach. The observer remains at the plot center for 10 minutes and records all birds detected by sight or sound. The plots are sampled during the peak of daily bird activity from 15 minutes after sunrise until 1000 hours once in the late spring to cover local breeding birds and once in the late fall to cover local and migrating birds. In grassland vegetation or where vegetation is scarce (e.g. Ocotillo Wells, Oceano Dunes) a point count method can be employed along a 100 m to 300 m transect where the observer either spends 5 minutes at each point or records the birds continuously for a set period of time while walking the transect. Every attempt is made to locate and monitor all raptor nests (burrows) and perching locations within each SVRA every year.

**Small Mammals**

Small mammal surveys are usually conducted in the spring months every two years. The information gained from monitoring rodents and small mammals is valuable for understanding abundance of larger predators and raptors. Typically, small mammals are surveyed utilizing Sherman live traps baited with mixed grain in one plot in each of the vegetation/habitat types, both in OHV-use and non-use areas. Each plot will typically contain as many as 50 traps arranged in a grid pattern (10 m spacing). Animals are trapped for 3 consecutive nights in the late spring. In grasslands or habitat with scarce vegetative cover, traps are often placed along transects. Captured animals are identified, measured, checked for reproductive condition, hair-clipped, and released.

**Large Mammals**

Mammal populations can be generally estimated by random sampling to get a measure or "index" of the population present. This does not necessarily have to be a actual sighting of the animals themselves. Information can be obtained from tracks, droppings, rubbing sites, etc. It is important that observations have a common base to be able to compare year to year. For example, sightings per mile in the first two hours of daylight, or droppings (scat, pellets) found per mile or per randomly chosen sample areas. If any of these sample counts steadily increase or decrease over the years this is often a good indication that the population is also increasing or decreasing. Monitoring every two years is usually sufficient for noting population changes.

Chalked aluminum track plate stations with odoriferous bait (e.g. cat food, etc.) to attract animals can be utilized to identify larger mammalian carnivores and omnivores (Barrett 1983, Taylor and Raphael 1988). In sandy habitats (e.g. Ocotillo Wells, Hungry Valley, Oceano Dunes) this technique is often not effective because the plates are difficult to secure and are often blown downwind. In these situations, a 2 $m^2$ area of soil in protected sites can be smoothed and baited. Each tracking station is typically monitored for 3 consecutive nights.

Larger mammal herbivores (e.g. deer, rabbits, etc.) were initially inventoried at the SVRAs by sampling large (90 $m^2$) pellet plots. For the monitoring program, scat/pellet groups, as well as soil disturbance (gophers, etc.), can be identified and counted in conjunction with line intercept, point intercept, and quadrat vegetation sampling described above. A secondary method for monitoring larger mammals (as well as incidental nocturnal birds and amphibians) is the utilization of night spotlighting techniques (Kutilek *et al.* 1991). Night spot lighting is carried out beginning 1 hour after dark from a 4-wheel drive truck driven at 5-8 mph. Two observers stand in the bed of the truck, sweep the surrounding area with 400,000 candle power spotlights, and record all animals observed. The above descriptions for small and large animals represent typical protocols. However, the specific protocol for such monitoring in each of the SVRAs will have to be modified to reflect site specific parameters such as habitat type, terrain and anticipated observed species and their specific behavioral characteristics.

**Other Animals and Animal Signs**

The techniques utilized to monitor unusual animal species such as aquatic crustaceans (e.g. fairy shrimp), threatened, endangered, and other species of special concern will be specifically developed with that species in mind. Monitoring procedures will follow the protocols developed by experts and the regulatory agencies which have jurisdiction over such species (e.g. US Fish and Wildlife Service, California Fish and Game, etc.).

## DATA ANALYSIS AND INTERPRETATION

Measuring the ecological diversity of a habitat is typically a three step process. The first is designing a monitoring program to collect the desired data. The second is data collection on the species or habitat of interest. The third is analysis and interpretation of the data.

If a quantitative level of monitoring is desired, the design of the monitoring and process of collecting data must follow the correct use of statistical procedures in order to produce scientifically valid results. Once data is collected, a correct method of statistical analysis must be chosen. In most cases a random sample of individuals from the population of all species present is collected, therefore the method of analysis must reflect this sampling method. Additionally whenever reasonable, for comparative purposes, the same procedures will be carried out on control sites (i.e. non-OHV use areas).

### *Habitat Assessment Matrix*

In order to accurately analyze the health of the biotic environment at each of the State Parks within the OHMVR Division, a "Habitat Assessment Matrix" was developed (see Appendix 1 for sample Matrix). This matrix consists of a number of smaller matrixes each of which is used to measure some specific component of the Park's biotic environment (e.g., specific vegetation type, Threatened and Endangered Fauna). The matrix was specifically designed to allow the user to track year to year changes (via the ratio present year/previous year), as well as long term trends (via the ratio present year/base year) in any one measure. In order to control for unusual anomalies in the data, as well as unusual perturbations in the environment, replicate sampling (rows), as well as a variety of measures (columns) are used. Additionally, wherever possible the sampling of "control plots" is employed. Lastly, in order to sort out the proverbial "noise from the signal" and to more easily facilitate the use of this data by non-scientifically trained managers, the various measures are averaged to create a number of ordinal scores. These scores represent ratios of change; wherein a score of one represents no change, a score of less than one represents possible decline, and a score of greater than one a possible improvement in a particular habitat measure. These various ordinal scores are then displayed individually at the bottom right-hand corner of each matrix, allowing the manager or scientific professional to focus on those areas that might need further study or remediation. If an overall evaluation of the total park environment is then desired (as in the case of Performance Based Budgeting requirements), these various individual ordinal scores can themselves be summed and averaged to generate a "grand" ordinal score. Weighting the individual measures within each smaller matrix, as well as the individual matrix ordinal score, can be easily employed if deemed useful or necessary. This procedure would be carried out by the professional if it were determined that certain measures or scores were of greater importance. Some resource managers may argue, for example, that Federally threatened or endangered species deserve greater weight in this form of analysis. The specific measures used in the habitat matrix are customized for each park and habitat type by trained scientific professionals. Although many are self-explanatory, two different measures of species diversity "SDI" and "SDJ" probably need further explanation.

**Diversity Indices: SDI and SDJ**

The simplest and most widely used diversity index is the Shannon-Weaver Function, often referred to as SDI. SDI measures the average degree of uncertainty of predicting the species of a given individual picked at random from a community. Thus SDI reflects a measure of richness in the community. The formula is: $SDI = {}_{i=1}^{S}\Sigma\, P_i \log_b P_i$ . S = the number of species. $P_i$ = the proportion of the total number of individuals consisting of the *i*th species. $\text{Log}_b$ = logarithmic base, which is arbitrary; however the base "e" (natural log) is usually recommended (Hair 1980, Mullen 1992). In summary, the SDI is a measure which allows the resource professional to assess the diversity, richness or number of species in a given habitat.

Once the SDI is calculated, the measure SDJ (evenness of species in the community) can be calculated. The formula is: SDJ = SDI/SDImax., where $SDImax = \log_b S$. S is defined as the number of species monitored. (The same base of logarithms used to calculate SDI is also utilized in this equation.) The value for SDImax can be derived from a table of logarithms (Hair

1980). Thus, SDJ is the observed richness (SDI) divided by the maximum richness (SDImax) possible in the community. This measure is particularly useful in helping the resource manager to assess the degree to which the resources (e.g. food, space, habitat) in a particular community are partitioned amongst its various species inhabitants. It is generally observed that the degree to which a community is impacted or disturbed is inversely proportional to the evenness of resource distribution (SDJ). More simply put, it is generally observed that the more impacted an ecosystem, the more likely it will be dominated by a few weedy species.

SDI (Richness) and SDJ (Evenness) are measures which are generally widely accepted by the scientific community as being very useful tools for the assessment of habitat health. Taken together their usefulness is amplified to generate an estimate of the composition of species in a habitat, as well as reveal their relative importance or distribution. Perhaps as important, is the ability of the resource manager to utilize comparable SDI's and SDJ's, taken over time, in trends which may show how populations of different species are changing.

**Data averaging**

Data averaging in the matrix will be done by comparing the present year with the previous year and the present year with the base year. The present year divided by the base year for an entire row of a small matrix will equal $X_1$. The present year divided by the previous year for an entire row of a small matrix will equal $X_2$. The overall average (Xs) for each row of a small matrix = $(X_1 + X_2)/2$.

**Ordinal Scoring**

The ordinal score (T) for a given small matrix = sum(Xs)/n, where n = number of samples in the small matrix. The grand ordinal score (Tg) = sum(T)/N. Where N = the number of small matrix's. If a measure is to be given extra weight, then it's ordinal score will be weighted when calculating Tg.

## REPORTS, REVIEW, PROTOCOL CHANGES

### *Reports*

Annual reports expected to be generated by the implementation of the Habitat Monitoring System (HMS) will normally include; a report of monitoring done with results for the year, a completed matrix table to accompany the report, and checklist data compiled and available upon request. The annual monitoring report should include a discussion of any unusual results or events.

Every five years a trend report will be done which will summarize the data accumulated over the previous years. A discussion of changes in trends and possible explanations will be

included, as well as an evaluation of the effectiveness of current management practices and suggestions for changes if needed.

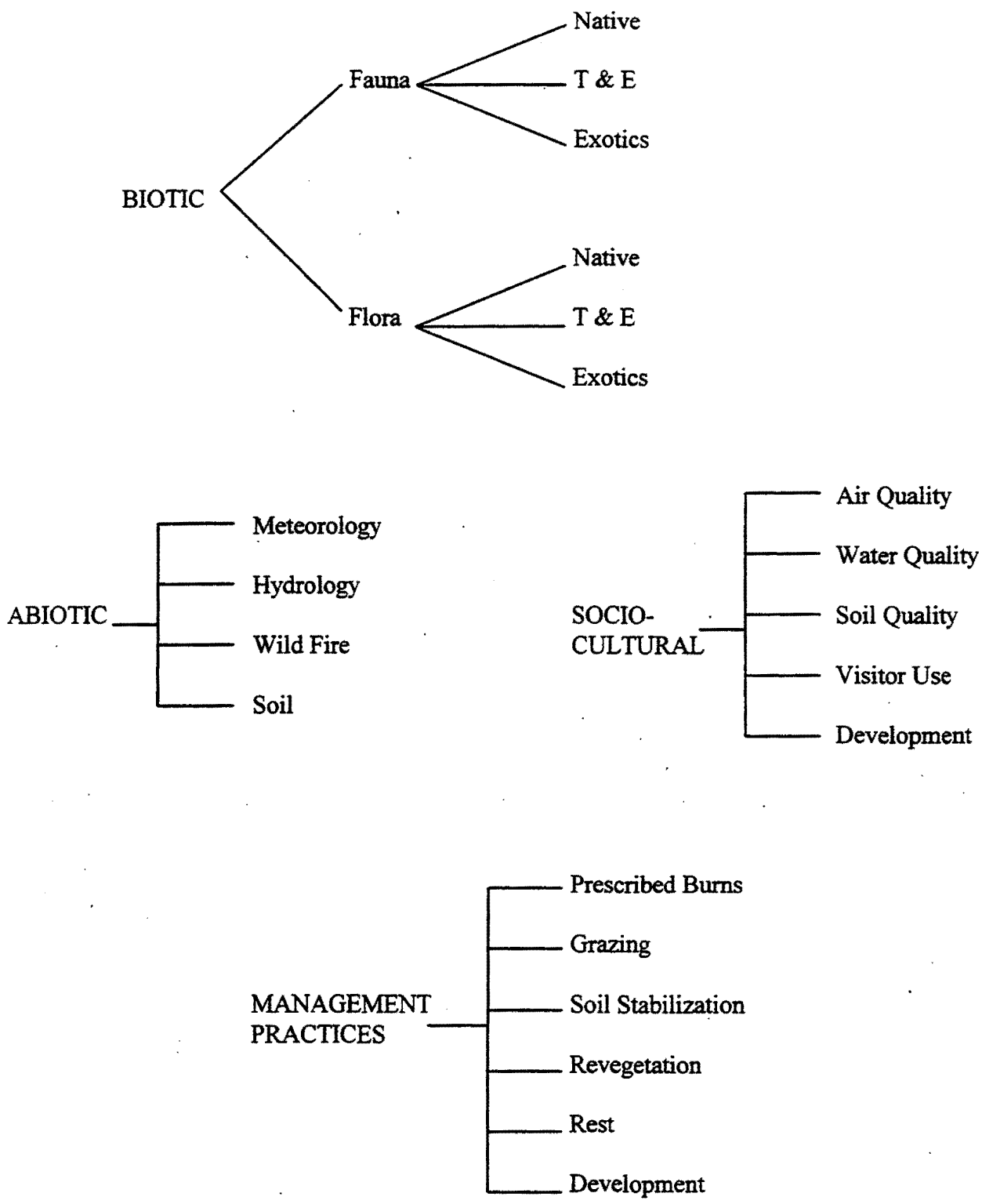
### *Review*

Periodical review of the HMS will be done to asses its effectiveness and applicability, this will be done by professionals within the OHMVRD. If changes are deemed necessary peer review will also be sought.

