

State of California Department of Parks and Recreation
Colorado Desert District Stout Research Center

Paleontology Certification Training Program
Curriculum and Lectures



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PALEONTOLOGY CERTIFICATION TRAINING PROGRAM

Overview:

Anza-Borrego Desert State Park⁷ (ABDSP) annually offers a college undergraduate-level *Paleontology Certification Training Program* (PCTP). This innovative program is for persons interested in participating in the conservation and management of the paleontologic and geologic resources of ABDSP and the greater Colorado Desert District (CDD). Paleontologic collections from ABDSP and the CDD region, maintained by the State include more than 25,000 specimens of fossil wood, invertebrates, and vertebrates representing over 550 species from a broad diversity of terrestrial and marine paleohabitats. The Program is coordinated through ABDSP and CDD of the California Department of Parks.

The PCTP consists of a series of lectures, workshops, and field trips, as well as hands-on apprenticeship work in paleontologic field surveying and recovery techniques, conservation laboratory skills, and curation and collections management. The course starts on the second Friday of November and runs through the last Friday of May. Each month, candidates attend the PCTP lecture and scheduled field, laboratory, and curation training workshops for a total of approximately 40 hours in each area. Candidates are certified upon the successful completion of this 160 hour course, development of competent technical skills, and demonstration of an understanding of basic paleontologic principles. Arrangements may be made for high school and college credit.

Purpose:

The PCTP was developed to provide and maintain basic professional training for volunteers who assist in the management and care of ABDSP and CDD paleontologic resources. Active Certified volunteers are considered non-paid State employees. Training is designed to assure competency in field, laboratory and collections activities.

Duties and Responsibilities:

Certified paleontology volunteers support and directly assist ABDSP and CDD staff in the various aspects of paleontologic resource management. These activities

include paleontologic surveying, specimen recovery, microfossil processing, laboratory preparation, and curation and collections management. Certified volunteers must attend and participate in educational workshops and continued training. A *Volunteer Service Agreement* (DPR 208), and *Colorado Desert District Duty Statement, State Park Paleontology Volunteer* must be reviewed annually. The State curatorial/collections policies also include adherence to the American Association of Museums *Code of Ethics*, and the Society of Vertebrate Paleontology *Bylaw Article 9. Statement of Ethics*.

Upon successful completion of the PCTP, volunteers are expected to consistently continue their assistance at a reasonable level (fiscal year 80 hour minimum), and maintain their technical proficiency in all aspects of the program. Volunteers should express a dedicated interest in, and a positive attitude towards the paleontologic program. Membership in the *Anza-Borrego Desert State Park Paleontological Society* is recommended but not required. Behavior which is unsafe or detrimental to the goals and policies of the paleontology program and/or ABDSP rules and regulations, will be cause for dismissal.

Instructors:

ABDSP and CDD staff directly participate in the PCTP. They provide supervision and guidance, assure that the highest professional standards are maintained, and deliver lectures and workshop training on specific geologic and paleontologic topics.

Experienced Certified paleontology volunteers, who have perfected their technical skills also may instruct new members during the PCTP. Different instructors will cover the various subjects and specialities listed below. New members learn and develop their skills with instructors on an apprenticeship basis. Through each training stage, the progress and accomplishments of individual students may be reviewed (see PCTP Check Lists).

Program Content:

- Introduction to the Paleontology Program
 - Volunteers and State paleontology resource management
 - History of paleontology at Anza-Borrego Desert
 - Anza-Borrego Desert paleontologic collections
 - Geologic history of the Anza-Borrego Desert region
- Field Survey and Specimen Recovery
 - Introduction, rules and regulations

- Fossil surveying
 - Using aerial photographs, DOQQs, and topographic maps
 - Plotting locations with a GPS
 - Describing fossil localities
 - Describing sedimentary rocks and depositional features
 - Locality/specimen Field Data Sheets
 - Collecting/recovery methods, plaster jacketing
 - Grid methods and taphonomy

