

Geologic Formation of the Nipomo-Guadalupe Dunes
And Historic Background of the Preserve

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ABSTRACT

The public is often misinformed or unaware of the natural geology of the Nipomo-Guadalupe sand dunes. Therefore the aim of this project was to compose an educational documentary for adults and children to learn why and how these dunes formed, which should lead to a greater interest in their protection. The study site was located within the Nipomo-Guadalupe Dunes, which included the area between Oso Flaco Lake and the Pier Avenue entrance which is just north of the Pismo Dunes Natural Preserve. I gathered information through library research, touring the dunes using an off-highway vehicle, and receiving input from the employees of the Nipomo-Guadalupe dunes State Park. This information was organized into an informational video to be used for educational purposes within the State Park system. Once people become more educated of the dune geology and vast history of the area they will be able to make informed decisions regarding their usage and protection of this spectacular dune system on California's West coast.

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Chapter 1: Introduction

The Oceano Dunes State Vehicular Recreation Area (SVRA) is located on the Central Coast of California. This State Park consists of 3,600 acres of coastline along the Pacific Ocean (SVRA pamphlet, 2011). This particular SVRA offers a variety of recreational activities including off-roading, bird watching, hiking, fishing, and horseback riding. Oceano Dunes staff is always searching for new ways to educate the public about their State Park and what it offers. This is achieved through their Interpretive Program and various marketing techniques (Bellman, 2011, pers com). It is the job of Park and Recreation Specialist, Dena Bellman, to come up with innovative ways to promote Oceano Dunes SVRA. In August 2011, she developed a plan to compose a video in the hopes of educating visitors of the Oceano Dunes about its history and unique geology. Due to Dena's busy schedule she enlisted some help in carrying out this task. The video then became available for me to complete as my senior project.

The overall goal was to develop an educational video based on dune geology that can be used for outreach purposes to better educate the public on this topic. The Oceano Dunes was the focus of this geologic research which included the origin of sediments, the processes of ocean currents, natural dune vegetation, and the power of wind combined in perfect harmony to produce a dune ecosystem. This goal was achieved through the help of videographers, local geologists, and recreation specialists all involved in the Oceano Dunes State Park system.

In order to compose a video that accurately covered major aspects of the Oceano Dunes I had to research its cultural resources, natural resources, geology of the dunes, off-highway vehicle aspect of the dunes, and the community's attachment to this vast ecosystem. It was

crucial that I understood how the Arroyo Grande creek and the Santa Maria River wash sediments into the ocean, providing a source of sand to the beach. It was important to research the factors that allowed the sand dunes to form in this specific geographic area. The goal of the Oceano Dunes State Park was for me to illustrate the connection between the environmental factors of the dunes with the recreation aspect of the OHV area. Also, I found it necessary to learn more about this particular State Park and how they manage and protect these dunes.

My video will be used by the Oceano Dunes SVRA whenever an educational tool is needed. Examples of this include being used as a visual aide for the Oceano Dunes SVRA Interpretive Program and as a link on the Oceano Dunes website, ohv.parks.ca.gov. The video will also be organized as a series of six short YouTube videos which will be available to the public for viewing.

Chapter 2: Literature Review

Overview of the Nipomo-Guadalupe Dunes Complex

Introduction

If you have ever driven along Highway 1 through Pismo there is no doubt you have noticed a spectacular dune system. The Nipomo-Guadalupe Dunes Complex is located on the Central Coast of California and consists of 3,600 acres along the Pacific Ocean (SVRA pamphlet, 2011). These dunes are known worldwide as the most extensive coastal dunes left in California (SVRA pamphlet, 2011). Today, the dunes are mainly known for their recreational aspect however there is much more to be learned about this unique, natural ecosystem.

History of the Dunes

The Dune Complex has a rich history dating back 10,000 years ago to its first inhabitants, the Chumash (Hammond, 2004). The Chumash were a tribe of hunters and gatherers who migrated seasonally to the coast in search of food and shelter (Hammond, 2004). The Mediterranean climate and abundant food supply made the Central Coast, specifically the Nipomo-Guadalupe Dunes, a sufficient place to live permanently (Hammond, 2004). The famous “Pismo” clams, or *Tivela stultorum*, were the primary food source of the Chumash (Hammond, 2004). To this day we see evidence of this through excavation of the Indian middens on the Central Coast (SVRA pamphlet, 2011). The Chumash weren’t the only ones to call the dunes their home, another infamous group of people took residence there many years after.

A new era of growth began in Oceano on March 31, 1901 when two sections of railroad joined together linking the small beach town to Los Angeles and San Francisco leading way to an influx of visitors (Hammond, 2004). Shortly after the completion of the railroad, Oceano became known as “The Atlantic City of the West” (Hammond, 2004) by promoting their boardwalk, dance pavilion, and railroad (Hammond, 2004). A special group of individuals known as “The Dunites” took a liking to the peace and solitude that the dunes offered (The Dunes pamphlet, 2011). “The Dunites” can be described as a group of free-thinkers, artists, writers, nudists, mystics and hermits (The Dunes pamphlet, 2011).

