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## Peninsular bighorn sheep of Coachella Valley

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PENINSULAR BIGHORN SHEEP OF COACHELLA VALLEY

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A Project  
Presented to the  
Faculty of  
California State University,  
San Bernardino

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts  
in  
Education:  
Environmental Education

---

by  
Frances Jolene Cassano

March 2004

PENINSULAR BIGHORN SHEEP OF COACHELLA VALLEY

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by  
Frances Jolene Cassano


March 2004

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## ABSTRACT

The basis of this study was to research environmental education and interpretive programs on Peninsular bighorn sheep, *Ovis canadensis cremnobates*, an endangered species in Coachella Valley, were available through federal, state, local agencies and organizations. In contrast to the abundant scientific information available about bighorn sheep, environmental education and interpretive programs were found to be very limited. Recommendations about future educational and interpretive programs were included.

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## CHAPTER ONE

### INTRODUCTION

The focus of this study was to research federal, state, local agencies and organizations on their environmental education and interpretive programs regarding Peninsular bighorn sheep, *Ovis candensis cremnobates*, a native species in Coachella Valley. This study provided a basis for making recommendations about educational and interpretive programs that could increase the education and awareness of Peninsular bighorn sheep and their habitat.

Peninsular bighorn sheep have been recognized in Coachella Valley as one of the region's most critical endangered species. On March 18, 1998, the population of Peninsular bighorn sheep in the United States Peninsular Ranges was placed on the endangered species list. Bighorn sheep are protected from Palm Springs, California, south to the United States-Mexico international border. Bighorn sheep are protected because of considerable population decline. The reduction of bighorn sheep has been attributed to disease, predation, habitat loss, and human disturbance (Bighorn Institute, 2003a).

The Bureau of Land Management (BLM) described the Coachella Valley in its proposed *California desert conservation area plan for the Coachella Valley and final environmental impact statement*, as an area covering more than 100 square miles. The Coachella Valley consists of broad and low elevations which run northwest to southeast along the westernmost limits of the Colorado Desert portion of the Sonoran Desert. It is bounded by the San Bernardino Mountains to the northwest, the Little San Bernardino Mountains to the northeast, the Salton Sea to the southeast, and the Santa Rosa and San Jacinto Mountains National Monument to the southwest (United States Department of the Interior, Bureau of Land Management, California Desert District Palm Springs-South Coast Field Office, 2002).

The preliminary review of scientific information on bighorn sheep led this author to conclude that an abundance of information was available to the public. The scientific information was found to be available in different formats, including publications such as U.S. Fish and Wildlife Service's *Recovery plan for bighorn sheep in the Peninsular Ranges, California* (2000). In most cases, such information also has been distributed to the public through formal modes of communication such as



public meeting announcements through the Bureau of Land Management's Palm Springs Desert District office and web site, [www.ca.blm.gov/palmsprings](http://www.ca.blm.gov/palmsprings).

Knowing that information is available, the goal of this project was to investigate several agencies and organizations that are key sources of information about bighorn sheep to determine the extent of their environmental education and awareness programs for children and adults. This goal was based on the premise that environmental education programs related to Peninsular bighorn sheep are needed for the public to be aware of habitat needs of bighorn sheep, relevant issues, problems and possible actions to protect their habitat.

Increases in habitat loss, degradation, and fragmentation by urban and commercial development, as well as increased use of recreation areas such as by hiking and off-highway vehicle use (motorized or non-motorized), are concerns that need to be addressed related to bighorn sheep. Since protection of the environment and its resources have been recognized by the public as being important (Botkin, 1995), habitat issues for bighorn sheep could have public support due to appropriate environmental education programs.

## CHAPTER TWO

### NATURAL HISTORY OF DESERT BIGHORN SHEEP

This chapter provides natural history and other relevant information on the Peninsular bighorn sheep in Coachella Valley to help establish an understanding of the needs of this endangered species. As appropriate, general information about desert bighorn sheep is provided.

*Ovis canadensis*, "Canadian sheep," is the scientific name for bighorn sheep. All bighorn sheep ranging from the Rocky Mountains and North American deserts are of the same species.

The term "desert bighorn" is used to describe the bighorn sheep that inhabit dry and barren desert environments. Four subspecies of the Canadian sheep are known as Desert bighorn sheep. These four subspecies of desert bighorn sheep are known as Nelson's, *Ovis canadensis nelsoni*; Mexican, *Ovis canadensis mexicana*; Peninsular, *Ovis canadensis cremnobates*; and Weem's, *Ovis canadensis weemsi*.