### *Protocol Changes*

When it is deemed necessary to change monitoring protocol, a discussion of the rational for the change and a complete description of the new methods will be included with the annual report and the HMS Unit Report. In addition, the first year of the use of the new protocol, the old protocol method will also be done. This allows for comparison of the new and the old methods.

## Figure 1: FLOWCHART OF HABITAT COMPONENTS



# Figure 2: ABIOTIC CHECKLIST

Date _____

(Attach all reports and comments to this checklist. Include source of information.)

I) Meteorology

a) Annual/Monthly Report of Precipitation ☐

b) Annual/Monthly Report of Hi/Low Temperature ☐

c) Annual/Monthly Report of Wind, direction and velocity ☐

d) Tide Record (storm effects) ☐

e) Storms (data should include date, precipitation, duration, wind speed, & effects) ☐

II) Hydrology

a) Local Reservoir Levels, annual report ☐

b) Local River/Stream Levels, annual report ☐

c) Floods (data should include, date, location, cause, & effects) ☐

d) Groundwater (data should include, capacity, level, quality, & recover) ☐

III) Wildfire

a) Unplanned Burns ☐

(Comment on the intensity, duration, speed of the fire as well as recognized hot spots, fuel load, wind speed and direction, and damage due to suppression efforts. Comments should be made on both those fires within the Park as well as those located outside but adjacent to the Park. Other data should include date, location, acreage, effects, & cause.)

IV) Soil

a) Soil Conservation Guidelines/Standards Monitoring System Data Sheets ☐

b) Erosion Events (data should include date, location, & extent) ☐

# Figure 3: SOCIO-CULTURAL CHECKLIST

Date _____

(Attach all reports and comments to this checklist. Include source of information.)

I) Air Quality

a) Annual/Monthly Report ☐

b) Unusual/significant pollution releases or periods of poor air quality. ☐

II) Water Quality

a) Annual/Monthly Report ☐

b) Unusual/significant pollution releases or periods of poor water quality. ☐

III) Soil Quality ☐

(Note any unusual/significant changes in soil quality. Have any chemicals spilled or fuels leaked from accidents? Attach report.)

IV) Visitor Use

a) Annual/Monthly Report ☐

b) Special Events (data should include date, event, & # of visitors) ☐

V) Development (data should include date, location, company, & project type) ☐

# Figure 4: MANAGEMENT PRACTICES CHECKLIST

Date _____

(Attach all reports and comments to this checklist. Include source of information.)

The following are examples of management practices and suggested data for collection. These practices will vary between SVRA's.

I) Prescribed Burns ☐

(data should include date, location, acreage, intent, effects, and anything significant about the burn)

II) Grazing ☐

(data should include location, acreage, term of contract, & intent)

III) Soil Stabilization ☐

(data should include location, acreage, methods, & effects)

IV) Revegetation ☐

(data should include area, terrain type, procedures, & effects)

V) Rest ☐

(data should include duration, location, acreage, intent, & effects)

VI) Development ☐

(data should include date, location, & project type)

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# Oceano Dunes Unit Description

## *Site Location*

Oceano Dunes State Vehicular Recreation Area (ODSVRA) is located on the central California coast along the southern coastal region of San Luis Obispo County. Primary access to this area is via US Highway 101 and California Highway 1. The site is loosely bounded on the north by the non-vehicular section of Pismo Beach, on the west by the Pacific Ocean, on the south by The Nature Conservancy's Mobile Coastal Preserve, and on the east by the cities of Grover City and Oceano (Figure 5). In the southern portion of the ODSVRA is the Oso Flaco Lake Natural Area, which is accessed from Oso Flaco Lake Road off of California Highway 1. ODSVRA at 3600 acres comprises approximately 25% of the 15, 000 acre Guadalupe-Nipomo Dunes complex.

## *Abiotic Factors*

### Climate

The Guadalupe/Nipomo dune complex of Oceano Dunes SVRA is in the coastal California fog belt. The climate has mild, wet winters and warm, dry summers with consistent early morning and late afternoon coastal fog. Annual precipitation is approximately 17 inches (450 mm). Average annual temperatures for the area range from 50° to 65° F (11 to 18 C). Frost is not common and the growing season is approximately 360 days. During the late spring and early summer afternoons, off-shore winds (sea breezes) from the northwest are persistent in direction and velocity. Average wind speed during these periods is between 12-16 miles per hour. Overall cloudiness during the winter is found about 40% of the time. Although fog and low clouds only occur 20% of the time during the summer, the number of days of occurrence is about 20 per month.

A diurnal wind cycle moves air inland during the day and towards the ocean at night. In the summer the Nipomo dunes receive a strong off-shore wind which begins in the late morning and reaches its maximum velocity in the late afternoon. The nighttime on-shore wind (land breeze) is not as strong and reaches its maximum velocity in the early morning hours. Net air movement over the Nipomo dunes is from the northwest to the southeast Winter storms and strong storm events erode the beach and shore dunes, depositing the sand off-shore. This process is reversed in the summer during calmer weather, when swell waves transport sand bars landward, thus building up the beach and dunes with the help of the strong off-shore wind.

At Oceano Dunes SVRA meteorological summaries are maintained for precipitation, temperature and wind velocity. These and storm events, are recorded for baseline information for the habitat monitoring program.

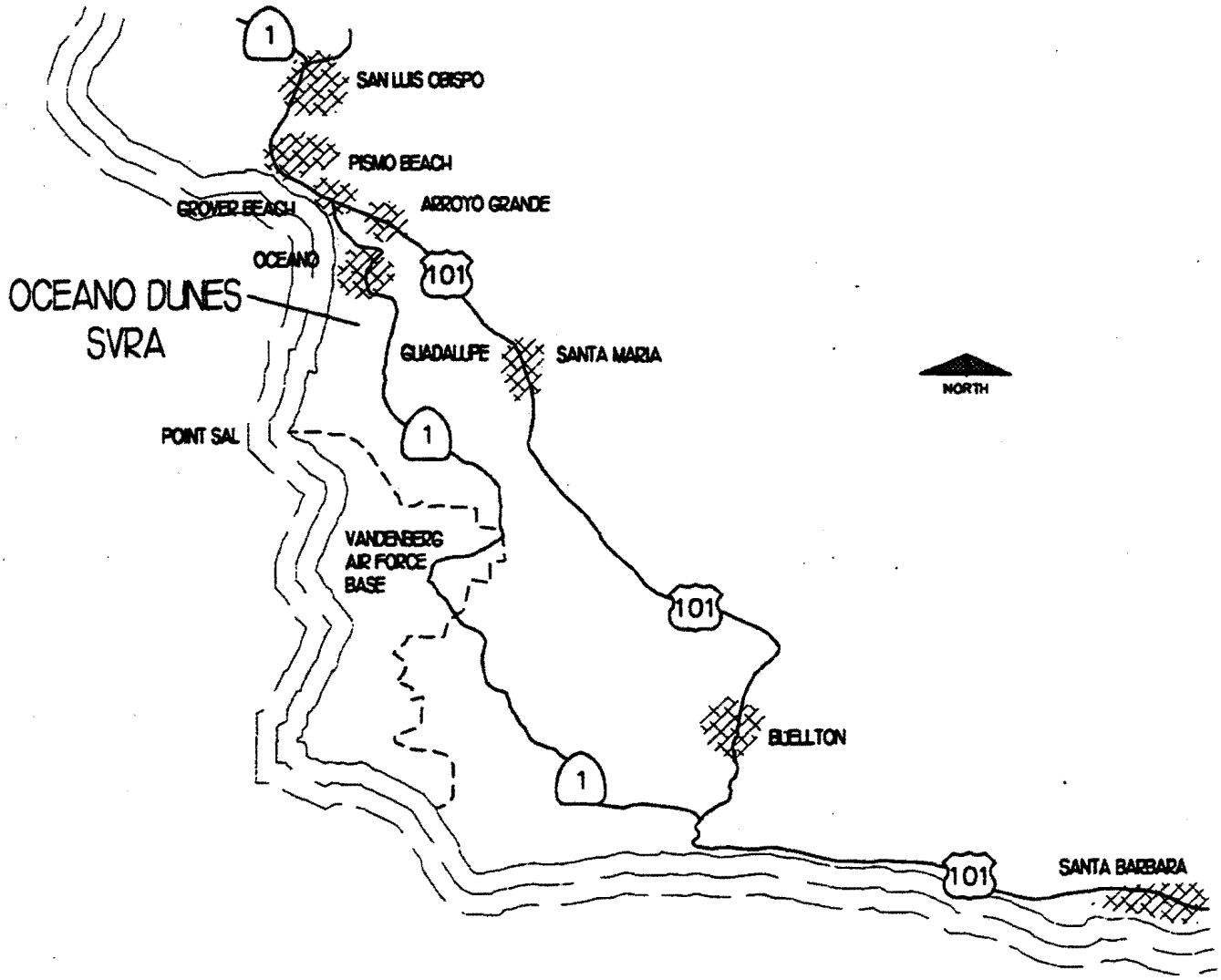



FIGURE 5. VICINITY MAP OF OCEANO DUNES SVRA
IN SAN LUIS OBISPO COUNTY, CALIFORNIA

**Hydrology**

Oceano Dunes represents one of the last remaining intact dune/slack complexes in southern and central California. A dune/slack complex is a series of wetland swales (slacks) and small lakes, interspersed by open sand dunes. The sand dune area extending from the city of Pismo Beach to the mouth of the Santa Maria River is a massive dune complex that crosses two major watersheds, the Arroyo Grande Creek/Cienega Valley watershed on the north and the Santa Maria River/Santa Maria Valley watershed on the south. Between these two watersheds is an ancient stabilized sand dune complex known as the Nipomo Mesa that rises abruptly to 200 feet elevation. Prior to approximately 1850, the Santa Maria River channel flowed in a more northwesterly direction where it entered the ocean near Oso Flaco Lake. Around 1850 during a period of levee construction and field draining for agriculture, the Santa Maria River was diverted to its present course (i.e. approximately six miles south of Oso Flaco Lake to another, albeit secondary, natural ocean outlet). Historically, the Santa Maria River very likely shifted its course between these two outlets depending on the flushing regime from major storm events.

Running the length of the dunes behind the foredune and secondary dunes (25-60 feet elevation), but windward of the highest dune mass (100 feet elevation), the fresh water table from both watersheds builds up at the foot of the Nipomo Mesa and creates a series of wet dune swales, marshes, and fresh water lakes interspersed among the sand dunes. Oceano Dunes SVRA contains many of the swale or slack areas found within the Nipomo dune complex. The groundwater in these swales is close to the surface and the resulting wetland vegetation (e.g., sedges, rushes, willows, wax myrtle) acts as the first vegetation barrier to the advancing sand dunes. Willows are one of a few plant species which are particularly well adapted to withstand sand inundation and climb the advancing dunes, vegetating the leeward slipface of the dunes thus prolonging the longevity of these wetland swales.

Immediately behind the slack areas and in front of the Nipomo Mesa escarpment, water from the Arroyo Grande aquifer forms several lakes and a series of marshes and wetland swales known as the Dune Lakes area. Water from Black Lake Canyon which flows off the Nipomo Mesa joins the Dune Lakes area and creates the deepest lake (Black Lake). South of Black Lake the dunes reach their greatest elevation (120 -148 feet) and inland penetration as they climb onto the southwest shoulder of the Nipomo Mesa.

In the past, water from Price Creek near the town of Pismo Beach flowed south joining Pismo Creek and the mouth of the Arroyo Grande Creek. Here, a fresh water marsh seasonal slough system built up behind the dunes in the spring and summer months. Today this area has been largely filled-in by development and the Oceano Airport. Before the dunes were stabilized by African ice plant and European beachgrass this wetlands area extended to the south behind the foredunes where Pismo Beach Natural Preserve now exists.

The Oso Flaco Creek watershed which is part of the mouth of the Santa Maria Valley watershed is immediately south of the higher dunes on the shoulder of Nipomo Mesa. Here fresh water backs up behind the dunes creating Oso Flaco and Little Oso Flaco Lakes and the surrounding marshland. Just north of Little Oso Flaco Lake, behind the highest dune ridge, are

three large slacks (including Boy Scout Camp and Maidenform Flats), and two small seasonal lakes (Jack Lake and Lettuce Lake).

The natural hydrologic regime of the Oceano dune area behind the fore- and secondary dunes north of Oso Flaco Lake has been very likely influenced by the rerouting of the Santa Maria River. Both Jack and Lettuce Lakes have shrunk in size and a large sand dune "blowout" has inundated a large swale area (between the present mile post eight and Boy Scout Camp), since the time the earliest aerial photographs were taken (circa 1930's). Both Lopez Reservoir and Twichell Reservoir that control water in the Arroyo Grande Creek and Santa Maria River watersheds respectively, were built to maintain ground water levels in the valleys for agricultural use. While these dams may maintain stable ground water levels in the valley bottoms and possibly the dune lakes complex, two side effects have probably occurred: the loss of new sediment for dune formation and; the gradual shrinking of the freshwater dune lakes (especially Oso Flaco Lake), due to gradual siltation and the lack of significant flushing by storm events.

