

SUMMARY OF RESEARCH ACTIVITIES WITHIN THE NATIONAL PARK SERVICE AREAS COOPERATING WITH THE U.W.-N.P.S. RESEARCH CENTER, 1986.

Bighorn Canyon National Recreation Area

- III. Studies Supported By University And Allied Funding Sources.
- A. Plant survey and vegetation map.
Dennis H. Knight, University of Wyoming.
Source of Support: University of Wyoming/NPS Research Center
Initiated 1983.
Ongoing.
- B. Vertebrate inventory of Bighorn Canyon National Recreation Area.
Stanley H. Anderson, University of Wyoming.
Source of Support: University of Wyoming/NPS Research Center.
Initiated 1984.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
- A. Bighorn Cave research project.
Source of Support: Volunteer Group, The National Cave Research Institute with partial support from NPS Bighorn Canyon NRA.
Initiated 1985.
Ongoing.

Canyonlands National Park

- I. Studies Conducted By Park Personnel.
- A. Tamarisk density in riverbank vegetation in Canyonlands National Park.
Jeff Connor, Natural Resource Specialist.
Initiated 1983.
Completion 1986.
- B. Biotic succession following the 1982 Bulter Wash fire and Salt Creek Fire.
Kate Kitchell and Jeff Connor, Natural Resource Specialists.
Initiated 1982.
Ongoing.
- C. Campsite assessment in the backcountry of Canyonlands National

Park.
Kate Kitchell, Natural Resource Specialist.
Initiated 1978.
Ongoing.

II. Studies Supported With National Park Service Funds.

- A. Water resources assessment in the needles district and adjacent BLM Lands.
Ecosystem Research Institute.
Initiated 1985.
Ongoing.
- B. Determine the sulfur content of different-age annual whorls of pinyon trees.
Roger W. Ferenbaugh.
Initiated 1985.
Ongoing.

III. Studies Supported By Universities And Allied Funding Sources.

- A. Evolutionary significance of a particular DNA sequence from the Kangaroo Rat, D. ordii
Karl C. Lark, University of Utah
Source of Support: National Institute of Health.
Initiated 1983.
Ongoing.
- B. Eriogonum inflatum, the allocation of limiting resources between reproduction and survival in life history variants of Eriogonum inflatum.
Nona R. Chiariedllo, University of Utah.
Source of Support: ?
Initiated 1983.
Ongoing.
- C. Research on the endangered Colorado Squawfish in Canyonlands National Park.
Bob Williams, Bureau of Reclamation.
Source of Support: Bureau of Reclamation.
Initiated 1984.
Ongoing.
- D. Research project on the interactions between yucca, its pollinatore and its seed predator.
John F. Addicott, University of Alberta.
Source of Support: Natural Sciences and Engineering Research, Council of Canada.
Initiated 1981.
Ongoing.

- E. An analysis of pothole water in Canyonlands National Park.
Stanley I. Dodson, University of Wisconsin.
Source of Support: ?
Initiated 1984.
Ongoing.

Capitol Reef National Park

- I. Studies Conducted By Park Personnel.
 - A. Grazing effects on the grasslands of Capitol Reef National Park.
Norman R. Henderson, Resource Management Specialist.
Initiated 1984.
Ongoing.
 - B. Abundance and distribution of Tamarisk along the Fremont River within Capitol Reef National Park.
Norman R. Henderson, Resource Management Specialist.
Initiated 1984.
Ongoing.
- II. Studies Supported With National Park Service Funds.
 - A. Domestic livestock grazing and range evaluation within Capitol Reef National Park.
Mike Davis, Northwest Agri-Tech.
Initiated 1984.
Ongoing.
 - B. Livestock grazing impacts on riparian areas within Capitol Reef National Park.
Richard C. Barth, Colorado School of Mines Research Institute.
Initiated 1984.
Ongoing.
 - C. Livestock impacts on archeological resources within Capitol Reef National Park.
Douglas Scott, NPS Midwest Archeological Center, University of Nebraska, Lincoln.
Initiated 1985.
Ongoing.
 - D. Ecology and distribution of newly introduced Bighorn Sheep within Capitol Reef National Park.
Gar Workman, Utah State University.
Initiated 1984.
Ongoing.
 - E. Preparation of a vegetation map for Capitol Reef National Park.

Bud Titlow, NPS, Remote Sensing Unit, Geographic Information Systems Division.
Initiated 1983.
Completion 1986.

- III. Studies Supported By Universities And Allied Funding Sources.
- A. A biogeographical analysis of the grasshoppers of the Great Basin.
James MacMahon, Utah State University.
Source of Support: Utah State University.
Initiated 1984.
Ongoing.
 - B. Early triassic bivalve mollusks.
Donald W. Boyd, University of Wyoming.
Source of Support: University of Wyoming.
Initiated 1985.
Ongoing.
 - C. Analysis of the upper Permian and Triassic Strata.
Diane Kamola, University of Utah.
Source of Support: University of Utah.
Initiated 1984.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
- A. Analysis of the Jurassic system on the Colorado Plateau.
Fred Peterson, US Geological Survey.
Source of Support: US Geological Survey.
Initiated 1982.
Ongoing.
 - B. Phylinae (Hemiptera: Miridae) of North America and Mexico.
Randall Schuh, American Museum of Natural History.
Source of Support: National Science Foundation.
Initiated 1983.
Ongoing.
 - C. Basalt Dikes.
Anne Gartner, US Geological Survey.
Source of Support: US Geological Survey.
Initiated 1984.
Ongoing.