Desert bighorn sheep have remarkable capabilities for adaptation to Southern California's hot desert climate and terrain. The desert bighorn sheep live in dry, desert mountain ranges, in foothills near rocky cliffs, and near

permanent water when available depending on the season. The desert environment is almost waterless and relatively barren of vegetation but these incredible animals survive (Bighorn Sheep Desert USA, 2003).

Nelson's desert bighorn is the dominant race of the desert bighorn sheep. They are found in the Mojave Desert of southern Nevada, southern California, and northwestern Arizona. The Nelson's bighorn sheep have adapted to the high temperatures of Death Valley that can reach 134 degrees Fahrenheit (Toweill, 2003).

Mexican desert bighorn sheep live in the Sonoran Desert and to the south and west of the range of Nelson's desert bighorn sheep. The range of this subspecies includes Arizona, New Mexico, Texas, and the Mexican states of Sonora, Chihuahua, and Coahuila. This subspecies is less common than Nelson's desert bighorn sheep (Toweill, 2003).

Weem's bighorn sheep are found from Loreto, Baja California, south to the tip of the Baja peninsula. Weem's desert bighorn sheep live in desert habitats that include black soils and that have large amounts of drinking water sources. The vegetation is thick, semi-tropical with palo blanco and palo verde trees, and organ pipe and prickly pear cacti (Toweill, 2003).

Baja California has two subspecies of desert bighorn sheep, the Peninsular and Weems. The Peninsular bighorn sheep are found from Palm Springs in southern California southward, west of the Salton Sea to Loreto in Baja California Sur. Populations of Peninsular desert bighorns in California were identified as endangered in 1998 because of population loss, degradation, and fragmentation of habitat, all associated with urban development (U.S. Fish & Wildlife Service, 2000).

#### Physical Characteristics

The age of bighorn sheep can be identified by their physical appearances. Male bighorn sheep or "rams" are identified by their twisting horns that grow during their entire life. Adult ram's horns measure over 30 inches in length and reach 15 inches in circumference at the base. Female bighorn or "ewes" have slender, straight horns that grow throughout their lives of lengths from 12-17 inches. Young bighorn that are less than one year of age are referred to as lambs (Bighorn Institute, 2003a). Lambs will have no horns visible until two months and at four months of age will begin to show up as small hard bumps (Toweill, 2003).

Prime rams have broad, stout appearance, and when in full flesh they appear to be heavy in the body and do not look proportioned. Mature rams become saggy in their appearance, and hold their heads lower than younger bighorn sheep. Young rams have smaller horns and slimmer bodies that give them the appearance of prancing when moving (Hansen, 1980).

Young ewes are slender until the age of two years old. After having their first lambs around the age of three years old, they fill out in the body but still retain their slender appearance. Ewes have slender necks compared to rams. Prime ewes have well proportioned bodies and do not lose this appearance in old age (Hansen, 1980).

Young lambs have an appearance of being solid with a short nose and neck. Their legs are long but not like that of a fawn. Lambs rapidly fill out and at the age of two to three months have grown into miniature adult-shaped bighorn sheep that are well proportioned (Hansen, 1980).

#### Diet

Limited research has supported the findings that grasses, shrubs, and forbs are the primary food sources.

These bighorn sheep have been studied mainly in the Santa Rosa Mountains and Anza-Borrego Desert State

Park of California. However, little work has been done on food habits, and data from the handful of stomach analyses are slight. What data are presented is inconclusive. The relative importance of browse, grass, and forbs in the diet of these bighorn is unclear. What evidence there is, points to all three classes of food as being important. (Browning & Monson, 1980, p. 88)

#### Recovery Plan

The recovery plan for Peninsular bighorn sheep was signed and issued by the U.S. Fish and Wildlife Service in October 2000 after an endangered designation was received. The document was disseminated to federal, state, local agencies, and to the public upon request. The goal of the recovery plan was to have self sustaining wild population of species with the least amount of resources required (U.S. Fish & Wildlife Service, 2000).

In 2000, U.S. Fish and Wildlife Service estimated the current population to be 334 animals, distributed in eight known ewe groups (subpopulations) in Riverside, Imperial, and San Diego Counties from the San Jacinto Mountains south to the Mexican border. These Peninsular bighorn sheep were found to be located on the east facing, lower

elevation slopes below 4,600 feet of the Peninsular Ranges along the northwestern edge of the Sonoran Desert.

