

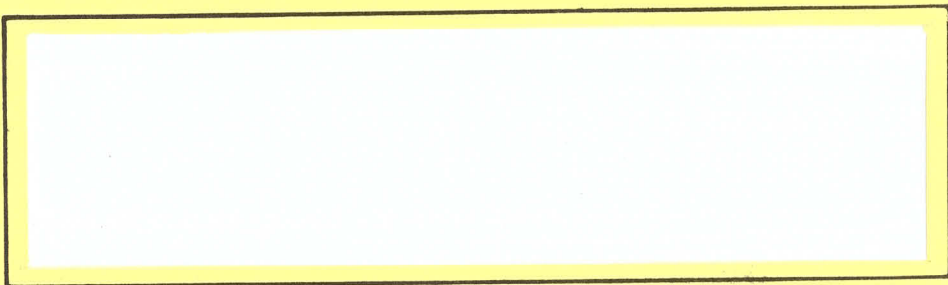
D-93
IN
STORAGE

File: Lake Mead NRA
Also Code Under:
Death Valley N.M.
Joshua Tree N.M.
Canyonlands N.P.



Cooperative National Park

RESOURCES STUDIES UNIT



University of Nevada
Las Vegas, Nevada 89154

Western Region
National Park Service
Dept. of the Interior
San Francisco, CA 94102

ON MICROFILM

PLEASE RETURN TO:
TECHNICAL INFORMATION CENTER
DENVER SERVICE CENTER
NATIONAL PARK SERVICE

COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT

University of Nevada/Las Vegas - National Park Service

The National Park Service and the University of Nevada signed a Master Agreement on November 4, 1971 that provided for the establishment and operation of this Unit on the Las Vegas Campus. The Unit, although located in the Department of Biological Sciences, is geared to provide a multidisciplinary approach that utilizes all talents on the University Campus to natural resources studies in areas administered by the National Park Service. Primary attention of this Unit is directed to Death Valley National Monument, California/Nevada; Lake Mead National Recreation Area, Nevada/Arizona; and Joshua Tree National Monument, California.

Through the direction and coordination of the Unit Leader, projects are undertaken in these areas that are designed to provide scientific facts upon which the park managers may make appropriate decisions and formulate and implement effective management action plans. Through close association with faculty members and through guidance of graduate students, a greater awareness of problems and needs of the Service are recognized and academic interests are channelized to participate with the National Park Service in studies of mutual interest and concern.



NOTICE: This document contains information of a preliminary nature, and was prepared primarily on an interim basis. This information is not intended for use in open literature prior to publication by the investigators named unless permission is obtained in writing from the Unit Leader.

COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT

DEPARTMENT OF BIOLOGICAL SCIENCES

UNIVERSITY OF NEVADA, LAS VEGAS

LAS VEGAS, NEVADA 89154

(702) 739-3219

NATIONAL PARK SERVICE

ANNUAL REPORT

DECEMBER 31, 1986

CHARLES L. DOUGLAS, UNIT LEADER

SENIOR RESEARCH SCIENTIST

TABLE OF CONTENTS

LAKE MEAD NATIONAL RECREATION AREA:

Food habits and food resources of bighorn in the River Mountains . . 1
Development of computer simulation model of River Mountain herd . . 2
Analysis of bighorn populations 4

DEATH VALLEY NATIONAL MONUMENT:

Interactions of desert bighorn sheep and feral burro 6
Anatomical and morphological adaptation of plants to aridity 7
A study of vegetational reinvasion following the Saline Fire 8
A study of vegetational recovery following burro removal 9

JOSHUA TREE NATIONAL MONUMENT:

A study of vegetational reinvasion following natural fire 10

CANYONLANDS NATIONAL PARK:

Development of computer simulation model of the Island in the
Sky herd 11

OTHER ACTIVITIES 12

OTHER UNIT ACTIVITIES 13

1986 UNIT PUBLICATIONS 14

CPSU/UNLV PUBLICATIONS LIST 16

OTHER RESEARCH AND STUDIES

Death Valley National Monument 24
Lake Mead National Recreation Area 29
Joshua Tree National Monument 30
Lehman Caves National Monument 31

Contribution Number CPSU/UNLV 024/09

FOOD HABITS AND FOOD RESOURCES OF
BIGHORN IN THE RIVER MOUNTAINS,
LAKE MEAD NATIONAL RECREATION AREA

Project Leader: Charles L. Douglas

Unit Affiliated Project

Start: September, 1981

Anticipated Termination: Upon Completion of Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To determine, through fecal analysis, monthly diets of bighorn sheep.
2. To identify relationships of the diets to relative availability, phenology, and nutritional status of existing forage.

Progress:

Monthly collections of known forage plants and bighorn fecal pellets have been made for the past several years. Forage species are sent to the Habitat Analysis Lab at Washington State University for nutrient analysis, which includes Kjeldahl crude protein, crude fat, total ash, gross energy, in vitro digestibility, and Van Sost sequential fiber analysis. Fecal pellets are analysed for fecal nitrogen.

Kirkeeng (1985) completed the first two years of this project, and established a baseline of food habits and food availability in the River Mountains. Several very important findings resulted from her study. Her studies enable us to relate nutrition in forage species to events occurring in the lives of ewes and lambs. Knowledge of nutritional availability in late winter and spring, helps us better understand the dynamics of lamb survival.

In the summer of 1982, bighorn ate only three species of plants: Mormon tea, globe mallow, and three-awn grass. In addition, these three species comprised 92 percent of the annual diet. These results were totally unexpected. Even though bighorn in the River Mountains are known to eat 32 species of plants (Kirkeeng, 1985), we were surprised to find only three species comprising such a large percentage of the diet. It follows that distribution of these three species may help explain seasonal movements and feeding strategies of the River Mountain herd. Furthermore, if decreased availability of those three species occurred through overbrowsing or other events, it probably would cause severe hardships for the sheep.