Custer Battlefield National Monument

- II. Studies Supported With National Park Service Funds.

- A. Archeological examination and inventory of cultural resources Custer Battlefield National Monument.
Douglas D. Scott, Midwest Archeological Center, Lincoln, Nebraska.
Source of Support: Custer Battlefield Historical and Museum Association.
Initiated 1983.
Ongoing.
- B. Geomorphologist study of deep ravine.
C. Vance Haynes, University of Arizona.
Source of Support: Custer Battlefield Historical and Museum Association.
Initiated 1985.
Ongoing.
- C. Forensic analysis of human bones found on Custer Battlefield as a result of 1984 and 1985 archeological survey.
Clyde C. Snow, University of Oklahoma.
Source of Support: Custer Battlefield Historical and Museum Association.
Initiated 1984.
Ongoing.
- D. Plant study of Custer Battlefield following the 1983 prairie fire.
Jane H. Bock and Maureen O'Shea-Stone, University of Colorado.
Initiated 1984.
Ongoing.
- E. Oral history of The Battle of Little Bighorn-Cheyenne informants.
Royal G. Jackson, Oregon State University.
Source of Support: University of Wyoming.
Initiated 1985.
Ongoing.

Dinosaur National Monument

- I. Studies Conducted By Park Personnel
 - A. Peregrine Falcon recovery program.
Stephen Petersburg, Resource Management Specialist; Gerald Craig, Colorado Division of Wildlife; William Burnham, The Peregrine Fund.
Initiated 1977.
Ongoing.
 - B. Air quality monitoring (particulates).
Stephen Petersburg, Resource Management Specialist; Pat Feeney, University of California, Davis.

- Initiated 1984.
Ongoing.
- C. Bighorn Sheep movements and habitat selection.
Stephen Petersburg, Resource Management Specialist.
Initiated 1984.
Ongoing.
- D. Fire effects studies (vegetation, breeding birds, small mammals).
Stephen Petersburg, Resource Management Specialist.
Initiated 1984.
Ongoing.
- E. Baseline vegetation studies.
Stephen Petersburg, Resource Management Specialist.
Initiated 1983.
Ongoing.
- F. River campground impact monitoring.
James McBrayer, River Ranger.
Initiated 1979.
Ongoing.
- G. Mormon Cricket population monitoring.
Stephen Petersburg, Resource Management Specialist.
Initiated 1982.
Ongoing.
- II. Studies Supported With National Park Service Funds.
 - A. Management of control of Mormon Crickets.
John Capinera and Chuck MacVean, Colorado State University.
Initiated 1985.
Ongoing.
 - B. Air quality monitoring (visibility).
Air Resource Specialists, Fort Collins, CO.
Initiated 1978.
Ongoing.
- III. Studies Supported By Universities And Allied Funding Sources.
 - A. Morrison Microvertebrates.
George Engelmann, University of Nebraska, Omaha
Source of Support: University of Nebraska, Earthwatch.
Initiated 1985.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
 - A. Colorado River fishes monitoring project.

Harold Tyus, Research Biologist, USFWS.
Source of Support: U.S. Fish and Wildlife Service.
Initiated 1981.
Ongoing.

- B. Identification of habitat requirements and limiting factors for Colorado Squawfish and Humpback Chubs.
Tom Nesler, Colorado Division of Wildlife.
Source of Support: Colorado Division of Wildlife.
Initiated 1980.
Ongoing.
- C. Determination of economic impact and economic threshold levels for brush and insect pests of the Sagebrush Ecosystem.
John Capinera, C. D. Bonham and E. T. Bartlett, Colorado State University.
Source of Support: Colorado State University, Western Regional Integrated Pest Management Competitive Grants Program (C.S.R.S., U.S.D.A.)
Initiated 1985.
Ongoing.
- D. Population monitoring on endangered fish, Utah.
Steve Cranney, Utah Div. of Wildlife Resources.
Source of Support: Utah Div. Wildlife Resources.
Initiated 1985.
Ongoing.

Fort Laramie National Historic Site

- III. Studies Supported By University And Allied Funding Sources.
 - A. Vegetation analysis and management.
Charles F. Olmstead, University of Northern Colorado.
Source of Support: University of Wyoming.
Initiated 1985.
Ongoing.

Glacier National Park

- I. Studies Conducted By Park Personnel.
 - A. Glacier National Park Landsat based resource information system.
Carl H. Key.
Initiated 1981.
Ongoing.

- II. Studies Supported By National Park Service Funds.
- A. Grizzly bear population studies.
Cliff Martinka.
Initiated 1967.
Ongoing.
 - B. Aquatic ecosystem inventory.
Leo F. Marnell.
Initiated 1979.
Ongoing.
 - C. Grizzly bear food ecology studies.
Kate Kendall.
Initiated 1982.
Ongoing.
 - D. Lake McDonald ecosystem investigations.
Leo F. Marnell.
Initiated 1986.
Ongoing.
 - E. Upper Kintla Lake charr studies.
Leo F. Marnell.
Initiated 1983.
Ongoing.
 - F. Local and long-range movements of Bald Eagles.
Riley McClelland and Leonard Young.
Initiated 1977.
Ongoing.
 - G. Nesting ecology of Bald Eagles.
Riley McClelland and Rick Yates.
Initiated 1985.
Completion 1989.
 - H. Behavior and distribution of different age classes of Bald Eagles at the autumn concentration.
Riley McClelland and Rob Bennetts.
Initiated 1983.
Completion 1986.
 - I. Roadside exotic plant communities.
Tad Weaver and Bryant Woods, Montana State University.
Initiated 1984.
Completion 1986.
 - J. Bighorn Sheep insular ecology.
Kim Keating.
Initiated 1985.
Ongoing.