Laboratory Conservation and Preparation

- Introduction, rules and regulations
- Tools, techniques and safety
- Cleaning, repair and restoration of fossil specimens
- Molds and casts (optional)
- Screen washing and microfossil sorting (occasional)

Curation

- Introduction, rules and regulations
- Specimen identification, osteology and odontology
- Cataloguing and collections data
- Collections organization
- Computerized records and data searches
- Loans

Lectures and Workshops

- Geologic history of ABDSP and the Salton Trough
- Local paleofaunas and paleofloras
- Plio-Pleistocene climates and paleoenvironments
- Sedimentary petrology and depositional environments
- Comparative vertebrate odontology
- Comparative vertebrate osteology
- Vertebrate taphonomy
- Invertebrate paleontology of ABDSP
- Field techniques and data collection
- Basic first aid and safety
- Guest professional lectures (occasional)

AN INTRODUCTION TO THE PALEONTOLOGY OF ANZA-BORREGO DESERT STATE PARK⁷

When most people think of Anza-Borrego Desert State Park⁷, they usually envision wild flowers, bighorn sheep, or vast arid landscapes framed by rugged mountains. Few realize that the expanses of Anza-Borrego's eroded badlands also provide a very different view, a window into the region's long vanished past. The Colorado Desert of southeastern California was not always a seemingly barren wilderness. The key to understanding and engaging this prehistoric world is paleontology, the study of the fossilized remains of ancient life, and Anza-Borrego has an exceptional fossil record. The fossil treasures from the park include preserved plants, a variety of invertebrate shells, animal tracks and an incredible array of bones and teeth representing over 550 species.

The oldest fossils from the region occur in the metamorphic rocks of the Santa Rosa and San Ysidro Mountains. These remains of microscopic marine animals are over 450 million years old. However, there is a 430 million year long gap between them and the next youngest mid-Miocene fossils. Most Anza-Borrego fossils date from 6 to less than a half million years old, about 60 million years after the last dinosaurs died.

Anza-Borrego Desert^J lies in a unique geologic setting along the western margin of the Salton Trough. This major topographic depression, with elevations under 200 feet below sea level, forms the northernmost end of an active rift valley and a geological continental plate boundary. The Trough extends north from the Sea of Cortez (Gulf of California) to San Geronimo Pass, and from the eastern rim of the Peninsular Ranges east to the San Andreas Fault Zone. Over the past 7 million years, a relatively complete geologic record of over 20,000 feet of fossil bearing sediment has been deposited within the Park along the rift valley's western margin. Here, paleontological remains are widespread and exceedingly diverse, and are found scattered over hundreds of square miles of eroded badlands terrain extending south from the Santa Rosa Mountains into northern Baja California, Mexico.

Both marine and terrestrial environments are represented by this long and rich fossil record. Six million years ago the ancestral Sea of Cortez filled the Salton Trough, extending northward past what would become the city of Palm Springs. These tropical waters supported a profusion of both large and small marine organisms. Through time, the sea gave way as an immense volume of sediment eroded during the formation of the Grand Canyon spilled into the Salton Trough. Bit-by-bit, the ancestral Colorado

River built a massive delta across the sea way. Fossil hard woods from the deltaic sands and associated coastal plain deposits suggest that the region received three times as much rainfall as today.

Anza-Borrego gradually changed from a predominately marine environment into a system of interrelated terrestrial habitats. North of the delta and intermittently fed by the Colorado River, a sequence of lakes and playa lakes has persisted for over 3 million years. At the same time, sediments eroded from the growing Peninsular Ranges and Santa Rosa Mountains spread east into the Trough. It is these sediments that provide an almost unbroken terrestrial fossil record, ending only a half million years ago. Here, the deposits of ancient streams and rivers trapped the remains of wild life that inhabited a vast brushland savannah laced with riparian woodlands.

As North and South America connected about 3 million years ago, terrestrial faunal migrations on a continental scale, the Great American Interchange (Webb 1976; Marshall, 1982), are evidenced by Anza-Borrego's fossils. Animals like giant ground sloths and porcupines made their first appearance in North America at this time.