**Soils and Geologic Processes**

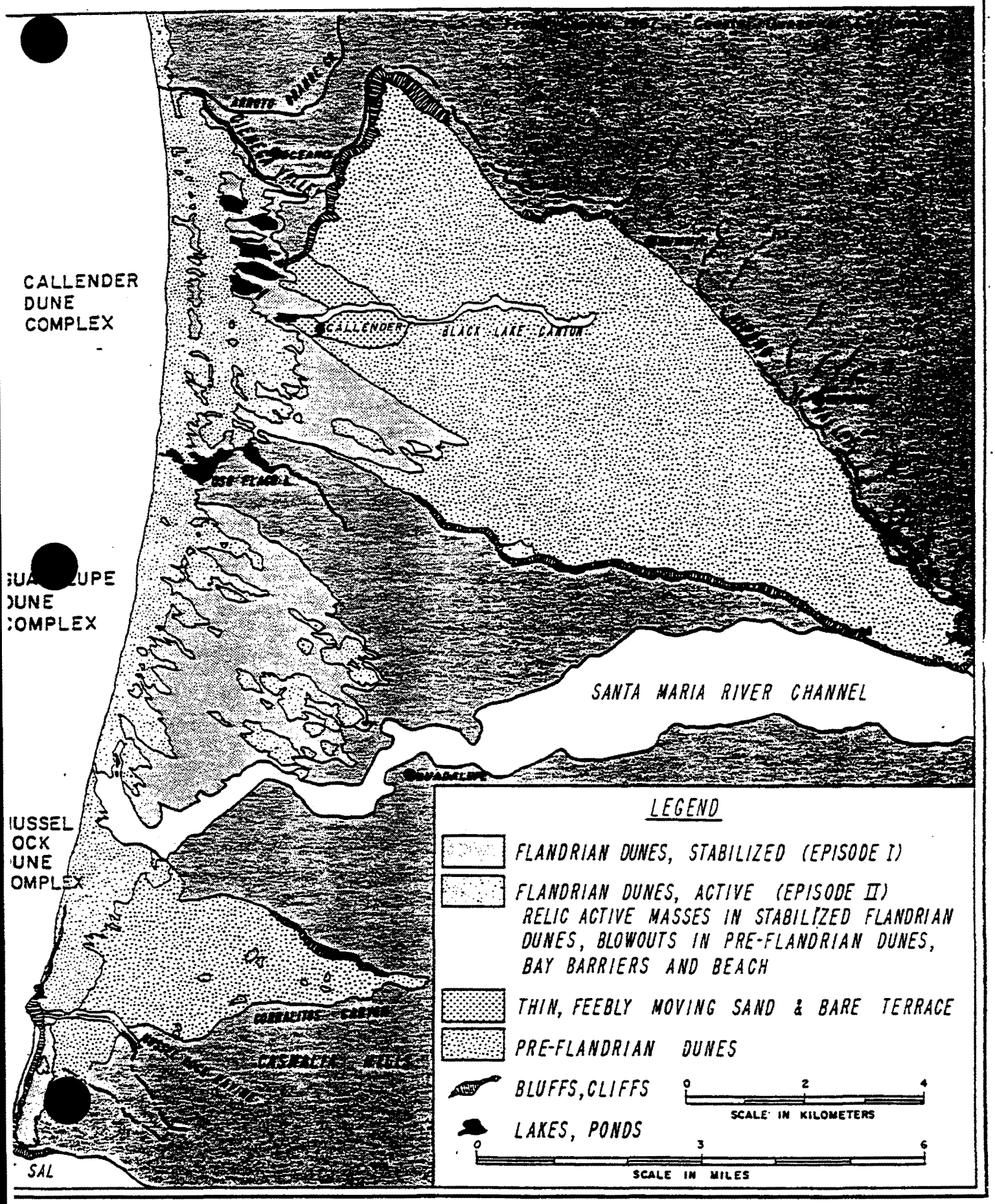
Lying within or near the structural influence of both the coast and transverse ranges the regional geologic structure in the Pismo Beach area is extremely complex. Since the Miocene Epoch records indicate several significant eustatic (i.e. sea level) changes interlaced with periods of horizontal uplift. These events resulted in numerous separate marine and fluvial deposits which by the middle Pleistocene were subject to major deformation and intense folding. Oceano Dunes is located in what is called the Callendar Dunes which begins at Arroyo Grande Creek and ends at Oso Flaco Creek (Cooper 1967).

The formation of the entire dune complex has been dated as occurring either during the pre-Flandrian or Flandrian transgressions. The dunes formed during the pre-Flandrian are known to be very old and are believed to pre-date at least one glacio-eustatic cycle. These highly stabilized vegetated ancient dunes cover approximately 18,000 acres, extend up to eleven miles inland and cover most of Nipomo Mesa. The dunes during the Flandrian occurred during two major episodes of advance. Episode I is the older and represents those stabilized and vegetated dunes just east of the dune preserve and ODSVRA (Figure 6). Dunes of this episode are generally found occurring no closer than 500 to 1500 feet from the ocean shore. The stabilized vegetated dunes around the dune lakes located adjacent to the study area represent dunes of this older episode. The dunes which were formed more recently are those of Episode II and are characterized as being active, unstable, generally unvegetated and reach all the way to the ocean shore. These types of dunes are represented within the ODSVRA off-highway vehicle (OHV) area. Pavilion Hill, however, is an example of an Episode I dune penetrating active Episode II

PLATE 2

FIGURE 6

# DUNE COMPLEXES OF THE NIPOMO REGION




*The Natural Resources of The Nipomo Dunes and Wetlands*, June 1976,
ornia Department of Fish and Game, U.S. Fish and Wildlife Service.

dunes. Pavilion Hill appears to be a remnant of an older Episode I lateral ridge which runes in a northwesterly to southwesterly direction to become part of the parabolic dune ridge which entraps and separates Big Twin Lake and White Lake.

Oceano Dunes is a result of the interplay between off-shore winds, long-shore currents, and sediment transport and deposition from local watersheds: primarily Pismo Creek, Arroyo Grande Creek, and the Santa Maria River. The soils of the dunes are unconsolidated white and yellow sands with low levels of organic matter (Cooper 1967). The sands originate from relatively recent geologic deposits (2000-10,000 YBP). Sand transport along this portion of the coast is accomplished mainly by longshore currents which move sediment in a southeasterly direction parallel to the shore. In the case of the Oceano Dunes area, the waves move in a direction that is perpendicular to the shore driving the sand onto the beach and then inland by northwest to southeast winds (290$^{o}$). It has been estimated that approximately 79,000 cubic yards of sand per year are deposited between Pismo Beach and Oso Flaco Creek and 46,000 cubic yards per year from Oso Flaco Creek to the Santa Maria River. This area also receives an additional 100,000 cubic yards of sand per year from older submerged alluvial deposits.

The typical criteria used to evaluate soil erosion hazard is difficult to apply to Oceano Dunes SVRA. Runoff production factors are extremely low on sand dunes. While vegetative cover ratings are applicable to sand movement where vegetation exists, the major portion of the dune complex is naturally devoid of any appreciable vegetation. Soil/sand conservation (e.g. , stabilization), is important in the case of the movement of dunes into open water, wet meadows, riparian zones, willow thickets, dune scrub, etc. The net effect of off-highway vehicles on unvegetated sand dunes is the removal of sand from the top of the slope and placing it at the bottom. This results in a gradual lowering of sand dune relief. Comparison of aerial photographs with a lens stereoscope has shown apparent reduction in relief in some areas (Worm Valley, Table Top, etc.).

## *Biotic Factors*

### Flora

***Plant communities:***

Several plant communities have been described for the Oceano Dunes (Munz and Keck 1973, DPR 1975, Holland 1986, Kutilek *et al* 1991, Howald 1993, Holland and Keil 1993). Holland and Keil (1993) have conducted the most detailed study of the dune plant communities in this area and have identified six native plant communities within the Nipomo dune complex. In addition to these plant communities there are introduced plant associations (i.e., urban/introduced landscape), and the active coastal sand dunes where no vegetation exists. This report will discuss eight plant associations or habitat types which are found within Oceano Dunes SVRA. These plant associations are found in discreet zones in relationship to the ocean shore and off-shore winds. They include:

- Coastal Strand

- Central Coastal Foredunes
- Active Coastal Dunes
- Central Coast Dune Scrub
- Coastal Willow/Wax Myrtle Thicket
- Coastal Dune Swale
- Coastal Freshwater Marsh and Ponds
- Coastal Dune Riparian Woodland

### Coastal Strand

The coastal strand vegetation occupies the primary foredune area just above the high tide/storm tide zone where shore rack accumulates. The native species which inhabit this habitat type are primarily low-growing, mat-forming, succulent perennials with deep and extensive root systems. Characteristic plants in this vegetation type include: beach saltbush (*Atriplex leucophylla*), coastal saltbush (*A. californica*), beach sand-verbena (*Abronia maritima*), sea-rocket (*Cakile maritima*), beach evening-primrose (*Camissonia cheiranthifolia*), and beach-bur (*Ambrosia chamissonis*). These plants are primarily pioneer native plant species that often do not become permanently established and are either washed or blown away during storms. Species diversity is very low and is principally limited to the seven species listed.

### Central Coast Foredunes

The central coast foredune plant community occurs just inland from the beaches and active dunes where dune succession has resulted in well established dune hummocks or foredunes. These vegetated foredunes form a corridor just inland from the beach and gradually grade into backdune plant communities (central coast dune scrub, dune swales, etc.) and the active coastal dune habitat. Species diversity and total vegetative cover is higher in this community than in the coastal strand community. Common species include: exotic European beachgrass (*Ammophila arenaria*), beach sand-verbena, yellow sand-verbena (*Abronia latifolia*), beach-bur, sea rocket, exotic ice plant (*Carpobrotus edulis*), dune morning glory (*Calystegia soldanella*), dune evening primrose, salt bush, cryptantha (*Cryptantha clevelandii*), dune poppy (*Eschscholzia californica maritima*), California aster (*Lessingia filaginifolia*) and coastal silver lupine (*Lupinus chamissonis*). Three rare plants are found in this plant community: beach spectacle pod (*Dithyrea maritima*), dune dandelion (*Malacothrix incana*), and surf thistle (*Cirsium thothophilum*). Where exotic sand-binding species like beachgrass and ice plant are not dominant, the foredune vegetation exists in a series of sand dunes which parallel the direction of the prevailing winds.

### Active Coastal Dunes

Non- vegetated active coastal dunes are not only a natural phenomenon, but also represent the most common habitat type found within the Nipomo dunes. The principal characteristic of this habitat is its lack of vegetation. Dunes of this habitat type form along the coastal strand and extend inland until stabilized by the vegetation of the central coastal dune scrub. Active dunes move well inland from the coast and often cover older stabilized dunes by engulfing coastal dune scrub, dune swale, marsh, and riparian plant associations. The Nipomo dune area north of Oso Flaco Lake, which includes both the State Preserve and SVRA, is a vast open space of

moving sand of higher secondary dunes that form a massive dune ridge often exceeding 100 feet in elevation. Found in the hollows which are located both windward and leeward of this ridge are pockets or "vegetation islands" of central coastal dune scrub, willow thicket, and dune swale. Closer to the ocean the active coastal dune habitat type is broken up by parallel ridges, mounds, and hummocks of central coast foredune vegetation. The open areas immediately adjacent to the coast where the central coastal foredune vegetation exists, including the ridges and mounds mixed with the active coastal dunes, is the prime nesting habitat for the least tern and western snowy plover.

### Central Coast Dune Scrub

Central coast dune scrub inhabits the interdune and secondary dune area behind the central coast foredune habitat. Coastal dune scrub is a successionally older and more diverse native plant community. This plant community occupies more protected dunes in areas away from the immediate coast. It is also characterized by a more well-developed vegetative cover and soils which are considerably more stable than those of the foredune communities. The most common and primary native plant that stabilizes the sides and tops of the sand dunes in this habitat type is mock heather (*Ericameria ericoides*). A host of other native perennial herbaceous and woody plants grow in the sandy openings between the mock heather dominated areas. Principal amongst these are silver beach lupine, beach strawberry (*Fragaria chiloensis*), telegraph weed (*Heterotheca grandifolia*), Blochman's leafy daisy (*Erigeron blochmaniae*), dune lotus (*Lotus heermannii*), crisp dune mint (*Monardella crispa*), coyote bush (*Baccharis pilularis*), shrubby phacelia (*Phacelia ramosissima austrolittoralis*), wallflower (*Erysimum insulare suffrutescens*), locoweed (*Astragalus curtipes*), yarrow (*Achillea millefolium*), deerweed (*Lotus scoparius*), and coastal buckwheat (*Eriogonum parvifolium*).