- III. Studies Supported By University And Allied Funding Sources.
 - A. Spotted knapweed.
Rob Tyser, University of Wisconsin-La Crosse.
Initiated 1984.
Ongoing.

- IV. Studies Supported By Funds From Other Sources.
 - A. Wolf ecology.
Robert Ream.
Source of Support: U.S. Fish & Wildlife Section 6 Funds.
Initiated 1978.
Ongoing.

 - B. Geology of Glacier National Park.
James Whipple.
Source of Support: US Geological Survey.
Initiated 1979.
Ongoing.

 - C. Border station water chemistry.
Jack Stanford, Yellow Bay Biological Station, Bigfork, Montana.
Source of Support: Glacier National Park (National Park Service).
Initiated 1983.
Ongoing.

- V. Publication.
 - A. Keating, K. A. 1986. Historical grizzly bear trends in Glacier National Park, Montana. Wildl. Soc. Bull. In press.

Glen Canyon National Recreation Area

- I. Studies Conducted By Park Personnel.
 - A. Monitoring lakeshore tamarisk invasion.
Charles W. Wood, Biologist
Initiated 1985.
Ongoing.

 - B. Carrying capacity of Lake Powell for boating use: field visitor surveys and impact studies.
Charles W. Wood, Biologist, Glen Canyon National Recreation Area, Mike Snyder, Landscape Architect, Rocky Mountain Region.
Initiated 1985.
Completion 1986.

- II. Studies Supported With National Park Service Funds.
- A. A survey of bacterial indicators of fecal pollution in Lake Powell, Glen Canyon National Recreation Area.
Jacquelyn A. Fitzgerald, et. al., Department of Biological Sciences, Northern Arizona University, Flagstaff.
Initiated 1985.
Ongoing.
 - B. Reclamation investigations on disturbed lands at Glen Canyon National Recreation Area.
Jeff Meyer and Robert Comer, Thorne Ecological Institute, and Jim Holland, Glen Canyon National Recreation Area.
Initiated 1984.
Completion 1994.
 - C. Inventory and evaluation of campsites and subsequent development of a recreation model for the San Juan River from Sand Island to Clayhills Crossing.
Larry Agenbroad and Dale Nations, Northern Arizona University, Flagstaff.
Initiated 1985.
Ongoing.
 - D. Survey of Peregrine Falcons at Zion and Canyonlands National Parks and Glen Canyon National Recreation Area.
James H. Enderson, The Peregrine Fund, Boise, ID.
Initiated 1984.
Ongoing.
 - E. Cultural resources inventory.
Richard Ambler, Northern Arizona University, Flagstaff.
Initiated 1984.
Ongoing.
 - F. Ruins stabilization.
Paul Nickens, Nickens and Associates, Montrose, Colorado.
Initiated 1983.
Ongoing.
 - G. Paleontological studies.
Larry Agenbroad, Northern Arizona University, Flagstaff.
Initiated 1984.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
- A. Glen Canyon environmental studies: A series of studies evaluating the impact of Glen Canyon Dam on the Colorado River through Glen and Grand Canyons.
Dave Wegner, Bureau of Reclamation.
Source of Support: Bureau of Reclamation, Salt Lake City.

Initiated 1982.
Completion 1987.

- B. An analysis of grazed and non-grazed Blackbrush ecosystems in Glen Canyon National Recreation Area.
Jeffery Klopatec, Department of Botany & Microbiology, Arizona State University, Tempe.
Source of Support: ?
Initiated 1984.
Completion 1986.

Grand Teton National Park

- I. Studies Conducted By Park Personnel.
- A. Ecological effects and biotic succession following the 1974 Waterfalls Canyon fire.
William J. Barmore, Jr., Research Biologist
Initiated 1974.
Ongoing. Measured in 1975, 1976, 1977 and 1983.
- B. Snake River cutthroat trout investigations.
Pete Hayden, Aquatic Biologist
Initiated 1964.
Ongoing.
- II. Studies Supported With National Park Service Funds.
- A. Bald Eagle nesting and banding study.
Robert Eng, Montana State University, Bozeman.
Initiated 1979.
Ongoing.
- III. Studies Supported By Universities And Allied Funding Sources.
- A. Mushrooms of Grand Teton and Yellowstone National Parks.
Kent H. McKnight, Agricultural Research Service, Beltsville, MD.
Source of Support: University of Wyoming and Agricultural Research Service.
Initiated 1967.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
- A. Effects of environmental variables on some physiological responses in Microtus montanus under natural conditions.
Aelita Pinter, University of New Orleans LA.
Source of Support: Private funds.
Initiated 1969.

Ongoing.