This record of changing environments and habitats includes over 550 types of fossil plants and animals, ranging from preserved microscopic plant pollen and algal spores to baleen whale bones and mammoth skeletons. Many of the species are extinct and some are known only from fossil remains recovered from the park. Combined with a long and complete sedimentary depositional sequence, these diverse fossil assemblages are an unparalleled paleontologic resource of international importance. Both the Pliocene-Pleistocene Epoch boundary and the Blancan-Irvingtonian North American Land Mammal Age boundary fall within the long geological record from the Anza-Borrego Desert. Environmental changes associated with these geological time divisions are probably better tracked by fossils from Anza-Borrego than in any other North American continental strata. These changes herald the beginning of the Ice Ages, and the strata undoubtedly contain fossil clues to the origin and development of modern southwestern desert landscapes.

The first fossils, marine shells from the ancient Sea of Cortez and fresh water shells from prehistoric Lake Cahuilla, precursor of the Salton Sea, were collected and described by William Blake in 1853 (Conrad, 1855). Blake was the geologist and mineralogist for the *U.S. Pacific Railroad Exploration* commissioned by Congress and President Pierce to find a railway route to the Pacific. It was Blake who first named this region the Colorado Desert.

Since the late 1800s, numerous scientific studies and published papers have centered on the marine organisms that inhabited the ancestral Sea of Cortez. Fossil assemblages from the classic Imperial Formation include calcareous nanoplankton and dinoflagellates, foraminifera, corals, polychaetes, clams, gastropods, urchins and sand dollars, and crabs and shrimp. The deposits also yield the remains of marine

vertebrates such as sharks and rays, bony fish, baleen whale, walrus, and dugong. Marine environments such as outer and inner shelf, platform reef, and near shore beach and lagoon are all represented within the Imperial Formation. As the sea shallowed, estuarine and brackish marine conditions prevailed, typified by thick channel deposits of oyster and pecten shell coquina that now form the Elephant Knees along Fish Creek.

Many of the marine fossils are closely related to forms from the Caribbean Sea. They document a time before the isthmus of Panama formed, when the warm Gulf Stream of the western Atlantic invaded eastern Pacific Ocean waters.

The oldest terrestrial vertebrate fossils from the Colorado Desert predate the late Miocene invasion of the Sea of Cortez. These very rare fossils, which include a gomphothere (elephant-like mammal), rodent, felid and small camelid, and were collected from the riverine and near shore lake deposits of the Anza and Split Mountain Formations. However, the most significant and abundant vertebrate fossils have been recovered from the latest Miocene through late-Pleistocene riverine and flood plane deposits of the Palm Spring Formation in the Vallecito and Fish Creek Badlands and Ocotillo Conglomerate exposed in the Borrego Badlands. These fossil assemblages occur in a 3.5 million year long uninterrupted stratigraphic sequence that has been dated using horizons of volcanic ash and paleomagnetic methods.

The bestiary for this savannah landscape reads like a *who's-who* for some of the most unique creatures to inhabit North America, animals like: *Geochelone*, giant bathtub-sized tortoise; *Aiolornis incredibilis*, largest flying bird of the northern hemisphere, with 17 foot wing span; *Paramylodon*, *Megalonyx* and *Nothrotheriops*, giant ground sloths, some with bony armor within their skin; *Pewelagus*, a very small rabbit (paleontologists do have a sense of humor); *Borophagus*, hyena-like dog; *Acrtodus*, giant short-faced bear; *Homotherium* and *Smilodon*, sabertoothed cats; *Miracinonyx*, the North American cheetah; *Mammuthus imperator*, largest known mammoth; *Tapirus*, extinct tapir; *Titanotylopus*, giant camel; and *Capromeryx*, the dwarf pronghorn.