Contribution Number CPSU/UNLV 025/13

DEVELOPMENT OF COMPUTER SIMULATION

MODEL OF RIVER MOUNTAIN HERD,

LAKE MEAD NATIONAL RECREATION AREA

Investigator: Charles L. Douglas

Unit Affiliated Project

Start: 1980

Anticipated Termination: Upon Completion of Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To construct a predictive simulation model that will enable managers to make informed decisions about removal of animals from the River Mountain herd for transplant.
2. To evaluate climatic parameters and herd data, and to determine relationships of these to lamb survival.

Progress:

The data base continues to be updated from monthly weather summaries supplied by the Bureau of Reclamation. The divergence of predicted events and observed events in the River Mountain herd is discussed in a recent publication:

D.M. Leslie, Jr. and C.L. Douglas. 1986. Modeling demographics of bighorn sheep: Current abilities and missing links. Trans. 51st N. Amer. Wildlife and Natural Resources Conf., pp. 62-73.

The reliability of the simulation model is dependent upon accurate population estimates. Confidence intervals around population estimates are large, and since 1980 have diverged from simulated population size. Population estimates (NDOW) tend to mirror the lamb:ewe ratios, i.e. a high ratio promotes population increase, and conversely, a low ratio causes the population to decrease. However, despite herd reductions of 139 animals between 1980-1983, estimates indicated a population increase. We cannot verify whether these represent a real increase or a by-product of increased survey efficiency. Our simulations represent our "best guess," but missing links prohibit an objective and accurate appraisal of the demographic

consequences of current management of desert bighorn in the River Mountains.

The River Mountain herd is being used as a standard for bighorn herds throughout the LAME area. It is likely that other herds are regulated by similar mechanisms as the River Mountain herd.

The work plan for FY 1988 is to conduct detailed analyses of bighorn habitat in the River Mountains using a computer mapping program (pMAP) that permits maps of habitat parameters (slope, aspect, distance to water, distance to escape terrain, elevation, etc.) to be prepared. We also plan to conduct analysis of plant distributions, with special attention being given to bighorn forage species.

Contribution Number CPSU/UNLV 030/03

ANALYSIS OF BIGHORN POPULATIONS
IN THE LAKE MEAD NATIONAL RECREATION AREA

Investigator: Charles L. Douglas

Contract Number: CA 8009-1-0003

Start: 1984

Anticipated Termination: 1988

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. Assess population numbers and seasonal distribution of the northern Black Mountain bighorn herd (1984-85 only). Evaluate the condition and use of water sources.
2. Assess nutritional status of the Black Mountain bighorn and compare levels with those in the River Mountain herd for the same time period.
3. Evaluate the extent and condition of bighorn habit, and any encroachment by domestic livestock.

Progress:

Aerial surveys were conducted in May and August 1986. The Black Mountains (Arizona and Nevada) were surveyed intensely, and the eastern side of the Colorado River was surveyed southward from the dam to Fire Mountain. The Eldorado Mountains, both inside and outside the park, were surveyed. The Newberry Mountains were surveyed, as was the western side of the river from Hoover Dam to Davis Dam.

Burro incursions into bighorn habitat were observed in the Black Mountains-Nevada, in the general area both North and South of Cottonwood Cove. Of particular concern were burros using low elevation drainages, just northeast of the Newberry Mountains. These burros are interacting with bighorn; the entire bighorn population of the Newberries was seen in the fans and drainages near the river. No bighorn were seen in the mountains proper. These observations were reported to the Superintendent and Resource Managements Staff, and plans are underway to remove some burros from critical areas.

May 27-28, 1986

	Female	Lamb	Yearling	Male	Total	Lamb/Ewe
Black Mountains, Nevada	136	36	--	57	229	27:100
Arizona side	80	37	3	--	<u>120</u>	46:100
(Fortification Ridge to Fire Mountain)					<u>349</u>	

August 4-6, 1986

	Female	Lamb	Yearling	Male	Total	Lamb/Ewe
Eldorado Mountains	117	47	3	30	197	
Newberry Mountains	17	3	--	3	<u>23</u>	
					<u>220</u>	37:100

The lack of observation of rams on the Arizona side in May was not surprising, since lower elevations near the river typically are inhabited by ewes and lambs at that time of year.

Although part of the Eldorado Mountains lie outside the Lake Mead boundary, we surveyed the entire range since sheep would be expected to cross back and forth into the park.

We were especially interested in obtaining distributional records of ewes and lambs during summer, and these surveys accomplished that objective.

Contribution Number CPSU/UNLV 006/45

INTERACTION OF DESERT BIGHORN SHEEP
AND FERAL BURROS IN DEATH VALLEY AND VICINITY

Project Leader: Charles L. Douglas

Unit Affiliated Project

Start: September 20, 1979

Anticipated Termination: Upon Completion of the Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To study the use of springs and habitat areas following the removal of feral burros.
2. To determine bighorn population demographics following burro removal.

Progress:

Time-lapse cameras were placed at all major springs during the summer of 1986 to record bighorn use following burro removal. A few burros remained in the Tin Mountains during this survey. Two weeks of activity at springs were recorded by Bill Dunn with the CPSU's time-lapse cameras. The film records are in the process of being evaluated.

We anticipate more widespread use of springs by bighorn following burro removal. To our knowledge this is the first study in which bighorn have been studied following release from competition with feral burros.

Contribution Number CPSU/UNLV 029/05

ANATOMICAL AND MORPHOLOGICAL ADAPTATIONS
OF PLANTS TO ARIDITY IN
DEATH VALLEY NATIONAL MONUMENT

Project Leader: Charles L. Douglas

Investigator: Mary G. Culp

Unit Affiliated Project

Start: January 1983

Anticipated Termination: Upon Completion of Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objective:

1. To determine possible anatomical and/or morphological differences between members of the same species growing along an elevational gradient.

Progress:

The final report has been printed and is available from the CPSU/UNLV.