- B. Winter ecology and migration of the Gros Ventre Buttes mule deer herd, Jackson Hole, Wyoming
T. Campbell, Biota Research and Consulting, Inc., and T. Clark, Idaho State University, Pocatello.
Source of Support: Boone and Crockett Club, Idaho State University, Spring Creek Ranch, and Biota Research and Consulting, Inc.
Initiated 1979.
Ongoing.
- C. Summer distribution and migration of elk that winter on the National Elk Refuge.
Bruce Smith, Management Biologist, National Elk Refuge.
Source of Support: U.S. Fish and Wildlife Service.
Initiated 1978.
Ongoing.
- D. Social interactions, movements and activity in otters.
Joseph G. Hall, San Francisco State University.
Source of Support: Private funds.
Initiated 1982.
Ongoing.
- E. Chronology of neogene sedimentary rocks in Jackson Hole, Wyoming.
Douglas W. Burbank, University of Southern California, Los Angeles.
Source of Support: National Science Foundation.
Initiated 1983.
Completion 1986.
- F. Life history strategies of the Montane Vole, Microtus montanus.
Frederick J. Jannett, Jr., Science Museum of Minnesota, St. Paul.
Source of Support: Science Museum of Minnesota.
Initiated 1978.
Ongoing.
- G. Late-glacial and postglacial vegetation and climate of Jackson Hole and the Pinyon Peak Highlands, Wyoming.
Cathy W. Barnosky, Carnegie Museum of Natural History.
Source of Support: University of Wyoming.
Initiated 1986.
Completion 1987.

Jewel Cave National Monument

- II. Studies Supported With National Park Service Funds.
 - A. Hydrologic study of Jewel Cave and Wind Cave.
E. Calvin Alexander, University of Minnesota.
Initiated 1985.
Completion 1988.

Knife River Indian Villages National Historic Site

- II. Studies Supported With National Park Service Funds.
 - A. Phase I archeological data base research for KNRI.
Stanley A. Ahler, University of North Dakota, Grand Forks.
Midwest Archeological Center, Lincoln, Nebraska.
Initiated 1976.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
 - A. Phytolith analysis of plant and sediment samples from Big Hidatsa.
Susan Mulholland, University of Minnesota-Duluth.
Source of Support: Private.
Initiated 1985.
Ongoing.

Theodore Roosevelt National Park

- I. Studies Conducted By Park Personnel.
 - A. Photographic study of the vegetative recovery of a rehabilitated roadway in Theodore Roosevelt National Park.
District Naturalist, South Unit, and Jeff Bradybaugh, Resource Management Specialist.
Initiated 1981.
Ongoing.
 - B. Distribution mapping of common and air pollution sensitive lichens.
Ray W. Snow, District Naturalist, North Unit.
Initiated 1982.
Ongoing.
 - C. Update and correction of taxonomy and synonymy for the Park's vascular flora.
Micki Hellickson, Chief Naturalist.
Initiated 1982.

Ongoing.

- D. Affects of various herbicides and application rates on leafy spurge.
Jeff Bradybaugh, Resource Management Specialist.
Initiated 1983.
Ongoing.
- E. Moth communities of the north unit of Theodore Roosevelt National Park, North Dakota.
Ray W. Snow, North Unit District Naturalist.
Initiated 1984.
Ongoing.
- F. The ecological role of lichens in Theodore Roosevelt National Park, North Dakota.
Ray W. Snow, North Unit District Naturalist.
Initiated 1984.
Ongoing.
- G. Isotopis (S) analysis of precipitation of the North Unit of Theodore Roosevelt National Park, ND.
Ray W. Snow, North Unit District Naturalist.
Initiated 1985.
Ongoing.
- H. Breeding bird atlas of the North Unit of Theodore Roosevelt National Park, ND, and Neighboring Townships.
Ray W. Snow and others, NPS.
Initiated 1985.
Ongoing.
- I. Range forage utilization and range condition trends in relation to large ungulate use at Theodore Roosevelt National Park.
Jeff Bradybaugh, Resource Management Specialist.
Initiated 1982.
Ongoing.

II. Studies Supported By National Park Service Funds.

- A. Distribution, movements, habitat use, food habits, and associated behavior of reintroduced elk in Theodore Roosevelt National Park.
Lynn Irby and others, Montana State University.
Initiated 1985.
Ongoing.

III. Studies Supported By Universities.

- A. Lichens of the Killdeer Mountains, ND.
Ray W. Snow, North Unit District Naturalist.
Source of Support: North Dakota State University.

Initiated 1983.
Ongoing.

- IV. Studies Supported By Funds From Other Sources.
- A. Inventory of the rare plants of North Dakota.
Richard Warner, North Dakota Natural Heritage Program.
Source of Support: North Dakota Natural Heritage Program.
Initiated 1982.
Ongoing.
- B. Aerial survey of deer, bighorn, elk and pronghorn for Theodore Roosevelt National Park.
North Dakota Game and Fish Department Personnel.
Source of Support: Theodore Roosevelt Nature and History Association.
Initiated 1982.
Ongoing.

Wind Cave National Park

- I. Studies Conducted By Park Personnel.
- A. Natural mortality of elk and bison in Wind Cave National Park.
Park Research Biologist and other members of Park staff.
Initiated 1977.
Ongoing.
- B. The effect of ungulates on abundance and distribution of trees and shrubs.
Park Research Biologist and other members of Park staff.
Initiated 1977.
Ongoing.
- C. Predator activities on black-tailed prairie dog towns.
Park Research Biologist.
Initiated 1981.
Ongoing.
- D. The effect of grazing by bison and elk on prairie plant communities.
Park Research Biologist.
Initiated 1981.
Completion 1986.
- E. Canada thistle colony dynamics on prairie dog towns.
Park Research Biologist.
Initiated 1984.
Completion 1987 or 1988.

- F. Fire's effect on cacti.
Park Research Biologist.
Initiated 1985.
Completion 1986 or 1987.

- II. Studies Supported With National Park Service Funds.
 - A. Coyote food habits in Wind Cave National Park.
William Franklin, Iowa State University and Park Research Biologist.
Initiated 1983.
Completion 1986.