S. Bowers' 1901 *Reconnaissance of the Colorado Desert Mining District* discusses the paleontological resources of the region. His narrative contains the first account of vertebrate fossils from Anza-Borrego. Shark's teeth and whale fossils are reported from the Coyote Mountains area, and the remains of an extinct zebra-like horse, identified as *Equus occidentalis*, from the eastern Borrego Badlands. Interestingly, Bowers comments that "Taken as a whole it (the Colorado Desert) is by far the largest deposit of fossils yet reported from the Pacific Slope." Bowers' observations did not miss the mark.

In the late 1930s, Guy Hazen and field party from the Frick Laboratory of the American Museum of Natural History were the first to systematically survey portions of

the Borrego and Vallecito Creek Badlands for vertebrate fossils. During World War II, the Park was used for military exercises, and paleontologic explorations did not resume until the mid-1950s. At that time, Ted Downs and others of the Natural History Museum from Los Angeles County initiated the most productive phase of paleontologic research in the region, lasting through the mid-1980s. In the early 1970s, George Miller, who had previously worked with Downs, established a paleontology program based at Imperial Valley College Museum in El Centro, California. Active work by Miller and his students continued through the late 1980s. The extensive paleontological collections amassed by the Imperial Valley College Museum and the Natural History Museum of Los Angeles County were recently united. The collection now resides in the park's Colorado Desert District Stout Research Center in Borrego Springs. Here, the fossils have been the focus of ongoing research, study and interpretation since the mid-1990s.

Although paleontological exploration of Anza-Borrego Desert State Park⁷ has stepped firmly into the twenty-first century with the application of GIS and computer assisted analyses to field surveys and resource management, many questions still remain. Expanding the detail and clarity of our paleontological view of the region's vanished past and improving our understanding of it's significance is an on going challenge. Exploration, conservation, research and interpretation continue as new fossils are discovered.

(extracted from *Fossil Treasures of the Anza-Borrego Desert*)

PALEONTOLOGY CODE OF ETHICS

The Department of Parks and Recreation adheres to the basic content of the American Association of Museums *Code of Ethics* for museum curators, and the Colorado Desert District (CDD) specifically follows the Society of Vertebrate Paleontology *Bylaw Article 9. Statement of Ethics* (below).

CDD and Anza-Borrego Desert State Park (ABDSP) Staff, paleontology volunteers and members of the Paleontology Society are expected to: 1. act ethically and legally in collecting, acquiring, reproducing, lending, and disposing of specimens; 2. discourage unethical, illegal, and destructive practices with respect to collecting, acquiring, storing, reproducing, displaying, transporting, and/or trafficking in specimens; 3. refrain from providing donors with appraisals for any gift or bequest of specimens; and 4. abide by all CDD and ABDSP rules, regulations and staff recommendations (see CDD Paleontologic Resources and Collections Management Policy 1995).

Society of Vertebrate Paleontology, Bylaw Article 9. Statement of Ethics:

"It is the responsibility of vertebrate paleontologists to strive to ensure that vertebrate fossils are collected in a professional manner, which includes the detailed recording of pertinent contextual data (e.g. geographic, stratigraphic, sedimentologic, taphonomic).

It is the responsibility of vertebrate paleontologists to assist government agencies in the development of management policies and regulations pertinent to the collection of vertebrate fossils, and to comply with those policies and regulations during and after collection. Necessary permits on all lands administered by federal, state, and local governments whether domestic or foreign, must be obtained from the appropriate agency(ies) before fossil vertebrates are collected. Collecting fossils on private lands must only be done with the landowner's consent.

Fossil vertebrate specimens should be prepared by, or under the supervision of trained personnel.

Scientifically significant fossil vertebrate specimens, along with ancillary data, should be curated and accessioned in the collections of repositories charged in perpetuity with conserving fossil vertebrates for scientific study and education (e.g. accredited museums, universities, colleges, and other educational institutions).

Information about vertebrate fossils and their accompanying data should be disseminated expeditiously to both scientific community and interested general public.