The purpose of the recovery plan was to establish goals and objectives, describe site-specific management actions to achieve the goals, and establish a schedule and estimate the costs associated to reclassify Peninsular bighorn sheep as threatened. The recovery plan provided guidelines and recommendations to be used in the development of conservation and management tasks associated with the recovery plan (U.S. Fish & Wildlife Service, 2000).

## CHAPTER THREE

### REVIEW OF AVAILABLE RESOURCES

#### Introduction

The design of this study was to visit federal, state, local agencies, as well as local organizations to review the extent of their scientific information on bighorn sheep and associated environmental and interpretive programs in Coachella Valley. The federal agency reviewed was the Bureau of Land Management (BLM), Palm Springs Coast Field Office. The state agency was the Anza Borrego Desert State Park, Borrego Springs, California. The local zoo selected, a nonprofit organization, was The Living Desert Zoo and Gardens, Palm Desert, California. A private non-profit organization, Bighorn Institute, located in Palm Desert, California, was reviewed. The Natural Science Collaborative of the Desert Region (NSCDR) a broad-based cooperative partnership was selected as the community partner. Also included was the interagency group named The California Desert Managers Group which includes members from federal and state agencies such as the Department of Defense, Department of Interior and the State of California.



## Bureau of Land Management

The Bureau of Land Management (BLM), Palm Springs South Coast Field Office, manages approximately 1.7 million acres of public land. The acreage is spread over 9.5 million acres in five geographic segments of Southern California, each with their own issues and management emphasis.

The Palm Springs South Coast Field Office is responsible for public lands in the urban interface where growth is occurring. The BLM's vision is to enhance the quality of life for all citizens through the balanced stewardship of America's lands and resources. Its mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. This federal agency's values are to serve with honesty, integrity, accountability, respect, courage, and commitment to make a difference. BLM's priorities include improving the health and productivity of the land to support multiple use missions and cultivating community based conservation, citizen centered stewardships and partnerships (United States Department of Interior, Bureau of Land Management, California Desert District Palm Springs-South Coast Field Office, & United States Department of Agriculture Forest Service San

Bernardino National Forest San Jacinto Ranger District, 2003).

The BLM in Coachella Valley has a history of working with federal, state and local governments, as well as organizations, schools, and the public, to conserve the excellence of the local landscape and its resources. The BLM is a partner in a public process that provides a forum for all cooperating entities to recognize and resolve issues (California Biodiversity News, 2003).

The BLM agency dedicated December 2003 as "Bighorn Sheep" month at the Santa Rosa and San Jacinto Mountains National Monument, an area jointly managed with the U.S. Forest Service. During the month of December 2003, several environmental education programs were available for the public, such as bighorn overlook hike, bighorn sheep of the American West, bighorn sheep lecture, and path of the bighorn (Bureau of Land Management, 2003).

The BLM, U.S. Fish and Wildlife Service and the Bighorn Institute worked cooperatively to organize an outdoor experience to observe bighorn sheep in their natural habitat during Bighorn Sheep month. This experience provided the public with information and points of interest about bighorn sheep and their habitat. The programs encouraged public participation to obtain a

better understanding about Peninsular bighorn sheep in Coachella Valley (Bureau of Land Management, 2003).

The Bureau of Land Management and the San Jacinto District, Idyllwild, California, San Bernardino National Forest are in the process of drafting an interpretive and environmental education concept plan for the Santa Rosa and San Jacinto Mountains National Monument. No specific topics for educational programs have been proposed. This plan was submitted January 2002.

#### Anza-Borrego Desert State Park

Anza-Borrego Desert State Park is located on the eastern side of San Diego County, with portions extending east into Imperial County and north into Riverside County. It is approximately a two-hour drive from either San Diego, Riverside or Palm Springs (Anza-Borrego Desert State Park, 2003).

With over six million acres of land, Anza-Borrego Desert State Park is the largest desert state park in the United States. The park consists of 500 miles of dirt roads, two wilderness areas and 110 miles of riding and hiking trails. Accessibility provides visitors with an opportunity to experience the wonders of this park (Anza-Borrego Desert State Park, 2003).

The park's mission is to provide for the health, inspiration and education of people by helping to preserve the park's extraordinary biological diversity, protecting its most valued natural and cultural resources creating opportunities for high-quality outdoor recreation (California State Parks, 2003).