 - B. Dietary analysis of sympatric herbivores at Wind Cave National Park.
Larry L. Tieszen, Augustana College, South Dakota and Park Research Biologist.
Initiated 1984.
Completion 1986.

 - C. Antiquity of prairie dog towns in Wind Cave National Park.
Everett M. White, South Dakota State University.
Initiated 1984.
Completion 1986.

 - D. Vertebrate paleontology in Wind Cave National Park.
James E. Martin, South Dakota School of Mines and Technology.
Initiated 1985.
Completion 1987.

 - E. Hydrologic study of Jewel and Wind Caves.
E. Calvin Alexander, University of Minnesota.
Initiated 1985.
Completion 1987.

- III. Studies Supported By Universities And Allied Funding Sources.
 - A. Riparian habitats in Wind Cave National Park.
Theodore L. Maguder, University of Hartford.
Source of Support: University of Hartford and personal funds of researcher.
Initiated 1981.
Ongoing.

 - B. Archeological neotaphonomy: Understanding the formation processes of faunal assemblages, the Wind Cave Taphonomy Project.
Galen R. Burgett, University of New Mexico and University of Wyoming.
Source of Support: University of New Mexico, L.S.B. Leakey Foundation, and personal funds.

Initiated 1984.
Completion 1987.

- C. Hydrology and hydrochemistry of the Pahasapa Limestone.
John Rohde, Washington State University.
Source of Support: Washington State University.
Initiated 1984.
Completion 1986.

IV. Studies Supported By Funds From Other Sources.

- A. Social behavior of prairie dogs.
John L. Hoogland, University of Maryland.
Source of Support: National Science Foundation and the Harry Frank Guggenheim Foundation.
Initiated 1975.
Ongoing.
- B. Social development in American bison.
Wendy Green and Aron Rothstein, City College of the City University of New York.
Source of Support: National Institute of Health.
Initiated 1982.
Completion 1988.
- C. Intensification of biological activity and control of ecosystem change by native herbivores in North American grasslands.
James K. Detling and April Whicker, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1984.
Completion 1988.
- D. Prairie dog grazing: its potential effects on vegetation attributes and soil nitrogen.
Miguel Angel Brizuela, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1985.
Completion 1988.
- E. Individual and interactive grazing effects of prairie dogs and bison upon vegetation and soil attributes.
M. S. Cid de Brizuela, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1985.
Completion 1988.
- F. Frequency of mycorrhizal infection in plant communities with diverse histories of prairie dog grazing, and effects of mycorrhizae infection on plant growth and plant interactions under different defoliation regimes.
Carol L. Simmons, Colorado State University.

- Source of Support: National Science Foundation.
Initiated 1985.
Completion 1989.
- G. Investigations of structural stability in the Wind Cave Ecosystem.
Kirsten Krueger, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1985.
Completion 1987.
- H. The role of prairie dogs and bison in determining the abundance and species composition of grasshoppers in Wind Cave National Park.
Richard A. Redak, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1985.
Completion 1987.
- I. Grazing patterns of American bison in the mixed-grass prairie ecosystem.
Ron Green, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1985.
Completion 1988.
- J. Plant-animal interactions: the role of native herbivores in selection of grazing adapted plants.
Elizabeth Painter and J. L. Detling, Colorado State University.
Source of Support: National Science Foundation.
Initiated 1981.
Completion 1986.
- K. Marked individuals in range plant studies.
Kirsten Krueger and E. L. Painter, Colorado State University.
Source of Support: Personal resources of investigators.
Initiated 1985.
Completion 1988.
- V. Publications.
- A. Archer, Steve and J. K. Detling. 1986. Evaluation of potential herbivore mediation of plant water status in a North American mixed-grass prairie. *Oikos*, in press.
- B. Brizuela, Miguel A., J. K. Detling and M. Silvia Cid. 1986. Silicon concentrations of grasses growing in sites with different histories. *Ecology* 67(4):1098-1101.
- C. Coppock, L. D. and J. K. Detling. 1986. Alteration of bison and blacktailed prairie dog grazing interaction by prescribed burning. *J. Wildl. Manage.* 50(3):452-455.

- D. Krueger, Kirsten. 1986. Feeding relationships among bison, prong horn and prairie dogs: an experimental analysis. *Ecol.*: 760-770.
- E. Krueger, Kirsten. 1986. Interactions and activity patterns of bison and prairie dogs at Wind Cave National Park: implications for manager. Nat'l. Wilderness Research Conf. July 23-26, 1985. Fort Collins, CO. 6 pp.

Yellowstone National Park

- I. Studies Conducted By Park Personnel.
 - A. Plant ecology studies.
Don G. Despain.
Initiated 1968.
Ongoing.
 - B. Bison ecology studies.
Mary Meagher.
Initiated 1969.
Ongoing.
 - C. Animal ecology studies.
Mary Meagher.
Initiated 1980.
Ongoing.
 - D. Study of thermal features in Yellowstone National Park.
Roderick A. Hutchinson.
Initiated 1974.
Ongoing.
 - E. Gypsy Moth detection.
J. Sweaney, National Park Service.
Initiated 1983.
Completion ?.
 - F. Elk studies.
Francis J. Singer, National Park Service.
Initiated 1985.
Ongoing.
 - G. Pleistocene events in the Yellowstone area
John Good, National Park Service.
Initiated 1981.
Ongoing.
 - H. Quaternary-present deformation, Yellowstone Lake Basin.
Wayne L. Hamilton, National Park Service.