### Coastal Willow/Wax Myrtle Thicket

Coastal Willow/Wax Myrtle Thicket is a unique plant association often mixed with the coast dune scrub . Arroyo willow (*Salix lasiolepis*) and wax myrtle (*Myrica californica*) are sub-trees and the vegetation appears as a thicket. Coastal willow/wax myrtle thicket is found in moist dune hollows that typically lack standing water and sometimes borders dunes, marshes, and ponds. This vegetation type is also successional to dune swales, and open ponds as these areas are engulfed by moving active dunes. The arroyo willow has an extensive root system which enables it to tap moisture in the lower water table even as building sand dunes make the water table less accessible. Pure willow thickets found at the crest of sand dunes are an indication of an active sand dune having engulfed a hollow, which at one time may have been a pond or dune swale. As the sand shifts via wind erosion, the willow is able to survive by continuously rooting from the buried branches. The understory is often sparse beneath the willow/wax myrtle association. The native wax myrtle grows with the willow primarily in moist flats and hollows behind the main dune ridge summit. Other native plants associated with the coast willow/wax myrtle thicket include: poison oak (*Toxicodendron diversilobum*), gooseberry (*Ribes divaricatum*), blue elderberry (*Sambucus mexicana*), twinberry (*Lonicera involucrata ledebourii*), blackberry (*Rubus ursinus*), and coyote bush.

### Coastal Dune Swale

The coastal dune swale habitat exists in small valleys and swales located between stabilized and active dunes where small to large depressions are near the water table (such as in many "vegetation islands"). This plant association is transitional (ecotonal) in nature and also represents later stages of hydrosere succession. It should be considered part of the dry end of the wetland vegetation mosaic that occurs in these valleys. The vegetation is a mixture of wetland and coastal dune scrub species. The willow/wax myrtle thicket association is often found adjacent or mixed with his habitat type. The primary ground cover in the coastal dune swale is made up of creeping rush (*Juncus leseurii*). Often this plant extends several feet in elevation up the sides of adjacent sand dunes. The native sedges, *Carex pansa* and *C. praegracilis* tend to dominate the more mesic flats in the coastal dune swale. Native plants associated with the coastal dune swale include: saltgrass (*Distichlis spicata*), creeping wild rye (*Leymus triticoides*), goldenrod (*Solidago californica*), California groundsel (*Senecio californica*), wire lettuce (*Stephanomeria virgata*), fiddleneck (*Amsinckia spectabilis microcarpa*), evening primrose (*Oenotheria hookeri*), wedgeleaved horkelia (*Horkelia cuneata sericea*), cinquefoil (*Potentilla egedii*), and spike rush (*Eleocharis macrostachya*).

### Coastal Freshwater Marsh and Ponds

Coastal freshwater marsh vegetation is found in aquatic areas that develop in and around ponds, lakes, and slow moving water sources. Standing water is persistent for much of the year. The vegetation is made up of shore plants and floating and emergent hydrophytes. Common plants found associated with the marsh shore include: saltgrass, rushes (*Juncus* spp.), monkeyflower (*Mimulus guttatus*), smartweed (*Polygonum punctatum leptostachyum*), marsh goldenrod (*Solidago confinis*), and stinging nettle (*Urtica holosericea*). Plants (i.e. emergent macrophytes) in the open water along pond shores include: common tule (*Scirpus acutus*), common reed (*Phragmites communis*), bullrush (*S. cernuus*, *S. microcarpus*, & *S. pungens*), and cattail (*Typha latifolia*). Floating and creeping emergent aquatic species include: Ludwigia (*Ludwigia palustris*), marsh pennywort (*Hydrocotyle verticillata*), water cress (*Rorippa nasturtium-officinale*), mosquito fern (*Azolla filiculoides*), duck weed (*Lemna minor* and *L. minuta*), pondweed (*Potamogeton pectinatus*), and water mote (*Wolffia punctata*).

### Coastal Dune Riparian Woodland

Coastal dune riparian woodland is a semi-aquatic vegetation found adjacent to freshwater marshes, ponds, and creeks (like that surrounding Oso Flaco Lake). Black cottonwood (*Populous trichocarpa*), arroyo willow, yellow willow (S. *lasiandra*), and velvet willow (*S. sitchensis*) are part of the riparian woodland type. Coast live oak (*Quercus agrifolia*) and wax myrtle are also found in scattered locations in successionally older portions of the riparian woodlands. Additional native plant species include: marsh baccharis (*Baccharis douglasii*), coyote bush, mugwort (*Artemisia douglasiana*), poison oak, virgin's bower (*Clematis* sp.), hedge-nettle (*Stachys pycnantha*), blackberry, and giant wild rye (*Leymus condensatus*).

### *Recent Vegetation Change and Historic Recreation*

European beachgrass was introduced on the northern dune area near Pismo Beach and in front of Pavilion Hill early in the century (circa 1905). Aerial photographs show that by 1949 the

the vicinity of Grand Avenue by the mid 1950's before this area was purchased by DPR. After 1950, beachgrass was extensively planted to stabilize the open sand dune area just north of Pier Avenue west of the State Beach campground. While there is no direct confirmation of beachgrass plantings south of Pier Avenue after 1950, by 1961 beachgrass was well established in the foredune areas where the Preserve is today and along the foredunes south of Oso Flaco Lake. African ice plant was also introduced along the Nipomo dunes early in the century. Unlike European beach grass, which tends to spread slowly from sites of introduction, ice plant spreads rapidly via wind, water, and wildlife. The native sand dune structure is very different from that of a sand dune system dominated by beachgrass and ice plant. Beachgrass and ice plant cover the foredunes with dense vegetation, smother the native vegetation and rapidly build the foredunes in both height and mass. On the other hand, foredunes dominated with native plant species tend to be covered with less vegetation and do not build to heights above 10 to 15 feet. Native foredunes are relatively low and run parallel to the prevailing winds, whereas foredunes dominated by beachgrass and ice plant are steeper, higher, wider and tend to build perpendicular to the prevailing winds.

During the period between 1949 and 1961 the mouth of Arroyo Grande Creek changed dramatically due to a combination of upstream water development and the establishment of beachgrass and ice plant. In 1949 a "back-up" arm of the creek extended south behind the native foredunes to a small lake (about half way between mile post 1 and 2). Sand dunes were just beginning to cut off this lake when the aerial photographs were taken. By 1961 this arm of the creek was completely cut off and the lake had become a wet meadow. Additionally, small thickets of willows were appearing where the creek once existed. Beachgrass was well established in front of the lake/meadow area at this time and a new beachgrass foredune area was becoming established further south, where mile post 3 stands today. Today the wet meadow area is a large willow thicket surrounded by beach grass.

The Oso Flaco Creek mouth also changed dramatically between 1949 and 1961. In 1949 a small lake existed in the main channel area west of main Oso Flaco Lake. In 1961 this area had become a wet meadow. Today this area is a willow thicket and the creek has turned to the south.

During the 1960s and early 1970s, off-highway vehicle use of the dune area increased. By the time the 1973 aerial photographs were taken, dune buggy riding was common and dune rail drag racing events were being held on Maidenform Flats in July. The 1973 aerial photographs show increased disturbance of the vegetation around Oso Flaco Lake and Worm Valley (behind Pavilion Hill). Wide trails were established in the native dune scrub vegetation in 1973 and the front of Pavilion Hill was being heavily impacted by these trails. The foredune vegetation south of Pavilion Hill was primarily made up of dune grass, ice plant and native vegetation. This vegetation mosaic stayed relatively intact between 1961 and 1976.

Between 1976 and 1983 there was a gradual and almost imperceptible loss of the foredune habitat in the most heavily used area between Pavilion Hill and Oso Flaco Lake. The primary reason for this was the development of three and four wheeled all terrain vehicles (ATVs) which quickly became the most popular vehicle type and greatly expanded ridership

access throughout the area. The exotic European beach grass located in front of Pavilion Hill was reduced to scattered individual clumps and much of the foredune sand had blown away. Today, the beach grass windward of the Pavilion Hill enclosure has almost completely disappeared and most of the beach grass inside the western end of the enclosure has been inundated by moving sand. So much sand has blown away, that the old asphalt road leading to the old Pavilion (circa 1905) has been exposed.

Since the non-riding areas and vegetation islands were fenced and protected from off-highway vehicle disturbance (1982-83) the vegetation behind the fence has made substantial recovery. This can clearly be seen by comparing the 1983, 1986, and 1994 aerial photographs. Vegetation has expanded within the enclosures and most of the riding trails have disappeared. In the 1986 aerial photographs (three years after fencing), the large open dune area just west of Oso Flaco Lake still had little vegetation. In the 1994 aerial photographs, pioneer plants and small colonies of native vegetation have been established behind the fence and the vegetation along the lake edge has expanded.

### *Exotics*

There are four introduced plants species that are considered major weeds and a threat to the plant communities and habitat of the Nipomo dunes. These are: European beachgrass, African ice plant, pampasgrass (*Cortaderia jubata*), and veldtgrass (*Ehrharta calycina*). In addition to these four major weedy species, there are a couple other species of less significance which are discussed below.

#### European beachgrass

European beachgrass has been extensively planted in the past for the purpose of sand dune stabilization. Beachgrass spreads primarily by runners and where it has been planted it completely dominates the native vegetation as a monoculture. Beach grass can be considered a vegetation type unto itself because of its competitiveness and dominance. Beachgrass dominates the native coastal strand primarily on the north end of Oceano Dunes SVRA near Pismo City beach and on the western front of Pismo Beach State Preserve. The southern portion of Pismo Beach State Preserve immediately adjacent to the SVRA has less beachgrass with more open native dune habitat and is an area where the Western Snowy Plover nests. Only a few clumps of beachgrass are present within the main OHV riding area. Beachgrass is present, though not dominant on the fenced coastal strand north of the mouth of Oso Flaco Creek. South of Oso Flaco Creek, within The Nature Conservancy's Nipomo Dunes Preserve, beachgrass is present intermittently in the coastal strand and expanding downwind into the secondary dune area for several miles towards the mouth of the Santa Maria River. South of the Santa Maria River beachgrass is almost totally absent in the central coast foredune vegetation. This area consists of hummocks of native foredune vegetation mixed with open active sand dunes and is the largest nesting area for both the least tern and western snowy plover.

#### Ice plant

The coastal foredune vegetation is also heavily invaded by African ice plant (*Carpobrotus edulis*). Like European beachgrass, African ice plant could be considered a vegetation type unto itself. Wherever it has been planted it smoothers and dominates the native foredune vegetation.

Unlike European beachgrass, African ice plant spreads vigorously by seed and has spread up and down the Nipomo foredune area from Pismo Beach to Point Sal. Pismo Dunes Natural Preserve has African ice plant mixed with the extensive beachgrass stands. African ice plant is very common in the foredunes and secondary dunes south of the mouth of Oso Flaco Creek. In addition to the African ice plant, there is another exotic ice plant species (*Carpobrotus chilensis*) which is also common within the Nipomo dunes. *C. chilensis* is most common in the secondary dune and back dune areas. Unlike the African ice plant, *C. chilensis* does not dominate the native plant community. For example, on top of big Coreopsis Hill, *C. chilensis* is completely compatible with the rich, diverse native plant community, growing in long single lines or spider-like sprays, dying in the center as it creeps along the ground. Because of this fact, many ecologists tend to believe *C. chilensis* is actually native to California. Between the foredune and backdune areas both ice plant species hybridize and exist in a cline with *C. edulis* types dominating closer to the ocean and *C. chilensis* types more common in the backdune areas.

### Pampasgrass

Pampasgrass is a large bunchgrass native to southern Argentina that becomes extremely weedy in the moist sandy sites within the Nipomo dunes. When unchecked, pampasgrass can completely dominate a site and exclude all native vegetation. The plants often get quite large and are difficult to remove by hand. Scattered pampasgrass plants and small populations are found mixed in the central coast foredune vegetation, as well as in the central coast dune scrub and the coastal dune swale vegetation. State Parks personnel and volunteers from the California Native Plant Society have removed many of these plants and seedlings and have been very effective in reducing the size of some of the smaller stands of pampasgrass. Seedlings are continually germinating in those areas once occupied by pampasgrass and in areas near other populations. Constant vigilance is necessary to remove this plant from the Nipomo Dune Complex.

### Veldtgrass

Veldtgrass is an introduced perennial grass from South Africa that was introduced as a forage grass for livestock grazing in the early 1900's. It is extremely well adapted to sandy soils and has naturalized in the region primarily on the Nipomo Mesa. It is common in California coastal areas from San Luis Obispo County south to San Diego County. Veldtgrass has completely changed the vegetation composition of the more inland sites (backdunes) of the central coast dune scrub along the back of the Nipomo Dune Complex. It is so dominant that the possibility of restoring this community may be impossible and veldtgrass can now be considered a naturalized component of this central coast dune scrub phase. Because of this, eradication and restoration activities related to veldtgrass should concentrate in preventing this noxious grass from invading foredune vegetation and impacting areas of rare and endangered plant habitat.

### Other exotic species

Another plant found along the coastal strand from Pismo Beach to the State Preserve is an introduced dune grass, *Elytrigia juncea boreali-atlantica* (formerly *Elymus/Agropyron multinodus*). This grass is easily confused with the native dune grass, *Leymus mollis,* which is not found south of Morro Bay. While this grass is compatible with European beachgrass, no native plants grow with it. This dune grass is not a major threat to native coastal strand or coastal dune vegetation.

During the late 1800's extensive groves of blue gum (*Eucalyptus globulus*) were planted along the backdune area of the Nipomo Dune complex, especially on the Nipomo Mesa. The eucalyptus plantations have a very sparse understory vegetation with very few native plants. Limited plantings of eucalyptus have occurred on the Nipomo Dunes Complex and consideration should be given to removing these small stands especially where the native coastal dune scrub vegetation is being impacted.