The park's name was derived from a combination of the name of Spanish explorer Juan Bautista de Anza and the Spanish word "Borrego," referring to bighorn sheep. The park features washes, wildflowers, palm groves, cacti and sweeping vistas. Visitors may also have the opportunity to observe roadrunners, golden eagles, kit foxes, mule deer and bighorn sheep in their natural habitat. Anza-Borrego Desert State Park provides one of the very few refuges an area designated to the protection of Peninsular bighorn sheep. There are no known organized environmental education programs on any aspect of the park, including the subject of Peninsular bighorn sheep.

The Living Desert Wildlife and  
Botanical Park

The Living Desert Wildlife and Botanical Park in Palm Desert, California, occupies 1,800 acres of the Colorado Desert, 300 of which are developed as a zoo, botanical garden and natural history museum. The Living Desert was

established in 1970 as a non-profit education and conservation center dedicated to preserving desert plants and animal life. The park contains 10 lush botanical gardens representing 10 different desert ecosystems and more than 480 desert animals representing 158 species including several endangered Peninsular bighorn sheep (The Living Desert Wildlife & Botanical Park - Desert USA, 2003).

The mission of The Living Desert Wildlife and Botanical Park is to preserve a portion of the Colorado Desert in its natural state. The park's goal is to promote environmental education and awareness programs that increase appreciation for and knowledge about the plants and animals in desert ecosystems. The Living Desert promotes, under controlled conditions, increases in populations of various species of desert animals such as the Peninsular bighorn sheep and plants threatened or endangered with extinction in the park.

The park provides several programs for park visitors, such as informal talks and an interpretive narrated tour of the park's animals. The park does not have a specific environmental education program on Peninsular bighorn sheep. The park does encourage cooperative research and educational programs that emphasize the importance of

## California Desert Managers Group

The California desert encompasses enormous land area within a day's drive of 40 million people. Approximately 80 percent of the desert, or 20 million acres, is publicly owned and includes three national parks, six military bases, 72 wilderness areas, 15 state parks and extensive assets of public lands managed by the Bureau of Land Management (California Desert Managers Group, 2003)

The Desert Managers Group (DMG) was established as the forum for government agencies to address and discuss issues of common concern. Through cooperative management, each agency can achieve greater operational efficiency, and improve resource protection (California Desert Managers Group, 2003).

The vision of the DMG is to work together to conserve and enhance the California desert for current and future generations. Its mission is to develop coordinated and complementary management guidelines, practices, and programs. The managers group coordinates and integrates management efforts in the California desert to conserve and restore desert resources. The group supports and provides the public with high quality recreation use, public education and visitor services. DMG develops and integrates the databases and scientific studies needed for

effective resource management and planning strategies (California Desert Managers Group, 2003).

Controversial issues and conflicting demands on California's desert lands make it necessary for the Department of Defense, Department of the Interior, and the State of California to work together and to support each others agency mission. They have put together teams from federal and state agencies to design environmental education programs such as on the desert tortoises and their habitat. Currently there are no known Peninsular bighorn sheep environmental education programs being considered by the DMG (California Desert Managers Group, 2003).

#### Bighorn Institute

The Bighorn Institute is located in Riverside County, in the city of Palm Desert. The facility is located on 300 acres of land that includes an office, laboratory, biologist's residence, and pens for the captive herd and bighorn sheep rehabilitation (Bighorn Institute, 2003a).

The Bighorn Institute was formed in 1982 by a group of biologists and veterinarians to investigate the causes of bighorn sheep declines, with the main focus being on the Peninsular bighorn sheep. Due to the sensitive nature

of both disease research and the captive-rearing and wild release program, sheep at Bighorn Institute are not available for public viewing (Bighorn Institute, 2003b).

The Bighorn Institute is dedicated to conservation of the world's sheep through research and education. Its main goal is to conduct research into the ecology of wild sheep populations with particular emphasis on Peninsular bighorn sheep. The institute also conducts a captive breeding and wild population augmentation program to provide genetic and demographic support to declining Peninsular bighorn sheep population (Bighorn Institute, 2003c).

Through hard work and dedication at the Bighorn Institute the captive breeding program was successful in releasing two Peninsular bighorn yearling rams and one ewe into the northern Santa Rosa Mountains during the months of May and July 2003. This additional releasing has brought the Institute's count of 96 bighorn sheep that have been released into the wild from the captive breeding facilities since 1985. The releasing of bighorn sheep has been a cooperative effort by U.S. Fish and Wildlife Service, California Department of Fish and Game, and the Bighorn Institute (Bighorn Institute, 2003d).