Initiated 1983.
Ongoing.

- III. Studies Supported By Universities And Allied Funding Sources.
- A. White Pelican reproduction in the Molly Islands breeding colony, Yellowstone National Park.
Kenneth L. Diem, University of Wyoming, Laramie.
Source of Support: University of Wyoming.
Initiated 1978.
Ongoing.
 - B. Ecological studies on parasites of the Gibbon elk herd.
David E. Worley, Montana State University, Bozeman.
Source of Support: Montana State University.
Initiated 1978.
Ongoing.
 - C. Aversive repellent tests, bears.
C. Jonkel, University of Montana.
Source of Support: University of Montana.
Initiated ?.
Completion ?.
 - D. Biology of thermal spring systems in western North America.
Samuel D. Rushforth and Jack D. Brotherson, Brigham Young University, Provo, UT.
Source of Support: Brigham Young University
Initiated: 1981.
Completion: 1986.
 - E. Study of Yellowstone and Lost Creek tuffs.
Tammy Wolcott, University of Calgary, Alberta, Canada.
Source of Support: University of Calgary.
Initiated: 1981.
Ongoing.
 - F. Research of fluoride effects in wildlife and vegetation.
James L. Shupe, H. B. Peterson and A. E. Olson, Utah State University, Logan.
Source of Support: Utah Agriculture Experiment Station, U.S. Department of Energy and private industry.
Initiated 1956.
Completion 1986.
 - G. Relationship between reserve design and mammal presence and extirpation.
W. Newmark, University of Michigan.
Source of Support: University of Michigan.
Initiated 1983.
Completion ?.

- H. Intraspecific competition in American Bison cows in late winter.
A. Rutbert, University of Washington.
Source of Support: University of Washington.
Initiated 1983.
Completion ?.
- I. Distribution of shore bugs and brine flies at Sylvan Springs, YNP.
V. Resh and M. Barnby, University of California.
Source of Support: University of California.
Initiated 1983.
Completion ?.
- J. Aquatic invertebrates of YNP.
G. Roemhild, Montana State University.
Source of Support: Montana State University.
Initiated 1983.
Completion ?.
- K. Herbarium collection.
R. Athey, Memphis State/Vanderbilt University.
Source of Support: ?.
Initiated 1983.
Completion ?.
- L. Biosystematic study of Rocky Mountain populations of Sisyrinchium (Iridaceae).
A. Cholewa, University of Idaho.
Source of Support: University of Idaho.
Initiated 1983.
Completion ?.
- M. Aspects of the natural history of the Sagebrush Lizard.
G. Carpenter and D. Duvall, University of Wyoming.
Source of Support: University of Wyoming.
Initiated 1983.
Completion ?.
- N. Population genetic structure in the Iguanid Lizard Sceloporus graciosus and its implications for the stasipatric speciation hypothesis.
J. Sites and P. Thompson, Brigham Young University.
Source of Support: Brigham Young University, National Geographic and National Science Foundation.
Initiated 1983.
Completion ?.
- O. Analysis of natural microbial populations by Ribosomal RNA cloning and sequencing.
N. Pace, Nat'l Jewish Hosp. and Research Center, and University of Colorado School of Medicine.
Source of Support: Nat'l Jewish Hospital, University of Colorado

- USPHS.
Initiated 1983.
Completion ?.
- P. Biochemical and ecological studies of extremely thermophilic bacteria.
R. Ramaley, University of Nebraska.
Source of Support: University of Nebraska.
Initiated 1981.
Completion ?.
- Q. Petrology of pleistocene and recent travertine, Yellowstone National Park, WY, and Gardiner, MT.
V. Pursell, University of Texas.
Source of Support: University of Texas and Geological Society of America.
Initiated ?.
Completion ?.
- R. Small mammal ecology following natural fire (Fan Creek Fire).
R. E. Moore and J. Alley, Montana State University.
Source of Support: Montana State University.
Initiated 1983.
Completion ?.
- S. Trace element analysis of obsidian from YNP: Southern Plains Archeological Project.
T. Baugh and F. Nelson, University of Oklahoma and Brigham Young University.
Source of Support: University of Oklahoma.
Initiated 1983.
Completion ?.
- T. Ecology and physiology of photosynthetic microorganisms.
R. Castenholz, University of Oregon.
Source of Support: National Science Foundation and University of Oregon.
Initiated 1983.
Completion ?.
- U. Cellobiase production in thermophilic bacteria and fungi.
J. Von Ashlefeldt, J. Mattoon and K. Andrews, University of Colorado.
Source of Support: University of Colorado.
Initiated 1983.
Completion ?.
- V. Ecology of hot springs microbial mats.
D. Ward, N. Revsbech, T. Tayne, K. Anderson and M. Bateson, Montana State University.
Source of Support: National Science Foundation and Montana State