Contribution Number CPSU/UNLV 034/04

A STUDY OF VEGETATIONAL REINVASION
FOLLOWING THE SALINE FIRE IN
DEATH VALLEY NATIONAL MONUMENT

Project Leader: Charles L. Douglas

Investigator: Dr. Patrick J. Leary

Start: Winter 1984

Anticipated Termination: Upon Completion of Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To study and report on revegetation and successional patterns following a lightning fire in Death Valley National Monument, California.

Progress:

Permanent belt transects were established in the burned area on Hunter Mountain in the Winter of 1984. Transects were read during the Fall of 1985 and the Fall of 1986. The data for the two seasons have been entered in the CPSU computer and analyzed. Plant cover, volume, frequency, density, and presence have been calculated for all perennials. These data were presented as a formal talk to the Death Valley Superintendent and the Death Valley 49ers in the Fall of 1986. The Hunter Mountain transects will be read again in the Fall of 1987.

Contribution Number CPSU/UNLV 035/02

A STUDY OF VEGETATIONAL RECOVERY
FOLLOWING BURRO REMOVAL IN
DEATH VALLEY NATIONAL MONUMENT

Project Leader: Charles L. Douglas

Investigators: Charles L. Douglas and Hermi Hiatt

Start: April 1985

Anticipated Termination: Upon Completion of Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To establish permanent belt transects in major vegetational communities at different elevations, and to use these to monitor vegetational recovery following burro removal.

Progress:

Eight permanent belt transects were established in Butte Valley in 1985. Baseline data were gathered from the transects late April 1985 and 1986. Subsequent data gathering will be done at the same time of year. These data have been entered into the CPSU computer, summarized, and will be the basis for a report (in preparation).

Four permanent belt transects were installed in the mixed shrub community in Wildrose Canyon. Two transects of 100 m² quadrants (20m x 50m) were placed inside an exclosure established in 1972. Two parallel transects were placed in line with the East-West trending fenceline of the exclosure. Each transect was 50 m from the respective North and South ends of the exclosure, parallel with the fence. Data from these transects were entered into the CPSU computer, summarized, and will be reported upon in the forthcoming report.

Contribution Number CPSU/UNLV 019/05

A STUDY OF VEGETATIONAL REINVASION
FOLLOWING NATURAL FIRE IN
JOSHUA TREE NATIONAL MONUMENT

Project Leader: Charles L. Douglas

Investigator: Dr. Patrick J. Leary

Start: November 1978

Anticipated Termination: Upon Completion of Project

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To study and report on revegetation and successional patterns following a lightning fire in Joshua Tree National Monument, California.

Progress:

Field observations of plants and soils was conducted in May 1986. This was the eighth year since the fire and sixth season that vegetational data have been collected.

The database was entered into the CPSU computer and analyses conducted. A final report is in preparation.

Contribution Number CPSU/UNLV 031/04

DEVELOPMENT OF COMPUTER SIMULATION MODEL
OF THE ISLAND IN THE SKY HERD,
CANYONLANDS NATIONAL PARK

Investigators: Charles L. Douglas and Carol R. Annable

Unit Affiliated Project

Start: 1984

Anticipated Termination: 1986

Cooperative National Park Resources Studies Unit

University of Nevada, Las Vegas

December 31, 1986

Objectives:

1. To construct a predictive simulation model that will enable managers to make informed decisions about removal of animals from the Island in the Sky herd for transplant.
2. To evaluate climatic parameters and herd data, and to determine climatic influence on lamb survival.

Progress:

The last two years' herd and climatic data have been added to the data base. Regression analysis will be conducted on climatic variables and lamb survival to determine whether the preliminary model still is valid, and to update the regression equations.

A journal article is being prepared on the model development, and will be submitted for publication in 1987. There is widespread scientific interest in this type of modeling, judging from reprint requests for earlier reports.

Efforts were made in 1985 and 1986 to record age classes of rams during the helicopter census. We will be working with these data to select, or develop, a suitable population model that will assist managers in making decisions about transplant removals from the herd.

OTHER ACTIVITIES

AGENCY/INTERAGENCY MEETINGS ATTENDED

1. NPS Representative to California Desert Workshop, Univ. California, Riverside. October 23, 1985.
2. Technical Meeting--NPS/Cal. Fish & Game. Monteray, Ca. December 3-5, 1985.
3. Technical Meeting--NPS/AZ Game & Fish, Boulder City, NV. January 29, 1986.
4. Technical Meeting--NPS/Nevada Dept. of Wildlife, Las Vegas, NV. January 28, 1986.
5. Resource Management Workshop, Las Vegas, NV. May 20-23, 1986.
6. WRO Scientists Workshop, Point Reyes.

PROFESSIONAL MEETINGS

1. Desert Bighorn Council Annual Meeting, Page, AZ. April 2-5, 1986.
2. North American Wildlife & Natural Resources Conf., Reno, AZ. March 23-25, 1986.
3. NPS Science Conference, Fort Collins, CO. July 13-18, 1986.

TRAINING SESSION GIVEN

1. Session on Wildlife Management Given to NPS Resource Trainees, Davis, Ca.
2. Conducted Field Trip for Resource Management Workshop, Las Vegas, NV.

OTHER PROFESSIONAL DUTIES

1. Served as Editor for the Desert Bighorn Council Transactions (since 1976).
2. Served on the Committee for the Conservation of Land Mammals, for American Society of Mammalogists.
3. Reviewed manuscripts for J. Wildlife Manage., Wildlife Soc. Bull., J. Mammalogy, and the Desert Bighorn Council Transactions.