The interest and fame of the Nipomo-Guadalupe Dunes led to some much welcomed attention from Hollywood filmmakers (The Dunes Center, 2011). The Guadalupe Dunes served as the filming site for the iconic film “The Ten Commandments” back in 1923(The Dunes Center, 2011). Over the years the movie set has been buried by the constantly shifting sand (The Dunes Center, 2011). As Hollywood filmmaking was in its heyday another pastime was developing in the Nipomo-Guadalupe Dunes.

Driving vehicles on the Oceano Dunes has been an activity there since the early 1930’s (Austin and Hammond, 2010). Some of the very first dune buggies were made out of old automobile frames (Hammond, 2004). In 1953 a man named Jerry Miller was one of the first to modify a dune buggy to increase traction on the dunes (Austin and Hammond, 2010). The Nipomo-Guadalupe Dunes are a place to take in the beauty of the natural ecosystem while also enjoying recreational activities just as the dunes were used in the past.

Dune Formation/Geomorphology

In regards to the Nipomo-Guadalupe Dunes Complex, a question many people have is “Why is there so much sand and how did it get there?” (Harris, 2011, pers com). To have a dune ecosystem form requires a unique combination of two main environmental conditions (Harris, 2011, pers com). The first is having sources of sediment (Harris, 2011, pers com). The sediment that formed the dunes in the Oceano SVRA (state vehicular recreation area) was carried to the ocean by the Santa Maria River and the Arroyo Grande Creek (Harris, 2011, pers com). Those sediments get dumped into the ocean where the churning waves break down them down into tiny grains of sand (Bannan, 1989). The sand gets carried by the longshore current; this current carries water and sediments parallel to the coastline until the sediments get washed up onto the beach by the churning waves (Harris, 2011, pers com). The sand gets blown by the wind until the grains get caught on dune vegetation or driftwood and begin to build up into the dunes we see on the beach (Parks, 2004). As the dune grows larger it becomes destabilized as layers of sand get deposited on the windward facing slope (Harris, 2011, pers com). By the process known as saltation, grains of sand blow across the dunes, up the peak of the dune, and are pushed down the leeward slope (Harris, 2011, pers com). Fine grains are the first to move to the leeward side, followed by heavier grains once they are destabilized by the wind (Harris, 2011, pers com). The result of this process is a repetition of layers that go from fine grains to heavier grains; these layers are called lamina (Harris, 2011, pers com).

The second condition necessary to form dunes is a prevailing wind (Harris, 2011, pers com). Typically, the Central Coast receives wind from the northwest (Harris, 2011, pers com). Dune formation depends on this wind to carry the recently deposited grains of sand and without this wind dunes would not exist (Harris, 2011, pers com). Dunes are constantly shifting and changing shape as wind direction changes (Harris, 2011, pers com). When wind changes direction the sand begins to form cross beds (Bannan, 1989). Cross bedding occurs when a layer of sand is covered by a new layer of sand that is being blown in from a different direction (Harris, 2011, pers com). It is these two environmental conditions, sediment source and prevailing wind that allow for the formation of the Nipomo-Guadalupe Dunes Complex.

Barchan Dunes and Transverse Dunes

Within the Nipomo-Guadalupe Dunes Complex you should expect to see two different types of sand dunes. These dunes are categorized by their shape. Transverse dunes occur when northwest winds push the sand into ridges at varying heights (Bannan, 1989). The windward facing slope rises gradually as the leeward side of the slope drops off abruptly, often called the slip face (Bannan, 1989).

Another type of dune is the Barchan dune which forms when sand begins to build up on vegetation or any obstructions on the beach (Bannan, 1989). As the sand builds upon the obstruction it forms a simple dune that will continuously grow as more sand is deposited there by the wind (Bannan, 1989). Sand grains blow around the edges of the dune which over time produce arms, or “horns”, around the main dune, creating a crescent shape (Bannan, 1989).

Plants and Wildlife

A variety of plants and animals are able to flourish in the windy, sandy, and salty dune environment (SVRA pamphlet, 2011). Oso Flaco Lake is contained within the southern end of the Oceano Dunes SVRA and is home to more than 100 rare species (The Dunes pamphlet, 2011). This area is known for its excellent bird watching and wildlife viewing opportunities (The Dunes pamphlet, 2011). It is not well known that the Oceano Dunes SVRA is one of the most productive western snowy plover and least tern breeding grounds in California (SVRA pamphlet, 2011).

A total of 24 rare plant species can be found within the dunes, which includes the surf thistle and the giant coreopsis (SVRA pamphlet, 2011). Some of the native plant species that thrive on the dunes include the arroyo willow, California sagebrush, sand verbena, bush lupine, and Indian paintbrush (SVRA pamphlet, 2011).

State Parks Role in the Dunes

The State Park system was created on November 6, 1928 when California voters passed a referendum (Hammond, 2004). In 1935 Harold Guiton recognized the importance of the dunes and donated 4.8 acres to the State Park system which would later become part of what we know now as Pismo State Beach (Hammond, 2004). The original 4.8 acres has grown today to 3,600 acres which includes 1,500 acres of OHV terrain (SVRA pamphlet, 2011).