- University.
Initiated 1983.
Completion ?.
- W. Ecology and characterization of bacterial nitrogen fixation in thermal springs.
C. Wickstrom, Kent State University.
Source of Support: National Science Foundation and Kent State University.
Initiated 1983.
Completion ?.
- X. Community position and pattern along a continuous thermal gradient; physical vs. biological constraints.
R. Riegert, University of Georgia.
Source of Support: National Science Foundation and University of Georgia.
Initiated 1983.
Completion ?.
- Y. Analysis of anoxic microbial activities in thermal springs.
J. G. Zeikus, F. S. Lupton and S. Goodwin, University of Wisconsin.
Source of Support: Department of Energy and University of Wisconsin.
Initiated 1983.
Completion ?.
- Z. Elemental and isotopic compositions of noble gases from Yellowstone thermal features.
M. Kennedy, J. Reynolds, S. Smith and M. Lynch, University of California.
Source of Support: Department of Energy and University of California.
Initiated 1983.
Completion ?.
- A¹. Early precambrian evolution of the Southern Beartooth Mountains.
C. Montgomery, Northern Illinois University.
Source of Support: National Science Foundation and Northern Illinois University.
Initiated 1983.
Completion ?.
- B¹. Petrology and geochemistry of mixed lava in YNP.
R. Guy and A. K. Sinha, Virginia Poly Instit. and State University.
Source of Support: Chevron, National Science Foundation and Virginia Poly Instit. and State University.
Initiated: 1983.
Completion ?.

- IV. Studies Supported By Funds From Other Sources.
- A. Petrology of the Yellowstone Plateau volcanic field.
R. L. Christiansen, US Geological Survey, Menlo Park, CA.
Source of Support: United States Geological Survey.
Initiated 1974.
Ongoing.
 - B. Remote monitoring of geothermal features.
Irving Friedman and Daniel Norton, US Geological Survey, Denver, CO.
Source of Support: United States Geological Survey.
Initiated 1980.
Completion 1991.
 - C. Multiphase fluid flow in geothermal systems.
Susan Werner Kieffer, US Geological Survey, Flagstaff, AZ.
Source of Support: United States Geological Survey.
Initiated 1976.
Completion ?.
 - D. Seismograph sensing.
Andrew M. Pitt, US Geological Survey, Menlo Park, CA.
Source of Support: United States Geological Survey.
Initiated 1978.
Ongoing.
 - E. Biology of trout in thermally enriched environment - Firehole River.
Samuel Luoma, US Geological Service.
Source of Support: United States Geological Service.
Initiated 1975.
Ongoing.
 - F. Isolation and characterization of fermentative anaerobes and aerobes from thermal areas.
Thomas Ng, Michael E. Himmel and K. Andrews, Solar Energy Research Institute.
Source of Support: U.S. Department of Energy.
Initiated 1980.
Ongoing.
 - G. Status of critical plant species.
Mark R. Stromberg and Robert Lichvar, The Nature Conservancy, Cheyenne, WY.
Source of Support: Wyoming Natural Heritage Program.
Initiated 1979.
Ongoing.
 - H. Ecology of Gallatin elk and range relationships.
Graham Taylor, Montana Department of Fish, Wildlife and Parks.
Source of Support: Montana Department of Fish, Wildlife and Parks.

- Initiated 1959.
Ongoing.
- I. Basic stream and lake inventory—all waters of Yellowstone National Park.
U.S. Fish and Wildlife Service, Yellowstone National Park.
Source of Support: U.S. Fish and Wildlife Service.
Initiated 1965.
Ongoing.
- J. Classifying butterflies of Yellowstone.
Jeffrey R. Saffle, University of Utah, Salt Lake City.
Source of Support: ?.
Initiated ?.
Completion ?.
- K. Relative digestibility of Artemesia tridentata subspecies and Artemesia nova by elk, deer and domestic sheep and preference by elk and deer on Gardiner hunting district.
Karl Striby, Montana State University, Bozeman.
Source of Support: ?.
Initiated ?.
Completion ?.
- L. Population, status, and ecology of grizzly bears in Yellowstone National Park and vicinity.
R. R. Knight, Interagency Grizzly Bear Study, Montana State University, Bozeman.
Source of Support: Multi-agency.
Initiated 1973.
Ongoing.
- M. Mushrooms of Grand Teton and Yellowstone National Parks.
Kent McKnight, Mycology Laboratory, U.S. Department of Agriculture, Beltsville, MD., Kimball Harper, Brigham Young University and Meinhardt Moser, University of Innsbruck.
Source of Support: U.S. Department of Agriculture and University of Wyoming, Brigham Young University and University of Innsbruck.
Initiated 1980.
Ongoing.
- N. Bryophytes of selected regions of Yellowstone National Park.
D. H. Norris and David Nakamura, Humboldt State University, Arcata, CA.
Source of Support: ?.
Initiated 1980.
Completion ?.
- O. Effects of hiker and horse trampling on tree growth in Northern Rockies.

- DeAna Lynn Nasseth, Baylor University, Waco, TX.
Source of Support: ?.
Initiated 1980.
Completion ?.
- P. Study of clays representing ore forming environments.
Mike Palin, New Mexico Tech. University, Socorro.
Source of Support: U.S. Office of Surface Mining.
Initiated 1981.
Ongoing.
- Q. Evaluation of lithospheric structure, seismicity, crustal deformation and possible magma sources at Yellowstone.
Robert B. Smith, University of Utah, Salt Lake City.
Source of Support: US Geological Survey.
Initiated 1960.
Ongoing.
- R. Stream gauging to monitor heat and mass flux of hot springs system.
J. M. Thompson and R. O. Fournier, US Geological Survey, Menlo Park, CA.
Source of Support: United States Geological Survey.
Initiated 1960.
Ongoing.
- S. Study of water and steam from hot springs and vents.
Alfred Truesdell, and Richard Makdisi, US Geological Survey, Menlo Park, CA Orono.
Source of Support: Personal funds
Initiated 1981.
Ongoing.
- T. Study of native undisturbed vegetation in Cooke City area.
Ray W. Brown.
Source of Support: Intermountain Forest and Range Experiment Station, U.S. Forest Service.
Initiated ?.
Completion ?.
- U. Hybridization and genetic deformity of high altitude vascular flora.
William J. Humphrey, Plant Taxonomy Division, Project Blue-snow.
Source of Support: ?.
Initiated ?.
Completion ?.
- V. Obtain waters low in natural tritium for purposes of ground-water dating of oil shale related waters from Utah.
McDonald Wrenn, University of Utah, Salt Lake City.
Source of Support: ?.
Initiated 1981.