OTHER UNIT ACTIVITIES

- DEVA: 1. Met with Superintendent Rothfuss and Peter Rowlands about resource management needs, and progress of research projects.
2. Arranged for Dr. Pat Leary to speak at Superintendents' Luncheon for Death Valley 49ers.
3. Flew bighorn surveys in the Cottonwood and Black Mountains.
4. Installed permanent transects in Wildrose Canyon.
5. Coordinated travel by Dr. Pat Leary to pursue his study of revegetation in the Saline fire area.
6. Conducted a week-long helicopter survey for burros following burro removal.
- LAME: 1. Attended meeting with Superintendent and Staff to discuss park needs for Auto CAD software.
2. Conducted aerial surveys of bighorn and bighorn habitat.
3. Met with Superintendent Wagers and Staff on resource needs.
- JOTR: 1. Visited park to discuss Resource Management needs with Superintendent Anderson and Bob Moon.
2. Coordinated proposal preparation for survey of desert tortoises in the monument.
- LECA: 1. Discussed resource needs with Superintendent Hendricks.
2. Discussed cave algal problems with various parks and researchers.
- CANY: 1. Discussed model development and data needs with the Resources Management Specialist.
- UNLV: 1. Presented talk to the Graduate Seminar, Dept. Biological Sci.
2. Attended UNLV Alumni Association Recognition Luncheon as a selected professor.
3. Served on 4 graduate committees.
4. Taught Graduate Problems and Thesis, 2 semesters.
5. Served on Graduate Examination Committee for Mary Culp--Anatomical and morphological adaptations of plants to aridity in Death Valley National Monument.

CPSU/UNLV PUBLICATIONS - 1986

PUBLICATIONS

1. Douglas, C.L. and H. Hiatt. 1986. Why do bighorn lambs die in the Lake Mead National Recreation Area? Proceedings 1986 NPS Sci. Conf. IN PRESS.
2. Douglas, C.L. and D.M. Leslie, Jr. 1986. Influence of weather and density on lamb survival of desert mountain sheep. J. Wildlife Mgmt. 50:153-156.
3. Leslie, D.M., Jr. and C.L. Douglas. 1986. Modeling demographics of bighorn sheep: Current abilities and missing links. Trans. 51st N. Amer. Wildl. and Nat. Res. Conf., pp. 62-73.

TECHNICAL REPORTS

1. Culp, M. 1986. Anatomical and morphological adaptations of plants to aridity in Death Valley National Monument. CPSU/UNLV 029/04.
2. Dunn, W. and C.L. Douglas. 1986. A population survey of the Tin Mountain bighorn population. CPSU/UNLV 006/36.
3. Kirkeeng, K. 1986. Food habits and food resources of bighorn in the River Mountains, Nevada. CPSU/UNLV 024/06.
4. Leary, K. and P. Peterson. 1986. Soils analyses in relation to vegetation in the Cottonwood Mountains, Death Valley National Monument. CPSU/UNLV 036/01.
5. Leary, P. 1986. Plant succession after fire, Hunter Mountain, Death Valley National Monument. CPSU/UNLV 034/01.

MANAGEMENT REPORTS

1. Douglas, C.L. and H. Hiatt. Progress report on installation of permanent transects in Wildrose Canyon, Death Valley.
2. Management Significance of Blake, "Seasonal analysis of bird communities in southern Nevada." Southwestern Naturalist 29(4):463-474.
3. Management Significance of Culp, "Anatomical and morphological adaptations of plants to aridity in Death Valley National Monument." CPSU/UNLV 029/05.
4. Management Significance of Douglas and Leslie, "Influence of weather and density on lamb survival of desert mountains sheep." J. Wildlife Mgmt. 50:153-156.

5. Management Significance of Kirkeeng, "Food habits and food resources of bighorn in the River Mountains, Nevada." CPSU/UNLV 024/08.
6. Management Significance of Leary, "Plant succession after fire, Hunter Mountain, Death Valley National Monument." CPSU/UNLV 034/02.
7. Management Significance of Leary and Peterson, "Soils analyses in relation to vegetaion in the Cottonwood Mountains, Death Valley National Monument." CPSU/UNLV 036/02.
8. Trip Report: Desert RD&E Workshop, Univ. of California, Riverside.
9. Trip Report: Annual Meeting with Superintendent in DEVA.
10. Trip Report: Annual Meeting with Superintendent in JOTR.
11. Trip Report: Annual Meeting with Superintendent in LAME.

NATIONAL PARK SERVICE
 COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT
 DEPARTMENT OF BIOLOGICAL SCIENCES
 UNIVERSITY OF NEVADA, LAS VEGAS
 LAS VEGAS, NEVADA 89154

PUBLICATIONS

O/P = Out of Print

- Blake, J. G. and C. L. Douglas. 1978. Albumin polymorphism in the feral donkey of Death Valley National Monument, California. *Animal Blood Groups and Biochemical Genetics* 9:9-12.
- Blake, J. G., C. L. Douglas and L. F. Thompson. 1981. Spatial variation in transferrin allele frequencies among herds of feral donkeys in Death Valley National Monument, California. *J. Mammalogy* 62:58-63.
- Corneli, D. and J. E. Cornely. 1979. Aversive conditioning of campground coyotes in Joshua Tree National Monument. *Wildl. Soc. Bull.* 7(2):129-131.
- Cornely, J. E. 1979. Anesthesia of coyotes with ketamine hydrochloride and xylazine. *J. Wildl. Manage.* 43(2):577-579.
- _____. 1979. Aversive conditioning of campground coyotes in Joshua Tree National Monument. 2nd Conf. on Scientific Research in the National Parks. USDI-NPS.
- O/P Douglas, C. L. 1975. A comparison of observer and camera counts of desert bighorn sheep. *Trans. Desert Bighorn Council*, 44.
- O/P _____. 1976. Studies of bighorn in Joshua Tree National Monument. *Desert Bighorn Council Trans.*, pp. 32-35.
- O/P _____. 1977. Coordination of bighorn research and management in Joshua Tree National Monument. *Trans. Second Wild Sheep Conference*, pp. 1-15, Colorado State Univ.
- _____. 1981. Burro impact on bighorn habitat. *Pacific Park Science*, Vol. 1(3):15-16.
- _____ and _____. 1986. Influence of weather and density on lamb survival of desert mountain sheep. *J. Wildl. Manage.* 50(1):153-156.
- Douglas, C. L. and W. E. Niles. 1976. An inventory of the biota of Lake Mead National Recreation Area. Abstract. 1st Conf. on Sci. Research in the National Parks. AIBS/NPS p. 231.
- Douglas, C. L. and C. Norment. 1977. Habitat damage by feral burros in Death Valley. *Desert Bighorn Council Trans.*, pp. 23-25.