***Threatened, Endangered, and Sensitive Plants***

A total of sixteen threatened, endangered, or otherwise sensitive plant taxa have been recorded or might be expected to be found within the Oceano Dunes SVRA (Appendix 2). Five of these taxa are classified as endangered or threatened either by the Fish and Wildlife Service or the Department of Fish and Game. Of these, only three plants: marsh sandwort (*Arenaria paludicola*), Gambel's watercress (*Rorippa ganbelii*), and beach spectacle-pod, (*Dithyrea maritima*) are found in or near the Oceano Dunes SVRA. Marsh sandwort and Gambel's watercress are aquatic plants that have been recorded in the past at Oso Flaco Lake. Hoover reported the last sighting of marsh sandwort in 1970 and Gambel's watercress has not been sighted in Oso Flaco Lake since 1982. Beach spectacle-pod is protected and monitored closely within the fenced-off area in the foredune area just north and south of Oso Flaco Lake. Three plants haven't been detected or are extirpated from the SVRA. La Graciosa thistle (*Circium locholepis*) is found in the Dune Lakes property to the east of the SVRA. Surf thistle (*C. rhothphilium* ) no longer occurs in the Oso Flaco area. San Luis Obispo monardella (*Monardella frutescens* ) is known to occur on nearby Big Coreopsis Hill. Five of the eleven remaining sensitive plants, not listed as threatened or endangered, are found in relative abundance within protected areas in Oceano Dunes SVRA. The three remaining potentially sensitive plants, desert almond (*Prunus fasciculata* var. *punctata*), giant spiny rush (*Juncus acutus* var. *sphaerocarpus*), and short-lobed broomrape (*Orobanche parishii* ssp. *brachyloba*) have not been found in the Oceano Dunes SVRA area. Desert almond is an uncommon plant potentially found in the rear dune regions south of Oso Flaco Lake. Giant spiny rush is found near the mouth of the Santa Maria River. Short-lobed broomrape has not been seen in the Oceano Dunes vicinity since 1967.

**Fauna**

***Mammals***

The largest vegetation islands have the greatest diversity of wildlife (Kutilek, et al 1991). The population of small mammals within these vegetative islands has been found to be abundant. Common small mammal species listed in order of abundance include: deer mouse (*Peromyscus maniculatus*), Heermann kangaroo rat (*Dipodomys heermanni*), California Mouse (*Peromyscus californicus*), California meadow mouse (*Microtus californicus*), dusky-footed wood rat (*Neotoma fuscipes*), western harvest mouse (*Reithrodontomys megalotis*), and California pocket mouse (*Perognathus californicus*).

Nine large mammals have been found on or adjacent to Oceano Dunes SVRA. The Coyote (*Canis latrans*) was most abundant via both direct sighting (night and day) and tracks. Track sightings include gray fox (*Urocyon cinereoargenteus*), racoon (*Procyon lotor*), Audubon

cottontail (*Sylvilagus auduboni*) and the striped skunk (*Mephitis mephitis*). Black-tailed deer (*Odocoileus hemionus columbianus*) and black-tailed jackrabbit (*Lepus californicus*) were sighted only at night. American badger (*Taxidea taxus*) was seen incidentally in the Tosco Refinery property, which is managed by the SVRA.

***Reptiles and Amphibians***

Several native reptiles and amphibians have been found within the Nipomo dunes in recent surveys. Small and medium-sized islands of vegetation are inhabited by the western fence lizard (*Sceloporus occidentalis*). Larger vegetation islands are inhabited by both the western fence lizard and the Pacific tree frog (*Hyla regilla*). Most of the reptiles and amphibians were found on the largest vegetation islands adjacent to or connected to the back-dune upland vegetation. These species include southwestern pond turtle (*Clemmys marmorata*), and California horned lizard (*Phrynosoma coronatum*). The southwestern pond turtle also occurs in Oso Flaco Lake. In addition to these more common species, incidental sightings of the California legless lizard (*Anniella pulchra*) and the western toad (*Bufo boreas*) have been recorded within the Nipomo dunes. In addition to the species mentioned above for the SVRA, the red-legged frog (*Rana aurora draytonii*) and the two-striped garter snake (*Thamnophis* hammondii) were observed at Oso Flaco Lake. The western pond turtle, the California legless lizard, the California horned lizard, and the two striped garter snake are listed by the California Department of Fish and Game as species of special concern. The red-legged frog is listed by the US Fish and Wildlife Service as Threatened.

***Birds***

Forty-three bird species have been sighted along the shoreline of Oceano Dunes SVRA (Kutilek et al 1991). Not all of the species are classified as shorebirds. Brewer's Blackbird (*Euphagus cyanocephalus*) and the American Crow (*Corvus brachyrhynchos*) are often seen feeding on organic material along the shoreline. Other non-shorebird species such as swallows are observed flying overhead. The most abundant species of shorebirds are Sanderling (*Calidris alba*), Heermann's Gull (*Larus heermanni*), California Gull (*Larus californicus*) , and Ring-billed Gull (*Larus delawarensis*)

Forty-six species of terrestrial birds have been sighted within the Oceano Dunes SVRA (Kutilek et al 1991). Fifteen species comprised 90% of all those detected. The small vegetation islands have the lowest number of terrestrial bird sightings. Oso Flaco Lake has 159 bird species represented (Burton and Kutilek, 1991). Raptors, including Red-tailed Hawk (*Buteo jamaicensis*), Great Horned Owl (*Bubo virginianus*), Barn Owl (*Tyto alba*), White-tailed Kite (*Elanus caeruleus*), Loggerhead Shrike (*Lanius ludovicianus*), and the Sharp-shinned Hawk (*Accipiter striatus*), are attracted to the dunes by the abundant population of small rodents, reptiles and small birds. Songbirds, upland game birds, and miscellaneous other species are especially plentiful in the areas of riparian growth and freshwater marshlands that exists around the lakes and within the larger vegetation islands. California Quail (*Callipepla californica*), Scrub Jays (*Aphelocoma coerulescens*), Mourning Doves (*Zenaida macroura*), and many other species also use the vegetated areas not associated with the wetlands for food, cover, and nesting sites.

***Threatened, Endangered, and Sensitive Wildlife***

Seven State and/or federally listed bird species occur around the Oso Flaco Lake Natural Area or in the SVRA. In addition, five sensitive herptiles (one listed), and one sea mammal are extant in Oceano Dunes. The Natural Diversity Data Base indicates that a sensitive insect was detected at Oso Flaco in 1980. Along with the listed species, eighteen birds, four herptiles, and one mammal of Special Concern occur in the SVRA or at Oso Flaco Lake Natural Area (Appendix 3). The listed birds include the Western Snowy Plover (*Charadrius alexandrinus nivosus*), California Least Tern (*Sterna antillarum browni*), American Peregrine Falcon (*Falco peregrinus*), California Brown Pelican (*Pelecanus occidentalis californicus* ), California black rail (*Laterallus jamaicensis coturniculus*), Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) and Swainson's Hawk (*Buteo swainsoni*). The most significant shore or water-associated birds sighted within the Oceano Dunes SVRA are the Western Snowy Plover (*Charadrius alexandrinus nivosus*) and the California Least Tern (*Sterna antillarum browni*). The Western Snowy Plover is state classified as a species of special concern and is a federally threatened species. The California Least Tern is both a state and federally endangered species. Both species have been extensively monitored and protected at the SVRA. The nearest tern nesting colony is at Mussel Rock, south of the Santa Maria River. Least Terns are observed feeding in the freshwater lakes within the Oceano Dunes region, primarily Oso Flaco Lake and the Dune Lakes. Successful nesting sites of the Snowy Plover have been observed at several locations within the SVRA. In 1997, there were twenty-one least tern nests in the SVRA, when the typical number is three to five. Both species are attracted to bare sand for nesting and rely on their cryptic camouflage to avoid predators (e.g., coyote, shrike, raccoon, skunk).

The American Peregrine Falcon, which is State and federally listed as endangered, is sighted occasionally at Oso Flaco Lake and at the beach in the SVRA. The California Brown Pelican, also listed by both agencies (CDFG,USFWS) as endangered, is seen along the beach , at the mouth of Arroyo Grande Creek, and over the ocean. One California black rail, listed as threatened by the State, was observed at Oso Flaco Lake by Burton (Burton and Kutilek, 1991) in the winter of 1991. The Western Yellow-billed Cuckoo is listed by the CDFG as threatened. One individual was observed in the Spring of 1990 at Oso Flaco Lake. Swainson's Hawk (State threatened) was regularly seen in the spring and summer months of 1990-1 at Coreopsis Lake (Burton and Kutilek, 1991).

One listed herptile species has been known to occur at Oso Flaco Lake, the federally threatened California red-legged frog. Ranger Dave Berry, Moro Bay State Park, observed red-legged frogs at Oso Flaco Lake from 1982-1986 (Burton and Kutilek, 1991).

As mentioned above in the herptile section, western pond turtles, California legless lizard, and California horned lizard inhabit the SVRA. The two-striped garter snake was only observed at Oso Flaco Lake. The western pond turtle can be found in some vegetation islands and in Oso Flaco Lake. The California legless lizard occurs in the vegetation islands and coastal dune scrub. California horned lizard was only seen in the Tosco Property (formally Union Oil) dune scrub. All of the above mentioned herptiles are listed by the California Department of Fish and Game as species of special concern.

The southern sea otter (*Enhydra lutris nereis*), which is federally threated, occasionally beaches itself in the SVRA. As mentioned above in the mammal section, American badger was seen in the early 1990's in the Tosco Refinery Property which is managed by the SVRA (Burton and Kutilek 1991).

Pacific Coast Steelhead (*Oncorhynchus mykiss*) was listed as threatened by the National Marine Fisheries Service in August 1997. The last known occurrance inside ODSVRA was approximately thirty years ago in the Arroyo Grande Creek. The SVRA will coordinate with the California Department of Fish and Game (CDFG) and the National Marine Fisheries Service with any surveys for the presence of Steelhead in Arroyo Grande Creek and if necessary, will adjust management practices should the species begin to inhabit the creek again.

There is habitat for Tidewater Goby (*Eucyclogobius newberryi*), a federally endangered fish, in Arroyo Grande Creek, although the CDFG have no recorded sightings for that location (CDFG 1997). The same measures pertaining to Steelhead will also be undertaken for this species (i.e. coordinating with appropriate agencies).

Upon reviewing the Natural Diversity Data Base for other sensitive species known to occur within or near the SVRA the White Sand Bear Scarab Beetle (*Lichnanthe albipilosa*), a federal Category 2 species of concern, was the only species not mentioned in reports done for this area. It was last seen in 1980 at Oso Flaco Lake.

## *Socio-Cultural Factors*

### Archeological & Historical features

The Oceano Dunes area is within the territory of the Indians of the northern Chumash, especially the group known as Obispeno. The native name for Obispeno appears to have been Stishini. Pismo and Huasna appear to be derived from Chumash village or area names (DPR 1975). The archeological sites from the SVRA date from the Canalino period which lasted from 2000 to 3000 years ago to the Spanish Conquest.

There are 14 sites within the Pismo Beach/Oceano Dunes parks, several cover less than 1500 square feet, five are between 3500 and 15000 square feet, and the two remaining sites are 54,400 and 67,500 square feet in area, respectively.

The small sites represent shell processing areas. The mid-sized sites suggest Indian camp locations, probably used during shellfish collection periods. The two largest sites may represent village sites, although the recorded depth of the sites leads one to think that favored camping locations are more likely.

Within the vehicle recreation area is one major archeological site, No. SLO-199, extending over nearly 25, 000 square feet.

The Pismo Beach region has an interesting post-Spanish conquest history. In 1769, Don Gaspar de Portola and his party camped in the area and killed an "oso flaco" (skinny bear) for food. Contanso, a member of the party, recounts "the party continued over the sand dunes (from Oso Flaco Lake) and then descended to the beach, along which they walked for several miles before camping for the night. Near their camping place was an Indian village of some forty people." Apparently, the party traveled up Pismo Beach after their bear meal.

A dance Pavillion called "La Grande Beach Pavillion" was constructed circa 1906 on what is now called Pavillion Hill. It was popular with ranchers and other locals for dance parties. It fell into disrepair in a few years and was eventually torn down about 1921. Dune stabilization was undertaken in front of the dance pavillion primarily with European dune grass and iceplant. Some of the wood may be still present including the foundation.

In the 1930's a group of people pursuing the "Bohemian lifestyle," and who referred to themselves as the "Dunites," lived in the vegetation islands area of what is now ODSVRA. They used native materials and wood from the crumbling building at Pavillion Hill to construct shacks in their settlement which they called "Moy Mell" which means "Pasture of Honey" or "Where the Spirits Dwell" in Gaelic. Dunite Ella Young, who coined the Moy Mel name, was Irish and devoted much of her life to the study of Celtic Mythology. Frenchy, aka George Blaise, was the protagonist in the book on Dunites, "The Face of the Clam." He was known to be a nudist, cosmic thinker, and somewhat of a vegetarian. The Dunites provided a colorful chapter to the human history of the area. The settlement was broken up in World War II. The last Dunite to live in the dunes, Bert Skivink, died in 1974. His cabin was burned, and scavengers and shifting sands have obliterated nearly all traces of the presence of the other Dunites.