Running this park today requires a large staff which consists of rangers, maintenance and resource workers, park aides, volunteers, recreation specialists, and district employees. Resource workers are individuals who hold degrees in Environmental Science and are responsible for rehabilitation projects that receive funding from state grants (Bellman, 2011, pers com). Each year during the months of March and September, 260 acres are designated off-limits to OHV's

and are protected as the western snowy plover and least tern breeding grounds (SVRA pamphlet, 2011). Other rehabilitation projects include dune stabilization and fisheries monitoring (Bellman, 2011, pers com). Projects in the Oso Flaco area that have been ongoing since 2010 are invasive species removal and mapping of invasive species using remote sensing (Bellman, 2011, pers com). A wind tower located near the southern end of the Dunes Complex is titled Oceano Dunes SVRA S1 Tower and serves as a monitor of particulate matter in the air (Bellman, 2011, pers com). The data collected is important in evaluating whether or not the Oceano SVRA is responsible for a supposed increase in particulate matter affected nearby housing on the Nipomo Mesa (Bellman, 2011, pers com).

Conclusion

The Nipomo-Guadalupe Dunes Complex is a geologically unique area on California's Central Coast. While visiting the dunes you will find a balance of OHV recreation and a natural dune ecosystem rich in plant and wildlife. Not only does the dune complex provide miles of sand for off-roading adventures, but also gives people the opportunity to explore and learn about this beautiful, natural habitat. State Parks has shown a strong commitment to providing effective resource management to preserve the dunes for years to come. The dunes are thriving today, just as they did years ago when the first community was developed there.

Chapter 3: Materials and Methods

When making an educational video it is important to put together a team of experts who can assist you throughout the video making process. Proper equipment is also required to produce a professional video with high quality picture and sound. Once you have a team and filming equipment you are ready to begin.

Dena Bellman, a marketing/recreation specialist from the Oceano Dunes SVRA, oversaw my project and gave input as to what should be included in the video that would best explain the dunes. We worked together for about three weeks prior to filming to decide on the six most important topics to cover in the video. Within those three weeks we researched those topics and took detailed notes. The next step was to take those notes and develop an outline that could be used as commentary during the video.

Aaron Freitas, with Freitas Consulting out of Santa Cruz, California, was hired by the Oceano Dunes SVRA to film and assist with this video project. Aaron is familiar with this State Park and the way it is run because he works with their recreation specialist for all marketing that is done within the dunes. The camera he used was a Cannon 5D digital SLR. It is a simple camera to use and it has the capability of shooting HD video as well. The camera has interchangeable lenses that allow for macro format or extreme telephoto shots.

In order to enhance the formality of the video we decided to include commentary and video footage with Geologist Will Harris. Will is the Senior Engineering Geologist at California Geological Survey. His input in the video was greatly appreciated as he was very knowledgeable with various geological processes involving the Nipomo-Guadalupe Dunes. He has worked with

Dena and Aaron in the past so it was a very smooth filming process since the video team was already well acquainted.

Aaron Freitas completed all the editing for the dune geology video using Adobe Premier. He prefers Adobe Premier over Final Cut Pro because it is more compatible with other graphic software used for various design needs. Adobe Premier integrates easily with Photoshop, Illustrator, and Aftereffects. Those programs are all very helpful when editing a video similar to the one we made of the dunes. The process of editing is very simple and can be done in a few days. Sometimes, as in the case of our video, certain footage shot that contained live commentary was not very fluid or clearly spoken. Scenarios like this one makes the editing process more difficult and time consuming. Re-organizing the video content by clipping and cutting footage takes more time to organize.

It is important to make sure that you and your video team are able to adapt to each other's styles of communication and work habits to assure that the project will be completed successfully. Remember that filming and editing take more time than expected so plan accordingly in order to stay on schedule.

Throughout this entire filming process the video team and I were constantly assessing our work and enhancing the video to raise its level of excellence. Feedback should also be provided once the video is completed in order to ensure you have produced the highest quality of work possible. The video was first viewed and analyzed by Dena Bellman, Aaron Freitas, and myself. We critiqued the video and listened to each other's input to make certain we were pleased with the results. Allow time after the completion of filming to correct any editing or filming errors if you are not satisfied with the outcome.

Chapter 4: Anticipated Results

YouTube is an excellent way for Oceano Dunes State Park to share this video with the public. There are two specific reasons why YouTube is so effective. First of all, YouTube is the most searched video database in the world and can generate enormous exposure of video content (Freitas, 2011, pers com). The Oceano Dunes State Park will be creating a specific YouTube channel that allows them to brand and consolidate all of their video content and create a social environment around it in the hopes of enhancing their marketing efforts (Freitas, 2011, pers com). Secondly, YouTube makes it very easy to store and distribute video content from their website (Freitas, 2011, pers com). Though it is not yet fully completed, the video will be located on the Oceano Dunes SVRA YouTube page which can be accessed using the following URL: <http://www.youtube.com/user/OceanoDunesSVRA>.

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