- _____ and _____. 1979. Ecological studies of feral burros in Death Valley. Proc. First Conf. on Sci. Research in the National Parks, Vol. I:373-383. USDI National Park Serv. Trans. and Proc. Series 5.
- Douglas, C. L., and L. D. White. 1978. Radio-telemetric studies of movements in desert bighorn sheep, Joshua Tree National Monument. Desert Bighorn Council Trans., pp. 21-22.
- _____ and _____. 1979. Movements of desert bighorn sheep in the Stubbe Spring area, Joshua Tree National Monument. Desert Bighorn Council Trans., pp. 71-77.
- _____ and _____. 1979. Research and management of bighorn sheep in Joshua Tree National Monument. 2nd Conf. on Sci. Research in the National Parks. USDI/NPS.
- Dunn, W. C. and C. L. Douglas. 1982. Interactions between desert bighorn sheep and feral burros at spring areas in Death Valley National Monument. Desert Bighorn Council Trans., pp. 87-96.
- Fisher, J. 1976. The decline of desert holly as related to ozone pollution in Death Valley National Monument. (Abstract) First Conference on Scientific Research in the National Parks. AIBS/NPS p.254.
- Ginnett, T. F. and C. L. Douglas. 1982. Food habits of feral burros and desert bighorn sheep in Death Valley National Monument. Desert Bighorn Council Trans., pp. 81-87.
- Hamilton, K., S. Holl and C. L. Douglas. 1982. An evaluation of the effects of recreational activities on bighorn in the San Gabriel Mountains, California. Desert Bighorn Council Trans., pp. 50-55.
- Leary, P. and W. E. Niles. 1976. Investigation of vegetational communities in Joshua Tree National Monument. Abstract. First Conference on Scientific Research in the National Parks. AIBS/NPS p. 176.
- Leslie, D. M., Jr. 1977. Home range, group size, and group integrity of the desert bighorn sheep in the River Mountains, Nevada. Desert Bighorn Council Trans., pp. 25-28.
- _____. 1978. Differential utilization of water sources by desert bighorn sheep in the River Mountains, Nevada. Desert Bighorn Council Trans., pp. 23-26.
- _____. 1979. Potential demographic consequences of transplants of desert bighorn sheep. 2nd Conf. on Scientific Research in the National Parks. USDI/NPS.
- _____. 1980. Remnant populations of desert bighorn sheep as a source for transplantation. Desert Bighorn Council Trans. pp. 36-44.

- Leslie, D. M., Jr. and C. L. Douglas. 1979. Movements of desert bighorn sheep in the River Mountains of Lake Mead National Recreation Area. Proc. 1st Conf. on Sci. Research in the National Parks, Vol. I:439-442. USDI/NPS Trans. and Proc., Series 5.
- _____ and _____. 1979. Desert bighorn sheep of the River Mountains, Nevada. Wildlife Monograph No. 66:1-56.
- O/P _____ and _____. 1980. Human disturbance at water sources of desert bighorn sheep. Wildlife Society Bulletin 8(4):284-290.
- _____ and _____. 1981. Status of population modeling of the River Mountain herd. Desert Bighorn Council Trans., p. 69.
- _____ and _____. 1982. Simulated demography of the River Mountain herd. Desert Bighorn Council Trans., pp. 97-99.
- _____ and _____. 1986. Modeling demographics of bighorn sheep: current abilities and missing links. Trans. 51st N.A. Wildl. & Nat. Res. Conf., pp. 62-73.
- McQuivey, R. P. and D. M. Leslie, Jr. 1977. The status and trend of desert bighorn sheep in Nevada: River Mountains. Job Pref. Report, NV. Dept. of Fish and Game. 31 pp.
- Wilson, L. L. and C. L. Douglas. 1982. Revised procedures for capturing and reestablishing desert bighorn. Desert Bighorn Council Trans., pp. 1-7.
- Yancey, M. J. and C. L. Douglas. 1983. Burro-small vertebrate interactions in Death Valley National Monument, California. Desert Bighorn Council Trans., pp. 17-25. (Published in 1984.)

THESES AND DISSERTATIONS

- Annable, C. R. 1985. 016/17. Vegetation and flora of the Funeral Mountains, Death Valley National Monument, California-Nevada.
- O/P Blake, J. G. 1977. 011/01. Serum protein polymorphisms of the feral ass (Equus asinus) in Death Valley National Monument.
- Cornely, J. 1979. 009/14. Home ranges and diets of coyotes in Joshua Tree National Monument in relation to prey densities. Ph.D. dissertation, Northern Arizona University.
- Culp, M.G. 1986. 029/04. Anatomical and morphological adaptations of plants to aridity in Death Valley National Monument.
- O/P Davis, T. 1975. 006/06. Physiological studies on the feral burro (Equus asinus).
- Dunn, W. C. 1984. 006/32. Ecological relationships between desert bighorn sheep and feral burros of Death Valley National Monument.