**Visitor Use**

Oceano Dunes SVRA is visited for various types of recreation including kite flying, sport and commercial fishing, horse back riding, walking, and beachcombing. In 1994 an extensive visitor survey was undertaken at Oceano Dunes SVRA (OHMVR 1995). In general, most of the visitors were day users who resided locally or in the California Central Valley. The users accessed the park via a vehicle and engaged in off-highway vehicle use, sightseeing, walking, and beach driving. A majority (56%) of the visitors spend most of their time in the OHV area. Eleven percent of the park visitors camp in the dunes south of Post 2 (Figure 7).

The most common users in the open-riding area are drivers of all-terrain vehicles (ATV)(quads, three-wheelers). They comprise approximately forty percent of the users. The remaining OHV users in the SVRA drive sport-utility vehicles, dirt bikes, sand rails, dune buggies, and other 4WD street legal vehicles.

The busiest time of year at Oceano Dunes is the summer, especially Memorial Day, Fourth of July, and Labor Day weekends. Spring break has become increasingly more popular in the late 90's. An average of one million people visit the SVRA annually. Oceano Dunes attracts the highest number of visitors of all the SVRAs, with Ocotillo Wells SVRA in the Colorado Dessert being the second highest with about 200,000 visitors.

### *Management Practices*

One of the first resource management tasks of the newly created OHMVRD at Oceano Dunes was the construction of the fence system to preserve and protect the dune plant communities. The determination of areas for protection from vehicular recreation was performed jointly by a professional committee of ecologists and managers from several public agencies (the County of San Luis Obispo, the California Coastal Commission, the California Department of Fish and Game, and the California Department of Parks and Recreation). As a result of this determination, in 1983 the slack "vegetation-island" plant communities, Oso Flaco Lake, and the southern 1/3 of Oceano Dunes SVRA north and south of Oso Flaco Lake were permanently closed to OHV recreation. In total, approximately 56% of the area managed as the State Vehicular Recreation Area was closed to vehicular recreation. The southern entrance at Oso Flaco Lake was closed to traffic, and beach access and parking lots and kiosks were constructed at the Grand Avenue and Pier Avenue entrances. These actions were implemented in order to monitor and control access to the open riding area of Oceano Dunes. During the first five years of OHMVRD management, fencing and law enforcement were the primary tools used to manage the natural resources and to control OHV impact. Subsequently, as noted below, dune stabilization and plant community restoration projects were implemented.

Dune stabilization and plant community restoration projects were implemented early in the management of Oceano Dunes by the OHMVRD, and have continued to be one of the most important resource management programs at Oceano Dunes (Sellery *et al.* 1983, Hallock *et al.* 1991, Hazebrook and Holland 1994). In many respects, the Oceano Dunes ranger and maintenance staff have developed cutting edge dune restoration methods. They have done this both in the collection and propagation of local plant material (with the assistance of Native Sons Nursery in Arroyo Grande), and in the application of restoration techniques such as temporary irrigation, straw punching, and seedling planting. The success of the Park's staff in developing these specialized techniques was shared with other restoration specialists when the Park hosted the Dune Guild meeting of the California Chapter of the Society for Ecological Restoration (1995). In 1996 Oceano Dunes SVRA hired an on-site Assistant State Park Resource Ecologist to coordinate the tern and plover monitoring program, the dune restoration program, and the habitat monitoring duties.

# Oceano Dunes Habitat Monitoring Methodology

## *Introduction*

A comprehensive baseline survey of flora and fauna was conducted at Oceano Dunes SVRA in 1991 by Dr. Michael Kutilek and others from San Jose State University (Kutilek *et al.* 1991a). The resulting document served as an initial inventory, wildlife habitat protection program and monitoring program for Oceano Dunes SVRA. Additional focused studies under the guidiance of Dr. Kutilek were performed including a report on the Nipomo Dune Complex and the unique associated wetlands (Kutilek *et al.* 1991b) and since 1990, several monitoring reports on the abundance of the threatened Western Snowy Plover and endangered California Least Tern (Burton 1990, Burton and Kutilek 1991a, 1991b, 1993, 1994, Burton *et al.* 1994, 1995, Perry 1992, 1994, 1995, 1996). The plover and tern reports define the bird survey methodologies that continue to be a major part of the habitat monitoring program at Oceano Dunes SVRA. In 1996, Oceano Dunes SVRA hired an Assistant State Park Resource Ecologist to continue to monitor and provide information for the management of the Western Snowy Plover and the California Least Tern (Tipton and Burton 1996). The current Oceano Dunes Habitat Management Plan (HMP) for the Western Snowy Plover and the California Least Tern (CDPR 1997) contain complete details regarding the monitoring program for these sensitive species.

Aerial photography of Oceano Dunes is conducted every two years in order to assess the impact of vehicular recreation to the dune system. This photographic record, as well as histroic aerial photographs have been compiled for analysis into a computer based Geographical Information System (GIS) format by the San Diego State University Center for Earth Systems Analysis Research (CESAR 1994). Because the initial Kutilek plan was done in the third year of an extended drought, it was recommended that an additional vegetation survey be performed for enlarging the baseline habitat monitoring data. In 1994, a more typical weather year, a vegetation survey and analysis was conducted of the major vegetation slack islands under the guidance of Professor V. L. Holland at the California Polytechnic State University, San Luis Obispo (Hazebrook and Holland 1994). The Oceano Dunes monitoring program utilizes control monitoring sites of similar vegetation/wildlife habitat where OHV recreation is not allowed to aid in comparing data from OHV riding areas. This effort includes the establishment of plots at Oso Flaco Lake Natural Area, the dune scrub area east of the riding zone, the Dune Preserve just north of Oceano Dunes SVRA, and the protected foredune region north of the mouth of Oso Flaco Creek. A key component of the Oceano Dunes monitoring program is the continued annual and seasonal monitoring of the known locations of the threatened, endangered and sensitive plant species where permanent measuring plots have been established. An additional element of the Oceano Dunes monitoring program is analyzing and assessing the effects of management practices, especially revegetation (Layne and Bros 1993).

In conjunction with the formal monitoring protocols, rangers and maintenance staff note any incidental sightings of wildlife in the SVRA. Rangers note the sightings in their daily log of

activities and maintenance staff communicates directly with the staff resource ecologist. The rangers' log is periodically reviewed by the resource ecologist and subsequently noted in the annual report.

## *Monitoring Protocols*

### Vegetation

#### *Vegetation Islands*

Purpose: To measure sand movement and aspects of this plant community to assess trends.

What: Sample open sand and herbaceous and tree/shrub layer along cross island transects.

Where: Dune Preserve, Pavillion Hill, Acacia, Ecalyptus Tree, Pipeline, Maidenform Flats (Figure 7).

When: Summer or early fall, once a year.

How: The same transects set up by Art Hazebrook (Hazebrook and Holland 1994) which are 50 meters long are used. Tree/ shrubs ( >1m) (black cotton wood, arroyo willow, mock heather) are sampled with the line intercept method where the start and end point of the shrub are noted. The herbaceous layer (wall flower, grasses, rushes) is sampled with 2m by 0.5m randomly distributed rectangular quadrats using a random number table. After the quadrats are established, the same place is sampled every year. The quadrats are oriented with the long axis perpendicular to the north-south vegetation gradient. The quadrats are placed alternately on the right and left sides of the transect. Percent of cover and height of tallest individual of each species in each quadrat is measured. At least ten quadrats are placed.

The vegetation in the vegetation islands is monitored once a year because the sand movement around and into the islands is very dynamic and the transects in the islands are an effective way to measure sand encroachment into the islands.

#### *Foredune Vegetation*

Purpose: To record assemblages of plants in the foredunes.

What: Survey the frequency and cover of foredune vegetation.

Where: The revegetation area at the southern boundary and north of Oso Flaco Lake.

When: Summer, once a year.

How: Five 30 meter permanently located transects. The dune plants are sampled with 2m by 0.5m randomly distributed rectangular quadrats using a random number table. After the quadrats are established, the same place is sampled every year. The quadrats are oriented with the long axis perpendicular to the north-south vegetation gradient. The quadrats are placed alternately on the right and left sides of the transect. Percent of cover and the height of the tallest individual of each species in the quadrat is measured. At least ten quadrats are placed.

This habitat is very dynamic, "blowouts" from the wind occur frequently, therefore, it is necessary to monitor once a year in the foredunes.

***Landscape Vegetation Trend Analysis***

Purpose: To determine larger plant community changes.
What: Measure area and boundaries of different plant communities on aerial photos.
Where: Aerial photographs of the entire park.
When: Every two years.
How: Measure the acreages of the different plant community types in the SVRA: Polygons are identified around the plant communities and vegetation islands on aerial photographs and area is measured with a digital planimeter. It is anticipated that all measurements will be accomplished with ArcView computer software in the future along utilizing digital orthophotography.

**Birds**

***Shoreline Transects***

Purpose: To record endemic and transient birds to establish trends and add to the body of knowledge and data.
What: Survey of bird species and numbers along shoreline at Oceano Dunes.
When: Once every season, 2 consecutive days in the Winter, Spring, Summer and Fall.
How: Survey conducted within a few hours of low tide. Surveyor records time and mileage and begins at Grand Ave., driving south recording numbers of birds and species. The bird survey is divided into two transects, one above high tide line and one below. The survey area is further divided into five sections: Grand Ave. to Pier Ave.; Pier Ave. to Mile Post 2; Mile Post 2 to Sand Hwy. cut off; Sand Hwy. to south riding boundary; and on foot from the south riding boundary to Oso Flaco Creek. At the end of each section time, mileage and bird count are recorded. When large groups of gulls are spotted the total number of gulls are counted first, then estimated as to the number of each species. For large groups of single species, like Sanderlings, estimates are made of their total numbers. In order not to count the same birds twice, only birds that are flying north are counted.

***Terrestrial Birds, Vegetation Islands***

Purpose: To record population data of terrestrial birds.
What: Determine individual numbers of each species in the vegetation islands.
Where: In nine vegetation islands: Pavillion Hill, South BBQ, N. Acacia, Cottonwood, Eucalyptus Tree, Pipeline, Maidenform Flat, South Indian Midden, Boy Scout Camp, (Figure 7) and three plots in Tosco.
When: Twice a year: June and first two weeks of October.
How: One plot per island/control.
Variable circular plots technique (Reynolds *et al.* 1980, Jones and Kutilek 1988) is utilized to sample birds. The observer walks to the center of each established plot or, if the plot was thickly vegetated or on a slope, to the highest open point on the plot. The observer records all birds that

flush during the approach with the aid of binoculars. The distances of the birds from the observer are measured with a range finder. The observer remains at the observation point for ten minutes and records all birds detected by sight or vocalizations. The plots will be sampled during the peak of daily bird activity, from 1/2 hour after sunrise until 1100 hrs.

***Wetland Birds***

Purpose: To record the population of resident and migratory wetland birds.
What: Determine individual numbers of each species.
Where: Oso Flaco Lake open water and riparian area.
When: Every two years survey 5 plots. Survey twice a year in June and the first two weeks in October,
How: Variable circular plot in riparian area (see above). Timing of the survey should be similiar to terrestrial birds. The open water area will be surveyed from the foot bridge in Oso Flaco Lake and the species will be noted and their respective numbers counted.

***Bird Night Survey***

Purpose: To record nocturnal bird species.
What: Survey for the presence/absence of black rails and owls and other nocturnal birds.
Where: Oso Flaco for Black Rails and vegetation islands for owls and other nocturnal birds
When: Black Rail: beginning of June; Owls: January or February.
How: Black Rail: Time-play survey, play the Black Rail call and listen for response. Owls: Listen for courting owls at night

**Small Mammals**

Purpose: To record small mammal densities and diversities in the vegetation islands.
What: Acquire density and species diversity data.
Where: Four islands (L2, M3, S3, M2 per Kutilek) which includes one small island, two medium sized and one large island as well as Tosco Refinery property and Maidenform Flat to serve as control areas. M2 was chosen to detect any movement from the small island to the south (Figure 7).
When: Spring, three consecutive nights, every two years.
How: Sherman live traps (long ones) baited with wild bird seed and walnut oil, and supplied with cotton bedding are placed 10m apart around the perimeter of the vegetation island or area (Wone 1997). The grid system is not used because the vegetation is too dense. Each control area and large island will have a total of 50 traps while the medium and small islands will have 30 and 20 traps, respectively. The beginning of the trapline is randomly placed at a point around the perimeter. Captured rodents are identified as to species, ear-tagged (National Band and Tag Co, Newport, KY), sexed, and released at the site of capture. All traps are checked and closed in the morning before 0900 HR and are opened again in the evening.

### Large Mammals

#### *Track Station*

Purpose: To record nocturnal carnivores in the area.
What: Records presence/absence.
Where: Vegetation islands. Three track stations; one small, medium, and large island.
When: Three consecutive nights; once a year during the spring.
How: A level area in the vegetation island is located and a 1 $m^2$ area on the sand is smoothed (Wone 1997). Sand is wetted with a spray bottle; being sure the sand is wet to a least 1 cm depth. Prior to smoothing and wetting the sand, odoriferous cat food is affixed to the center of the 1 m2 area. Cat food is fastened to the sand by running a cable though it and then twisting the cable to lock it on to the can. The other end of the cable is then wrapped to a small brick and then buried. Additional small holes are poked on the top and bottom of the can to enhance scent emissions.