With the tremendous human population and urban growth over the past few decades in the Coachella Valley, the



Peninsular bighorn sheep have not fared well. The Bighorn Institute put out an alert article entitled "A Peninsular Bighorn herd on the brink of extinction" in their official newsletter which was sent across Coachella Valley (Bighorn Institute, 2003b).

Education plays a role in the Bighorn Institute efforts to address the protection of Peninsular bighorn sheep. Staff from the Institute have provided information at large community events, as well as at special events. For example, the executive director and research biologist of the Bighorn Institute, James R. DeForge, lectured and guided a field trip in December 2003. This outdoor experience provided the public with new information and points of interest about bighorn sheep and their habitat. This program was aimed at encouraging the public to participate in learning more about the Peninsular bighorn sheep of Coachella Valley (Bureau of Land Management, 2003).

CHAPTER FOUR  
RECOMMENDATIONS

The purpose of environmental education is to foster the education of skilled individuals able to understand environmental problems and possess the experience to develop effective solutions to them. This education will allow individuals to take action and put into practice possible solutions that will improve the environment (Jacobson, 1999).

It is therefore imperative that effective public environmental education and interpretive programs be implemented. The public needs to be informed of reasons why specific actions are being taken, which applies to understanding habitat needs of Peninsular bighorn sheep. Conservation efforts have a greater chance of being successful if supported by the public (U.S. Fish & Wildlife Service, 2000).

Recommendations

The following recommendations were as a result from the research of available materials related to bighorn sheep. Included are recommendations for education and interpretation from the U.S. Fish and Wildlife Service's *Recovery Plan for Bighorn Sheep in the Peninsular Ranges*,

*California*, 2000. All entities involved with Peninsular bighorn sheep research are urged to consider these recommendations related to education and interpretation.

1. Continue existing programs such as December 2003 Bighorn Sheep month led by the Bureau of Land Management, Palm Springs Desert District. The continuation of this program will open avenues for children and adults to learn about scientific information about Peninsular bighorn sheep in Coachella Valley.
2. Develop curricula on the subject of Peninsular bighorn sheep that meet California state education standards and encourage their incorporation into K-12 instruction.
3. Provide teacher training on background information and lessons on Peninsular bighorn sheep. This could include a teaching packet that would aid teachers in introducing students to Peninsular bighorn sheep.
4. Continue and encourage new cooperative efforts to introduce environmental education programs and their benefits to children and adults.
5. Coordinate with the public and interest groups why there is a need for specific recovery

actions such as trails and predator management for Peninsular bighorn sheep.

6. Establish new programs that reach the public through the tourist industry and ecotourism operators.
7. Explain specific recovery actions should be explained to the general public. For example, home owners, land managers and developers should be provided with information that explains: (a) why restrictions on toxic plants, fences and pesticides are needed, and (b) why artificial feeding of coyotes could adversely affect bighorn sheep. Recreation groups should be provided with information that explains why trail closures are necessary in Peninsular bighorn sheep habitat.
8. Expand and regularly update existing programs to provide accurate view of current knowledge regarding Peninsular bighorn sheep. Use displays that feature current population status and monitoring activities, current research projects and conservation activities.
9. Encourage agencies and organizations to consider how they can use programs to contribute to the

recovery of Peninsular bighorn sheep, and also how their activities complement those of other agencies or organizations.

10. Hold an annual meeting of government officials including the Fish and Wildlife Service, BLM, California Department of Fish and Game, California Department of Parks and Recreation, U.S. Forest Service, researchers, Bighorn Institute and educational facility representative or public relations directors, to exchange information and ideas for improving and updating education programs.
11. Reach people who would not typically be exposed to traditional programs such as people who do not frequent visitor centers or do not have children.
12. Provide opportunities for the public to take part in conservation activities.
13. Produce local and national television programs featuring Peninsular bighorn sheep and send out press.
14. Establish observation logbooks at visitor centers to allow visitors to record bighorn sheep and other species observed.

15. Conduct public attitude assessments to determine the effectiveness of specific programs in order to guide future activities.
16. Utilize trained Peninsular bighorn sheep ambassadors at popular trailheads during high usage periods and during periods of trail closure to provide additional information and answer questions.
17. Ensure that collected information on Peninsular bighorn sheep are maintained by one agency so that a complete data base is available for researchers, managers and the public.

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