- O/P Fisher, J. 1978. 001/06. Studies relating to the accelerated mortality of Atriplex hymenelytra in Death Valley National Monument. M. A. thesis, University of California, Riverside.
- O/P Frazier, K. S. 1977. 005/07. An ecological study of the fan palm oases of Joshua Tree National Monument.
- Ginnett, T. F. 1982. 006/26. Comparative feeding ecology of feral burros and desert bighorn sheep in Death Valley National Monument.
- Goings, D. B. 1985. 033/01. Spring flow in a portion of Grand Canyon National Park, Arizona.
- Hamilton, K. M. 1982. 020/06. Effects of people on bighorn sheep in the San Gabriel Mountains, California.
- O/P Hogan, J. T. 1977. 003/07. The ecology of the Joshua tree in Joshua Tree National Monument.
- Holland, J. 1982. 008/18. A floristic and vegetation analysis of the Newberry Mountains, Clark County, Nevada.
- Kingsley, K. 1981. 018/05. Mammals of the Grapevine Mountains, Death Valley National Monument.
- Kirkeeng, K.I. 1985. 024/06. Food habits and food resources of bighorn in the River Mountains, Nevada.
- O/P Kurzius, M. 1981. 017/06. Vegetation and flora of the Grapevine Mountains, Death Valley National Monument, California/Nevada.
- O/P Leary, P. 1977. 004/07. Investigation of the vegetational communities of Joshua Tree National Monument, California.
- O/P Leslie, D. M., Jr. 1977. 010/07. Movements of desert bighorn sheep in the River Mountains of Lake Mead National Recreation Area.
- Marble, J. R. 1985. 027/03. Techniques of revegetation and reclamation of land damaged by off-road vehicles in the Lake Mead Recreation Area.
- Peterson, P. M. 1984. 022/06. Flora and physiognomy of the Cottonwood Mountains, Death Valley National Monument.
- Schramm, D. R. 1982. 012/13. Floristics and vegetation of the Black Mountains, Death Valley National Monument.
- White, L. D. 1980. 006/16. A study of feral burros in Butte Valley, Death Valley National Monument.
- Yancey, M. J. 1984. 021/06. A study of burro-small vertebrate interactions in Death Valley National Monument, California.

CPSU/UNLV REPORTS

- O/P Blake, J. G. 1978. 008/09. Birds of the Lake Mead National Recreation Area, Project Report #1.
- Cornely, J. 1979. 009/14. Home ranges and diets of coyotes in Joshua Tree National Monument in relation to prey densities. Ph.D. dissertation, Northern Arizona University.
- Douglas, C.L. 1976. A preliminary census of desert bighorn sheep in Organ Pipe National Monument.
- _____. 1977. 003/08. Management significance of the ecology of the Joshua tree in Joshua Tree National Monument.
- _____. 1977. 15. Feral burros of San Miguel Island.
- _____. 1977. 005/08. Management significance of an ecological study of the fan palm oases of Joshua Tree National Monument.
- _____. 1977. 004/08. Management significance of an investigation of the vegetational communities of Joshua Tree National Monument, California.
- _____. 1980. 009/16. Management significance of home ranges and diets of coyotes in Joshua Tree National Monument in relation to prey densities.
- _____. 1980. 006/19. Studies of bighorn-burro interaction in Death Valley: progress toward the objectives.
- _____. 1981. 006/22. Management significance of spatial variation in transferrin allele frequencies among herds of feral donkeys in Death Valley National Monument, California.
- _____. 1981. 017/07. Management significance of vegetation and flora of the Grapevine Mountains, Death Valley National Monument, California/Nevada.
- _____. 1981. 018/06. Management significance of the mammals of Grapevine Mountains, Death Valley National Monument.
- _____. 1982. 006/27. Management significance of the comparative feeding ecology of feral burros and desert bighorn sheep in Death Valley National Monument.
- _____. 1984. 025/06A. Simulated effects of transplant removal from the River Mountains Bighorn Herd II.
- _____. 1984. 022/07. Management significance of the flora and physiognomy of the Cottonwood Mountains, Death Valley National Monument, California.
- _____. 1984. 021/05. Management significance of a study of burro-small vertebrate interactions in Death Valley National Monument.

- O/P _____. 1985. 006/35. Wildlife management plan for the Cottonwood Mountains, Death Valley National Monument, California.
- _____. 1985. 016/08. Management significance of vegetation and flora of the Funeral Mountains, Death Valley National Monument, California/Nevada.
- _____. 1985. 024/08. Management significance of food habits and food resources of bighorn in the River Mountains, Nevada.
- _____. 1985. 027/04. Management significance of techniques of revegetation and reclamation of land damaged by off-road vehicles in the Lake Mead Recreation Area.
- _____. 1986. 006/38. Management recommendations for improving wildlife habitat degraded by man in the Black Mountains, Death Valley National Monument.
- _____. 1986. 029/03. Management significance of anatomical and morphological adaptations of plants to aridity in Death Valley National Monument.
- _____. 1986. 034/02. Management significance of plant succession after fire, Hunter Mountain, Death Valley National Monument.
- _____. 1986. 036/02. Management significance of soil analyses in relation to vegetation in the Cottonwood Mountains, Death Valley National Monument, California.
- Douglas, C. L. and C. R. Annable. 1985. 031/02. A model of climatic variables affecting bighorn lamb survival in Canyonlands National Park, Utah.
- O/P Douglas, C. L. and K. Kingsley. 1981. 023/01. Bighorn habitat evaluation and management guidelines for the Grapevine Mountains, Death Valley National Monument.
- O/P Douglas, C. L. and C. Norment. 1976. 006/27. Movements of burros in Death Valley: the Wildrose-Emigrant Area. Special Report #3.
- Douglas, C. L. and P. Sanchez. 1974. Potential environmental impact of proposed water supply systems in Furnace Creek and Cow Creek, Death Valley National Monument.
- _____ and _____. 1984. 006/30. Wildlife Census in the Southern Cottonwood Mountains, Death Valley National Monument I.
- _____ and _____. 1984. 006/31. Wildlife Census in the Southern Cottonwood Mountains, Death Valley National Monument II.
- Douglas, C.L. and L.D. White. 1975. 002/04. Studies of bighorn in Joshua Tree National Monument. Special Report #4.
- _____ and _____. 1979. 002/14. Movements of desert bighorn sheep in the Stubbe Spring area, Joshua Tree National Monument.