#### *Night Spotting*

Purpose: To record larger mammals and other wildlife active at night.
What: Records presence/absence; but can provide more detailed information if behavior, sex, and age are noted.
Where: In between islands, perimeter of islands.
When: Minimum: Spring once per year for three consecutive nights; optimum spring and fall
How: Two methods are being compared for effectiveness (Wone 1997): night-spotlighting and the use of a night scope. Night-spotlighting is conducted from a vehicle using a handheld spotlight (spotlight should be a minimum of 400,000 candlepower). Spotlighting will be done in transit between predetermined islands and also at the perimeter of the island. Surveyors search for eye shines and identify the animal. The procedures for the use of the night scope is the same as night-spotlighting, but the scope will be used instead of a spotlight.

### Herptiles

Purpose: To determine presence/absence of reptiles and amphibians.
What: Time-constrained searches.
Where: Three islands and Oso Flaco Lake area.
When: April and October
How: Time constrained searches (Bury and Raphael 1983) are performed in suitable habitat. Areas are searched thoroughly for one hour, turning over rocks, logs, and other debris to look for amphibians and reptiles beneath. Moist areas including ponds and large pools of water (eg. Oso Flaco Lake) and around the bases of shrubs are searched.

### Threatened and Endangered Species

Results regarding new locations of sensitive plants, animals or plant communities are submitted to the California Natural Diversity Data Base annually.

### *Threatened and Endangered Flora*

Purpose: To follow the population trends of plant species of special concern.
What: Making an absolute count in a predetermined area that the species inhabits.
Where: Various (See Appendix 2).
When: During peak flowering periods.
How: Find populations and place small wooden stakes on the corners of the population. Count the numbers of individual plants within the stakes. A grid system is utilized for mapping (Barry 1996). The number of pollinators in a ten minute period is recorded. Surveys are conducted in late morning, when flowers open up.

All beach spectacle pod locations and selected populations of more abundant species such as crisped monardella, wedge-leaved horkelia, dune larkspur, San Luis Obispo monardella, suffrutescent wallflower, and Blochman's fleabane daisy are monitored. Marsh sandwort and Gambel's watercress are searched-for annually with the cooperation of the Department of Fish and Game. In addition, the two locations of giant coreopsis (Big and Little Coreopsis Hills) are closely monitored because these locations are the northernmost range of the species. Sensitive species not presently found on Oceano Dunes SVRA including: La Graciosa thistle, surf thistle, short-lobed broomrape, giant spiny rush, dunedelion, and the sand almond are searched-for every year during the sensitive plant inventory.

### *Threatened and Endangered Fauna*

#### Western Snowy Plover

Purpose: To monitor this species in the SVRA to provide proper protection for the continued success of the population.
What: Breeding and winter surveys.
Where: From Pismo Creek to 2 km south of Oso Flaco Creek.
When: Early March to September; December and January.

*Breeding:*

Where: From Pismo Creek to 2 km south of Oso Flaco Creek.
When: Early March to September.
How: With the onset of breeding in March, surveying for nesting Western Snowy Plovers is begun by driving the primary dunes, in suitable habitat, in a sinuous pattern in order to find every possible nest and/or egg. The "search images" are adult nesting birds or eggs in the sand. The area between Grand Avenue and Pier Avenue is surveyed by driving or walking along the foredunes. The OHV riding area is surveyed primarily by vehicle. Surveys are accomplished by foot south of the riding area. When surveying by foot, the Point Reyes Bird Observatory methodology (Warriner et al 1986) is utilized, which includes stopping and scanning an area with binoculars for tracks or birds. Surveys are conducted a minimum of four or more days per week. It is important to survey before the weekend to detect nests before the time the SVRA is busy (See 1996 Western Snowy Plover and California Least Tern Breeding Season at Oceano Dunes State Vehicular Recreation Area, California report and the Habitat Management Plan for more details).

Exclosures are erected around nest sites in the open riding area when located, per US Fish and Wildlife Service guidelines.

*Winter Surveys:*

Where: Pismo Creek to Mussel Rock. This area is divided into 3 sectors: Pismo Creek to Oso Flaco Creek, Oso Flaco Creek to Main Street in Guadalupe, and Main Street to Mussel Rock.

When: Mid December and Mid January.

How: The area from Pismo Creek to the Southern OHV riding boundary is surveyed by vehicle. The area south of this is surveyed on foot. The location and numbers of Western Snowy Plovers are recorded along with information on bands and sex. Surveys start around 8:00 am at all sectors.

The Habitat Management Plan (HMP) developed with the US Fish and Wildlife Service, requires that winter surveys be done from Grand Ave. to the Southern Boundary of the SVRA. Oceano Dunes SVRA is surveying the whole area from Pismo Creek to Mussel Rock to collect data on a more regional basis.

California Least Tern

Purpose: To monitor California Least Tern nesting success.

What: Breeding survey.

Where: In the riding area and around Oso Flaco Lake.

When: April to September.

How: The search for terns is made while conducting Western Snowy Plover surveys. The survey methodology entails stops at elevated points along the primary dunes to watch and listen for terns. Often they can be detected over large distances by their calls or by watching for the erratic flight of gulls attempting to escape the assault of terns defending a territory. The survey also looks for terns in the Dune Preserve, the island section of the riding area (1-2 km inland from the shore), the Dune Lakes located immediately east of riding area, the Oso Flaco Lake Area, and the open dunes south of Oso Flaco Lake. Exclosures are erected for nests located in the open riding area (see 1996 Western Snowy Plover and California Least Tern Breeding Season at Oceano Dunes State Vehicular Recreation Area, California report and the Habitat Management Plan).

California Brown Pelican

The California Brown Pelican is monitored in conjunction with the shorebird count.

Swainson's Hawk

The Swainson's Hawk is monitored along with the vegetation islands and Oso Flaco Lake plots.

American Peregrine Falcon

The American Pergrine Falcon is monitored during the shorebird cound and by incidental sightings by rangers and staff.

Western Yellow-billed Cuckoo

The Western Yellow-billed Cuckoo is monitored in conjunction with the Oso Flaco Lake and vegetation island variable circular plots.

Southern Sea Otter

The southern sea otter is not formally monitored but incidental sightings by rangers, the ecologist, and other staff are noted.

California Red-legged Frog

Purpose: To monitor for presence/absence of California red-legged frogs.
What: Aquatic and riparian habitat survey.
Where: At Oso Flaco Lake in the causeway and along the shore.
When: May 1 to November 1; four times, twice during the day and twice at night
How: Surveying for the frog during the above mentioned months decreases the possibility of disturbing breeding frogs, eggs, or tadpoles (USFWS 1997). Surveyors wait at least twenty-four hours before repeating surveys at the same site. Day surveys are conducted on clear sunny days and night surveys are conducted on warm still nights one hour after sunset and 12 midnight. The surveyor walks along entire shore, visually scanning all shoreline areas. When duckweed or other floating vegetation is present, the surface of the water is scanned. Care is taken not to disturb sediments, vegetation or any visible larvae. When walking on the bank, care is taken not to crush rootballs, overhanging banks, and streamside vegetation that might provide shelter for frogs. When conducting night surveys flashlights and headlamps using four to six D batteries or one 6-volt battery are used in order to not harm frogs with bright spotlights (see 1997 USFWS Guidance for more details).

Red-legged Frogs were last recorded at Oso Flaco Lake Natural Area in 1986. They were observed in nearby Coreopsis Lake, north of Coreopsis Hill in 1991. No confirmed sightings have been made since that date. These surveys are conducted to determine presence/absence and, if present, abundance. If located, USFWS monitoring and management protocols will be developed and implemented.

Steelhead

Currently, no active monitoring program is in place for this species by State Park staff because they do not presently occur in the SVRA. Pacific Coast Steelhead was listed as threatened by the National Marine Fisheries Service in August 1997. The last known occurrance inside ODSVRA was approximately twenty years ago in the Arroyo Grande Creek. The SVRA will coordinate with the California Department of Fish and Game (CDFG) and the National Marine Fisheries Service with any surveys for the presence of Steelhead in Arroyo Grande Creek and, if necessary, will adjust management practices should the species begin to inhabit the creek again.

Tidewater Goby

The tidewater goby inhabits estuaries. The presence of the tidewater goby in the seasonal estuary formed within the floodplain of Arroyo Grande Creek is doubtful. It is common, since the construction of Lopez Dam (12 miles upstream), for the Arroyo Grande Creek floodplain to

completely dry up during the dry season. In the years in which some water has remained to form an estuary, the low volume of fresh water coupled with infusion of salt water from high tides may increase the salinity above 10 parts per thousand which is higher than the published acceptable level of salinity for the species. The channelization of the creek has exacerbated the situation by not allowing any places for the goby to seek refuge when there are high volume releases from the dam. Winter storms breach the sandbar that builds at the mouth of Arroyo Grande Creek as well, scouring the floodplain and thereby removing the estuary. It is highly unlikely, given the hydrological regime, that a population of tidewater gobies could survive in Arroyo Grande Creek.

The California Department of Fish and Game have no recorded sightings for that location (CDFG 1997). If through coordination and communication with the USFWS and CDFG, the presence of tidewater goby is confirmed, Oceano Dunes will coordinate with these agencies in adjusting management practices to ensure protection of the species.

**Species of Special Concern and other Sensitive Species**

Results regarding locations of sensitive plants, animals or plant communities are submitted to the California Natural Diversity Data Base annually.

Sensitive Birds

The following species of special concern listed in Appendix 3 will receive specific attention while sampling the variable circular plots in the vegetation islands, dune scrub, and Oso Flaco Lake or along with the shorebire transects, wherever appropriate: Common Loon, White Pelican, Double-crested Cormorant, Long-billed Curlew,California Gull, Elegant Tern, Northern Harrier, Osprey, Black-shouldered Kite, Cooper's Hawk, Sharp-shinned Hawk, Ferruginous Hawk, Golden Eagle, Merlin, Black Swift, California Horned Lark, Loggerhead Shrike, Yellow Warbler, and Tri-colored Blackbird.

American Badger

The badger can be detected using the track station and nightspotting methodologies listed above.

White Sand Bear Scarab Beetle

The Natural Diversity Data Base indicates that White Sand Bear Scarab Beetle, a federal Category 2 species was last seen in 1980 at Oso Flaco Lake. There is no current active monitoring program by State Park staff for this species at Oceano Dunes SVRA. Oceano Dunes will coordinate with the California Department of Fish and Game (CDFG) and the U.S. Fish and Wildlife Service with any surveys for the presence of the beetle at Oso Flaco Lake and, if necessary, will adjust management practices should the species begin to inhabit the lake area again.

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# Appendix 1: Sample Matrix

# HIMS MATRIX

## FLORA HABITAT No. 1 VEGETATION ISLAND #1 (OHV area)

| MEASURE | SDJ | | | | | SDI | | | | | % COVER | | | | | % EXOTICS | | | | | X1 | X2 | Xo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect or Quadrat # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 4 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 5 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| | | | | | | | | | | | | | | | | | | | | | | Sum | #DIV/0! |
| | | | | | | | | | | | | | | | | | | | | | | Y | #DIV/0! |

## FLORA HABITAT No. 1 VEGETATION ISLAND #2 (OHV area)

| MEASURE | SDJ | | | | | SDI | | | | | % COVER | | | | | % EXOTICS | | | | | X1 | X2 | Xo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect or Quadrat # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 4 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 5 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| | | | | | | | | | | | | | | | | | | | | | | Sum | #DIV/0! |
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## FLORA HABITAT No. 1 VEGETATION ISLAND #3 (NON OHV area)

| MEASURE | SDJ | | | | | SDI | | | | | % COVER | | | | | % EXOTICS | | | | | X1 | X2 | Xo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect or Quadrat # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 4 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 5 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| | | | | | | | | | | | | | | | | | | | | | | Sum | #DIV/0! |
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## FLORA HABITAT No. 2 FOREDUNE VEGETATON (Reveg. area)

| MEASURE | SDJ | | | | | SDI | | | | | % COVER | | | | | % EXOTICS | | | | | X1 | X2 | Xo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect or Quadrat # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 4 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 5 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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## FLORA THREATENED AND ENDANGERED SPECIES

| MEASURE | ABSOLUTE COUNT | | | | | POLLENATOR COUNT | | | | | | | | | | X1 | X2 | Xo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species & plot # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | | | | | | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
| 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
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| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
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| 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
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# HMS MATRIX