The barter, sale, or purchase of scientifically significant vertebrate fossils is not condoned unless it brings them into, or keeps them within, a public trust. Any other trade or commerce in scientifically significant vertebrate fossils is inconsistent with the foregoing, in that it deprives both the public and professionals of important specimens, which are part of our natural heritage."

PALEONTOLOGY VOLUNTEER GENERAL INFORMATION

Volunteer Duties:

Paleontology volunteer duties and activities are specifically defined and fall within the following categories; *Standard Paleontology Volunteer*, *Paleontology Laboratory Volunteer*, *Paleontology Curation Volunteer*, and *High School Internship* (see *Volunteer Duty Statements*). One of these specific duty categories will appear on the *Volunteer Service Agreement* (DPR 208). Also, a separate *Colorado Desert District Duty Statement*, *State Park Paleontology Volunteer* document accompanies the *duty performance form*. All volunteers are considered non-paid State employees. All paleontology volunteers must contribute a minimum of 80 hours each fiscal year.

State Forms:

All active volunteers must have a current signed *Volunteer Service Agreement* (DPR 208), and a *duty performance form* on file. An *Authorization To Use Privately Owned Vehicles On State Business* (STD 261) form is required of those who wish to use their vehicles on paleontology program trips. High school inters must have a *Parental Permission* (DPR 208C) form on file.

Certification:

The *Paleontology Certification Training Program* (PCTP) provides professional training for volunteers who assist in the management and care of the Anza-Borrego Desert State Park (ABDSP) and Colorado Desert District (CDD) paleontologic collections and field resources. Training is designed to assure competency in field, laboratory conservation/preparation and curatorial activities. Certified Volunteers must be able to work on their own, and are required to maintain a high level of expertise through the regular attendance at lectures and workshops. The PCTP course starts on the second Friday of November and runs through the last Friday of May. Each month, candidates attend the PCTP lecture, scheduled field, laboratory, and curation training workshops for a total of approximately 40 hours in each. Candidates are certified upon the successful completion of this 160 hour course, development of competent technical skills, and demonstration of an understanding of basic paleontologic principles. Those enrolled in the PCTP must work with State staff or Certified Volunteers at all times.

Applicants with prior education, experience, and knowledge in the fields of paleontology and/or geology may petition the CDD Paleontologist for certification through examination.

Laboratory and Curation Volunteers:

Laboratory and/or Curation Volunteers assist in all aspects of preparation and curation. Participation in field activities is not required. However, they must demonstrate an understanding of the current techniques and methods used in these areas, and successfully pass those relevant portions of the PCTP examination. Participation in field activities is restricted to Certified Volunteers or those enrolled in the PCTP.

Anza-Borrego Desert State Park Paleontology Society:

Membership in the Paleontology Society (PS) is not required of or restricted to volunteers. Any individual interested in paleontology or the program activities may participate at any level. Donations and/or dues are not required. The PS assists CDD and ABDSP staff in paleontologic resources management activities. They participate in workshops and assist in the PCTP. The PS members are also active in relevant ABDSP interpretive programs.

Visitors:

Visitors are welcomed at all lectures and workshops. Visitors that join a field expedition must fill out a *Ride-Along Waiver* (DPR 675). Visitors must be accompanied by a Certified volunteer while in the field and laboratory/curation. Casual participation in these activities by friends and/or relatives is prohibited.

Volunteer Tax Benefits:

Many of those expenses that go along with donating time and services as a State Park volunteer are deductible, as long as you keep good records. Generally out of pocket expenses can be deducted. However, the monetary value of your time and services is not deductible. Park staff are not tax experts, so consult you CPA or tax preparer. Additional information is also available through the IRS.

The cost and upkeep of required volunteer uniforms is deductible. If you use your car, operating expenses, parking fees and tolls are deductible. Travel expenses incurred while performing volunteer duties or required activities may be deducted. If

you have been chosen to attend a convention on behalf of the Department (e.g. you present a paper at a Society of Vertebrate Paleontology meeting), you may deduct unreimbursed expenses of a reasonable amount for transportation, meals and lodging.