- Dunn, W.C. and C.L. Douglas. 1985. 006/36. A population survey of the Tin Mountain bighorn population.
- O/P Ginnett, T.F., W.C. Dunn, and C.L. Douglas. 1983. 006/29. Management significance of food habits of feral burros and desert bighorn sheep in Death Valley National Monument and interaction between desert bighorn sheep and feral burros at spring areas in Death Valley.
- O/P Holland, J., W. E. Niles and P. J. Leary. 1979. 008/13. Vascular plants of the Lake Mead National Recreation Area, Project Report #3.
- Holland, J., W. E. Niles and D. Schramm. 1980. 008/16. A guide to the threatened and endangered vascular plants of the Lake Mead National Recreation Area, Project Report #4.
- Kurzius, M. 1979. 019/01. A study of vegetational reinvasion following natural fire in Joshua Tree National Monument, Preliminary Report #1.
- Leary, K.D. and P.M. Peterson. 1984. 036/01. Soil analyses in relation to vegetation in the Cottonwood Mountains, Death Valley National Monument.
- Leary, P.J. 1979. 019/01. A study of vegetational reinvasion following natural fire in Joshua Tree National Monument. Preliminary Report #1.
- Leary, P.J. 1986. 034/03. Plant succession after fire, Hunter Mountain, Death Valley National Monument.
- Leslie, D.M., Jr. 1977. 010/06. Time-lapse photography vs. observer counts on bighorn in the River Mountains, Lake Mead National Recreation Area. Special Project Report #8.
- O/P _____. 1978. 010/10. Effects of construction on movements of desert bighorn sheep in the River Mountains, Lake Mead National Recreation Area.
- O/P Leslie, D. M., Jr. and C. L. Douglas. 1976. 010/02. Movements of desert bighorn sheep in the River Mountains of the Lake Mead National Recreation Area, Project Report #2, Special Report #2.
- O/P _____ and _____. 1976. 010/04. Movements of desert bighorn sheep in the River Mountains of the Lake Mead National Recreation Area, Project Report #2, Special Report #6.
- O/P _____ and _____. 1982. 025/02. Influence of climate and density on survival of desert bighorn lambs.
- O/P _____ and _____. 1982. 025/03. Simulated effects of transplant removal from the River Mountains bighorn herd.
- _____ and _____. 1984. 025/06. Simulated effects of transplant removal from the River Mountains bighorn herd II.
- O/P Miller, Robert R., Peter G. Sanchez, and David L. Soltz. 1985. 032/01. Fishes and Aquatic Resources, Death Valley System, California/Nevada. A Bibliography, 1878-1984.

- O/P Niles, W. E., C. L. Douglas, J. Holland, C. Downer, J. Blake, J. Schwartz, and G. Austin. 1977. 008/06. Biota of Lake Mead National Recreation Area, annotated checklist and bibliography, preliminary project report #1.
- Norment, C. and C. L. Douglas. 1977. 006/09. Ecological studies of feral burros in Death Valley. Special Report #3.
- O/P O'Farrell, M. J. 1978. 013/05. An assessment of impact of feral burros on natural ecosystems of the Lake Mead National Recreation Area, Arizona/Nevada.
- O/P Schwartz, J., G. Austin, and C. L. Douglas. 1978. 008/11. Amphibians, reptiles, and mammals of the Lake Mead National Recreation Area, Project Report #2.

OTHER RESEARCH AND STUDIES

DEATH VALLEY NATIONAL MONUMENT

Photoinhibition of the CAM succulent Opuntia basilaris growing in Death Valley: evidence from 77K fluorescence and quantum yield

Principal Investigator: William Adams
 Department of Environmental Biology
 Research School of Biological Sciences
 Australian National University
 P.O. Box 475
 Canberra ACT 2601 AUSTRALIA

Depositival environments and paleogeography of the Tin Mountain Limestone, Death Valley Region, California

Principal Investigator: Gregory R. Albright
 5294 Division St. #07
 Long Beach, CA 90803

Petrology and tectonics of the Kingston Peak granite, southern Death Valley, California

Principal Investigator: J.P. Calzia
 Dept. Geology
 University of California
 Davis, CA 95616

Tectonics and volcanism of the southern Great Basin

Principal Investigator: Michael O. Carr MS 975
 U.S. Geological Survey
 345 Middlefield Rd.
 Menlo Park, CA 94025

Petrology and geochemistry of the Nova Formation and Darwin Plateau rocks, Death Valley, California: Implications for magmatic and tectonic processes in extensional orogens

Principal Investigator: Drew S. Coleman
 1001 Indiana Apt. A
 Lawrence, KS 66044

Biology and range of desert aculeate Hymenoptera; floral interactions

Principal Investigators: Kenneth W. Cooper and Ruth S. Cooper
Flower Identifications
Dept. Biology
Univ. of California
Riverside, CA 92521

Long-distance migration of Drosophila

Principal Investigator: Dr. Jerry A. Coyne
Dept. Biology
University of Chicago
1103 E. 57th St.
Chicago, IL 60637

Plant distribution

Principal Investigator: Mary DeDecker
P.O. Box 506
Independence, CA 93526

Devils Hole pupfish

Principal Investigator: James E. Deacon
Dept. Biological Sci.
Univ. Nevada, Las Vegas
Las Vegas, NV 89154

Geomorphological development of Alluvial Fans in Death Valley

Principal Investigator: Dr. Ronald I. Dorn
Geography Department
Texas Tech University
Lubbock, TX 79409

Effects of Desert Varnish on Spectral Signatures of rocks and soils

Principal Investigator: John W. Eastes
USA ETL - RI - CRS
Ft. Belvoir, VA 22060-5546

Origin of the Assemblage Staurolite-Kyanite-Biotite-Garnet in Amphibolite-Grade metamorphic rocks in Vermont/New Hampshire and in Death Valley, California

Principal Investigator: Mario J. Giaramita
 Department of Geology
 University of California
 Davis, CA 95616

Taxonomic survey of parasitic Hymenoptera

Principal Investigator: Dr. Gordon Gordh
 Entomology Department
 University of California
 Riverside, CA 92521