## FAUNA: BIRDS - Shoreline Transect

| MEASURE | SDJ | | | | | SDI | | | | | Night Survey SDJ | | | | | Night Survey SDI | | | | | X1 | X2 | Xs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| OHV 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| OHV 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| No OHV 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| No OHV 2 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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## FAUNA: BIRDS - Vegetation Island Habitat

| MEASURE | SDJ | | | | | SDI | | | | | % COVER | | | | | % EXOTICS | | | | | X1 | X2 | Xs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Island & Plot # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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## FAUNA: BIRDS - Wetlands Habitat

| MEASURE | SDJ | | | | | SDI | | | | | Night Survey SDJ | | | | | Night Survey SDI | | | | | X1 | X2 | Xs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plot # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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## FAUNA: MAMMALS

| MEASURE | TRACKS IDENTIFICATION & FREQUENCY SDJ | | | | | TRACKS ID & FREQUENCY SDI | | | | | NIGHT SURVEY SDJ | | | | | NIGHT SURVEY SDI | | | | | X1 | X2 | Xs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| plot # | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | Present / Base | Present / Previous | (X1+X2)/2 |
| 1 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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| 3 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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| 5 | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
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## FAUNA: THREATENED AND ENDANGERED SPECIES

| MEASURE | ABSOLUTE COUNT (WINTER) | | | | | ABSOLUTE COUNT (# OF NESTS) | | | | | | | X1 | X2 | Xs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | | | Present / Base | Present / Previous | (X1+X2)/2 |
| | | | | #DIV/0! | #DIV/0! | | | | #DIV/0! | #DIV/0! | | | #DIV/0! | #DIV/0! | #DIV/0! |
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## ECOSYSTEM TREND ANALYSIS

| MEASURE | AERIAL ANALYSIS - ACREAGE | | | | | % NATIVE SPECIES & % EXOTIC SPECIES | | | | | AERIAL ANALYSIS - DENSITY | | | | | | X1 | X2 | Xs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | base year | previous year | present year | present / base | present / previous | | Present / Base | Present / Previous | (X1+X2)/2 |
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| SUMMARY OF ORDINAL SCORES (T) | |
|---|---|
| FLORA HABITAT 1 (veg island #1) | #DIV/0! |
| FLORA HABITAT 1 (veg island #2) | #DIV/0! |
| FLORA HABITAT 1 (veg island #3) | #DIV/0! |
| FLORA HABITAT 2 (foredune) | #DIV/0! |
| FLORA: T&E | #DIV/0! |
| FAUNA BIRDS(shoreline) | #DIV/0! |
| FAUNA BIRDS(veg island) | #DIV/0! |
| FAUNA BIRDS(wetland) | #DIV/0! |
| FAUNA MAMMALS | #DIV/0! |
| FAUNA: T&E | #DIV/0! |
| ECOSYSTEM | #DIV/0! |
| Ts | #DIV/0! |

# Appendix 2:Plant Species of Special Concern, Oceano Dunes

The U. S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (DFG) are charged with listing and protecting rare plants at the federal and state level (Endangered Species Act 1973, California Endangered Species Act 1984). In addition, the California Native Plant Society (CNPS) lists and monitors the status of all rare, endangered, and threatened plants in the *Inventory of Rare and Endangered Vascular Plants of California* (1994). A total of seventeen threatened, endangered, or otherwise sensitive plant taxa have been recorded or are expected to be found in the Oceano Dunes SVRA region. Two plants have recently been classified as endangered by the USFWS. Seven species are listed by the USFWS as Candidate species (Category 1 and Category 2). Category 1 (C1) are taxa which the Service has enough information on the biological vulnerability and threats to support proposals to list them as endangered or threatened species. Category 2 (C2) are taxa that the Service does not have enough data on file to support federal listing. Category 3 (C3c) indicates that the service considers the taxa too widespread or not threatened. The DFG lists one endangered plant (CE) and four threatened plants (CT). The CNPS lists eleven plants as rare and endangered in California (List 1B) and five plants on a "watch list" as having limited distribution (List 4). CNPS also gives each plant a R-E-D Code (Rarity, Endangerment, and Distribution with numbers ranging from 1-3 in each category. A higher number is an indication of greater sensitivity:

**R (Rarity)**

1. Rare but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time;
2. Occurrence confined to several populations or to one extended population;
3. Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

**E (Endangerment)**

1. Not endangered;
2. Endangered in a portion of its range;
3. Endangered throughout its range.

**D (Distribution)**

1. More or less widespread outside California;
2. Rare outside California;
3. Endemic to California.

One other native plant, giant coreopsis (*Coreopsis gigantea*), though not sensitive merits monitoring and protection. Giant coreopsis is common in its overall range, however, Oceano Dunes SVRA has the extreme northern extent of its range. Table 1. lists the rare, threatened, endangered, and sensitive plant species found or expected to be found on the Nipomo dunes along with their 1993 status with CNPS, USFWS, and DFG. These sensitive plants exist in protected areas in and around Oceano Dunes SVRA. A few of the more common plants like

crisped monardella and Blochman's fleabane daisy are found inside the enclosed vegetation islands within the Oceano Dunes SVRA. None of the plants are within open off-road vehicle areas. The Appendix describes these species and required habitat in more detail.

**Table 1. List of threatened, endangered, or sensitive plant taxa found or expected to be found in the Oceano Dunes SVRA region listed in priority order.**

| | Scientific Name | Common Name | CNPS (R-E-D) | USFWS | CA DFG |
|---|---|---|---|---|---|
| 1 | *Arenaria paludicola* | marsh sandwort | List 1B 3-3-2 | Endangered | Endangered |
| 2 | *Rorippa gambelii* | Gambel's watercress | List 1B 3-3-2 | Endangered | Threatened |
| 3 | *Cirsium loncholepis* | La Graciosa thistle | List 1B 3-2-3 | C1 | Threatened |
| 4 | *C. rhothphilum* | surf thistle | List 1B 2-2-3 | C1 | Threatened |
| 5 | *Dithyrea maritima* | beach spectacle-pod | List 1B 3-3-2 | C1 | Threatened |
| 6 | *Orobanche parishii* ssp. *brachyloba* | short-lobed broomrape | List 1B 2-2-2 | C1 | None |
| 7 | *Delphinium parryi* | dune larkspur | List 1B 3-2-3 | C2 | None |
| 8 | *Monardella crispa* | crisped monardella | List 1B 2-2-3 | C2 | None |
| 9 | *M. frutescens* | San Luis Obispo monardella | List 1B 2-2-3 | C2 | None |
| 10 | *Horkelia cuneata* ssp. *sericea* | wedge-leafed horkelia | List 1B 3-3-3 | C2 | None |
| 11 | *Erigeron blochmaniae* | Blochman's fleabane daisy | List 1B 1-2-3 | C3c | None |

| | | | | | |
|---|---|---|---|---|---|
| 12 | *Erysimum insular* var. *suffrutescens* | suffrutescent wallflower | List 4 1-2-3 | None | None |
| 13 | *Juncus acutus* var. *sphaerocarpus* | giant spiny rush | List 4 1-2-1 | None | None |
| 14 | *Malacothrix incana* | dunedelion | List 4 1-1-3 | None | None |
| 15 | *Prunus fasciculata* var. *punctata* | desert almond | List 4 1-1-3 | None | None |
| 16 | *Coreopsis gigantea* | giant coreopsis | None | None | None |

Distribution and Habitat Requirements of the Threatened, Endangered, and Sensitive Plants

Marsh sandwort (*Arenaria paludicola*) is a slender perennial herb of the pink family (Caryophyllacea) that roots at the nodes of procumbent stems. It grows in swamps and freshwater marshes near the coast and was once more widespread, extending in range from Washington State to southern California. Today the sole extant population occurs at Black Lake Canyon north of Oso Flaco Lake. Black Lake Canyon drains the Nipomo Mesa into the Dune Lakes area where several lakes and marshes exist. Hoover (1970) reports this taxa at Oso Flaco Lake but plants have not been located there in the last 20 years.

Gambel's watercress (*Rorippa gambelii*) is a rhizomatous perennial in the mustard family (Brassicaceae) found along the immediate coast in freshwater or brackish marsh habitats at the margins of lakes or along slow flowing streams. It was once common along California's coast from San Luis Obispo County to Baja Mexico. Today only three populations remain, all in San Luis Obispo county. Gambel's watercress was sited at Oso Flaco Lake in 1982 by Dr. Keil (Holland *et al* 1993) and a small population was recorded in Black Lake Canyon in 1992. Recent surveys (Holland *et al* 1993) have not relocated these plants. However, it is difficult to gain access to the marsh around Oso Flaco lake and these plants may still occur there.

La Graciosa thistle (*Cirsium loncholepis*) is a low-growing biennial thistle with white flowers in the sunflower family (Asteraceae). It grows in areas close to the margins of coastal wetland habitats from San Luis Obispo County south to northern Santa Barbara County. It has been reported from Black Lake to the Canada de Las Flores marshes near Los Alamos. Several small populations exist around wetland areas on the Nipomo Dunes Preserve (TNC) south of Oso Flaco Lake. Today the main population is found south of the mouth of the Santa Maria River.

Surf thistle (*Cirsium rhothphilum*) is a low-growing short-lived thistle in the sunflower family (Asteraceae) with white-felty, ripply leaves. The plants die after flowering which can take

up to five growing seasons. Surf thistle is a pioneer plant that is endemic to the ocean bluffs and bare foredune areas from Point Conception to Pismo Beach. In the Oceano Dunes region surf thistle is found on the Nipomo Dunes Preserve south of Oso Flaco Lake, along the Santa Marina River channel, and behind the foredunes on the Leroy Trust lands just north of Mussel Point and south of the county land managed by The Nature Conservancy.

Beach spectacle pod (*Dithyrea maritima*) is a low growing, small perennial with decumbent, leafy stems and widely spreading rhizomes in the mustard family (Brassicaceae). It grows in active sand dunes and foredunes, often where the sand is moving. It occurs sporadically along the coast from northern Baja to San Luis Obispo County and on two of the California Channel Islands. In the Oceano Dunes area, Beach spectacle pod is found in the protected dunes immediately north of Oso Flaco Lake, on the Nipomo Dunes Preserve, between the beach and Oso Flaco Lake, and in the Guadalupe Oil Field north of the mouth of the Santa Maria River.

Dune larkspur (*Delphinium parryi* var. *blochmaniae*) is an erect perennial herb with deeply lobed leaves and a raceme of large, dark blue flowers in the buttercup family (Ranunculaceae). It occurs on stabilized dunes from San Luis Obispo County to Ventura County. In the Oceano Dunes area, dune larkspur grows primarily on the stabilized dunes behind the open dunes and on the Nipomo Mesa. It is found in the protected dune scrub areas near Oso Flaco Lake and on the Nipomo Dunes Preserve in the vicinity of Big Coreopsis Hill.

Crisp monardella (*Monardella crispa*) is an aromatic woody perennial sub-shrub with clustered purple flowers in the mint family (Lamiaceae). It colonizes bare sandy areas and moving sand dunes. Crisp monardella occurs primarily from Pismo Beach south to Point Conception. Crisp monardella is generally abundant on the in the Oceano Dunes area, within the protected vegetation islands and protected areas.

San Luis Obispo monardella (*Monardella frutescens*) is similar to *Monardella crispa*, but often is a more slender plant. The two species occasionally hybridize. San Luis Obispo monardella is a locally common component of the more stabilized coastal dune scrub communities in the protected backdunes.

Short-lobed broomrape (*Orobanche parishii* ssp. *brachyloba*) is a parasitic herbaceous plant in the Broom-Rape Family (Orobanchaceae). It grows on sandy soil near the ocean on California's southern coast and on the California Channel Islands. Only two mainland locations are listed in the Natural Diversity Data Base (DFG 2/9/94): at Point Loma, San Diego County, and at Oso Flaco Lake. Short-lobed broomrape was last reported from the vicinity south of Oso Flaco Lake in 1967 by Hoover.

Wedge-leafed horkelia (*Horkelia cuneata* ssp. *sericea*) is a spreading woody perennial in the rose family (Rosaceae). It grows on sandy soils in coastal dune scrub communities. Wedge-leafed horkelia historically occurred from Marin to Santa Barbara counties in a variety of coastal sites. Wedge-leafed horkelia is locally abundant in the protected dune scrub and stabilized back dune area.

| Species | Status* | Location* |
|---|---|---|
| **Birds** | | |
| California Horned Lark (*Eremophila alpestris actia*) | CSC | S |
| Loggerhead Shrike (*Lanius ludovicianus*) | CSC | S, OF |
| Yellow Warbler (*Dendroica petechia brewsteri*) | CSC | S, OF |
| Tri-colored Blackbird (*Agelaius tricolor*) | CSC | OF |
| **Herptiles** | | |
| CA Red-legged frog (*Rana aurora draytoni*) | FT, CSC | OF |
| Southwestern pond turtle (*Clemmys marmorata pallida*) | CSC | S, OF |
| California horned lizard (*Phrynosoma coronatum frontale*) | CSC | S, OF |
| Silvery legless lizard (*Anniella pulchra*) | CSC | S, OF |
| Two-striped garter snake (*Thamnophis hammondii*) | CSC | OF |
| **Mammals** | | |
| Southern sea otter (*Enhydra lutris nereis*) | FT | S |
| American badger (*Taxidea taxus*) | CSC | S# |

*Key

| | |
|---|---|
| SE | Listed as Endangered by the State of Californa |
| ST | Listed as Threatened by the State of California |
| CSC | California Department of Fish and Game "Species of Special Concern" |
| FE | Listed as Endangered by the Federal Government |
| FT | Listed as Threatened by the Federal Government |
| S | Observed in the SVRA, north of the southern OHV riding boundary |
| S# | Observed in Tosco Refinery Propety, managed by the SVRA |
| OF | Observed at Oso Flaco Lake Natural Area |