Extensional tectonics of the southern Great Basin

Principal Investigator: Dr. Warren B. Hamilton
 Branch of Geophysics, MS 964
 U.S. Geological Survey
 Denver, CO 80225

Carbonate petrology class field trip

Principal Investigators: Fraka Harmsen and Robert Merrill
 Geology Dept., CSUF
 Fresno, CA 93740

Comparison of carbonate and siliciclastic turbidite facies models: Keeler Canyon Formation (Pennsylvanian), southwestern Great Basin

Principal Investigator: Dr. Paul L. Heller
 Department of Geology and Geophysics
 University of Wyoming
 Laramie, WY 82071

Metamorphic petrology of core complexes in the Bare Mountain, Death Valley area--a key to understanding the tectonics of Yucca Mountain

Principal Investigator: Thomas D. Hirsch
 MS 984, U.S.O.S.
 Denver, CO 80225

Metamorphism and tectonics in the Death Valley Region

Principal Investigator: Dr. Theodore C. Labotka
 Department of Geological Sciences
 The University of Tennessee
 Knoxville, TN 37996-1410

Evaporite deposition in closed basins

Principal Investigator: Dr. Tim K. Lowenstein
 Department of Geological Sciences
 State University of NY, Binghamton
 Binghamton, NY 13901

Collecting and recording of butterflies to be found in the Park

Principal Investigator: Dr. John T. McBurney
 739 N. Westwood Pl.
 Anaheim, CA 92805

Senior integrative exercises for Craig McCaa: a study of base surge
 emplacement at Ubenebe Crater

Principal Investigator: Craig McCaa
 431 Yoder Rd.
 Harleysville, PA 19438

Distribution of Corethrella (Diptera: Chaoboridae) in southern United States

Principal Investigator: Sturgis McKeever
 Department of Biology
 Georgia Southern College
 Statesboro, GA 30460

Population biology of Drosophila

Principal Investigator: John A. Moore
 Dept. Biology
 Univ. California
 Riverside, CA 92521

Genetic demography of pocket gophers, Thomomys bottae

Principal Investigator: Dr. James L. Patton
 Museum of Vertebrate Zoology
 University of California
 Berkeley, CA 94720

Collecting for Smithsonian--National Collection

Principal Investigator: Kathleen K. Smith
Smithsonian Museum
Washington, D.C.

Cottonwoods geologic mapping

Principal Investigator: J. Kent Snow
Geology Department
Harvard University
Cambridge, MA 02138

Geology of Death Valley and surrounding areas

Principal Investigator: Randall K. Stephenson
125 Real Road, Apt. A
Bakersfield, CA 93309

Basaltic volcanism of the Death Valley-Pancake Range zone

Principal Investigator: Dr. Ren A. Thompson
M.S. Geological Survey
MS 913, Box 25046
Denver Federal Center
Denver, CO 80225

Geologic investigations, Death Valley region

Principal Investigators: B.W. Troxel and L.A. Wright
U.C. Davis
Davis, CA 95616

Paleohydrology and paleoclimatology of southern Great Basin

Principal Investigator: Isaac J. Winograd
U.S. Geological Survey
432 National Center
Reston, VA 22092

LAKE MEAD NATIONAL RECREATION AREA

Lake Mead largemouth bass evaluation

Principal Investigator: David A. Buck
State Mailroom complex
Las Vegas, NV 89158

Lake Mead sport fishery evaluation

Principal Investigator: David A. Buck
State Mailroom complex
Las Vegas, NV 89158

Striped bass investigation

Principal Investigator: David A. Buck
State Mailroom complex
Las Vegas, NV 89158

General Research

Principal Investigators: Dave Buck and Mike Burrell
Nevada Dept. of Wildlife
Las Vegas, NV

Fisherman use and harvest

Principal Investigators: Dave Buck and Michael Burrell
Nevada Department of Wildlife
Las Vegas, NV

Striped bass life history

Principal Investigators: Dave Buck and Mike Burrell
Nevada Department of Wildlife
Las Vegas, NV

Status of Devils hole pupfish at Hoover Dam refugium

Principal Investigator: Dr. James Deacon
Environmental Consultants, Inc.
4150 Flamingo Crest Drive
Suite #1
Las Vegas, NV 89121

Early life history of razorback suckers in Lake Mohave

Principal Investigator: Dr. Paul C. Marsh
Arizona State University
Tempe, AZ 85287

JOSHUA TREE NATIONAL MONUMENT

Collection of Pinyon Pine twigs on Eagle Mountain and Covington Flats area

Principal Investigator: Dr. D.K. Bailey
University of Colorado Museum

Flower-visiting aculeate Hymenoptera of the Sonoran (Coloradan)-Mohavean Desert transition

Principal Investigator: Kenneth W. Cooper
Dept. of Biology
University of California
Riverside, CA 92521

Spatial dispersion of desert plants

Principal Investigators: H.F. Howe J. Wright
Dept. Biology STRI
U. Iowa APO
Iowa City, Iowa Miami, FL 34002

Collection of common woody perennials for class study

Principal Investigator: David Keil
497 Lilac Drive
Los Osos, CA 93402

Rainfall measurements and soil moisture penetration in Covington Flats

Principal Investigator: Thomas A. Kornozlje
17904 Clarkdale
Artesia, CA 90701

Chemo-systematics in Chrysothamnus

Principal Investigators: J. Kumamoto and R.W. Sura
Dept. of Botany and Plant Sciences
Univ. of California
Riverside, CA 92521

Collection of small blocks of basalt from Malapai Hill

Principal Investigator: Jay S. Noller
345 Middlefield Rd., MS 975
Menlo Park, CA 94025

Identification of flowering plants and their respective pollinating insects

Principal Investigator: Emilia Anne Parra
P.O. Box 231
Claremont, CA 91711

LEHMAN CAVES NATIONAL MONUMENT

Effects of geologic processes on cave morphology and stability

Principal Investigators: John R. Ege and John J. Golob
U.S. Geological Survey
Box 25046, MS 966
Denver, CO 80225