Completion ?.

- W. Depositional environments of Yellowstone fossil forests at Specimen Ridge.
Richard F. Uretich, University of Massachusetts, Amherst.
Source of Support: ?.
Initiated 1981.
Ongoing.
- X. Upper Yellowstone Bighorn Sheep study.
L. Irby and K. Keating, Montana State University.
Source of Support: Montana Department of FW&P and North American Foundation for wild sheep.
Initiated 1983.
Completion ?.
- Y. Energy expenditure of elk and deer in snow.
C. Robbins, Washington State University.
Source of Support: U.S. Forest Service.
Initiated 1983.
Completion ?.
- Z. Interagency grizzly bear study.
L. Roop, Wyoming Game and Fish.
Source of Support: U.S. Fish and Wildlife Service.
Initiated ?.
Completion ?.
- A¹. Fish population survey--Robinson and Little Robinson Creeks.
R. Spateholts, Idaho Fish and Game.
Source of Support: Idaho Fish and Game.
Initiated 1983.
Completion ?.
- B¹. Breeding bird survey.
D. Bystrak, U.S. Fish and Wildlife Service.
Source of Support: U.S. Fish and Wildlife Service.
Initiated ?.
Completion ?.
- C¹. Status of critical bird species.
S. Findholdt, Wyoming Natural Heritage Program.
Source of Support: Wyoming Natural Heritage Program.
Initiated ?.
Completion ?.
- D¹. Postfire timber damage in the Northern Rocky Mountain/Inter-mountain Region.
D. Peterson, USDA - Forest Service.
Source of Support: U.S. Forest Service.
Initiated 1983.

- Completion ?.
- E¹. Impact of forest fire on the nutrient influx into Heart Lake, YNP.
R. Stottlemeyer, Michigan Tech. University.
Source of Support: Man and the Biosphere.
Initiated 1983.
Completion ?.
- F¹. Biological control of mosquitos with mermithid nematode parasites.
L. Nielsen, S. Dickson and L. Hanson, University of Utah.
Source of Support: National Institute of Health.
Initiated 1983.
Completion ?.
- G¹. Hybridization and genetic deformity of high altitude vascular flora.
W. Humphrey.
Source of Support: ?.
Initiated 1983.
Completion ?.
- H¹. Preliminary survey of plants in Bechler Area and Pitchstone Plateau.
D. Lindsay.
Source of Support: ?.
Initiated 1983.
Completion ?.
- I¹. Class and environmental relationships of wetland vegetation in central YNP.
D. Mattson and F. Johnson, University of Idaho.
Source of Support: ?.
Initiated 1983.
Completion ?.
- J¹. Microorganisms from alkaline thermal springs and pools as potential tools in biomass conversion.
K. Andrews and K. Grohman, Colorado College.
Source of Support: SERI.
Initiated 1983.
Completion ?.
- K¹. N₂ fixation in rhodospirillaceae.
M. Madigan, Southern Illinois University.
Source of Support: USDA.
Initiated 1983.
Completion ?.
- L¹. Isolation of extreme thermophilic bacteria.
S. Mainzer, Corning Glass Works.
Source of Support: Corning Glass Works.
Initiated 1983.

Completion ?.

- M¹. Isolation of organisms responsible for leaching metal ions from minerals.
J. Wolfram and B. Breckenridge, EG&G, Idaho.
Source of Support: Dept. of Energy Genentech, Inc.
Initiated 1983.
Completion ?.
- N¹. Rocky Mountain acidification study.
J. H. Gibson, Colorado State Univ., C. Schofield, Cornell Univ., J. Galloway, Univ. of Virginia, Wm. McFee, Purdue Univ., and R. Johnson, Colorado State Univ.
Source of Support: U.S. Fish and Wildlife Service.
Initiated 1983.
Completion ?.
- O¹. Hydrogen release from active faults.
C. Rocken and R. Wah, University of Colorado.
Source of Support: ?.
Initiated 1983.
Completion ?.
- P¹. Electrical geophysical studies, Upper Boundary Creek area of YNP.
D. B. Hoover, US Geological Survey.
Source of Support: U.S. Geological Survey.
Initiated 1983.
Completion ?.
- Q¹. Calcite Springs hydrothermal system.
D. Foley, Univ. of Utah Research Institute.
Source of Support: ?.
Initiated 1983.
Completion ?.
- R¹. Active and fossil geothermal systems.
D. White, US Geological Survey.
Source of Support: U.S. Geological Survey.
Initiated 1983.
Completion ?.
- S¹. Mafic inclusions in 2.7 billion year granite rock, Northern Yellowstone.
C. Casella, Northern Illinois University.
Source of Support: ?.
Initiated 1983.
Completion ?.
- T¹. Dendrochronology in the Yellowstone Fossil.
A. Chadwick and M. Arct, Loma Linda University.

- Source of Support: ?.
Initiated 1983.
Completion ?.
- U¹. Volcanology and petrology of Lake Cenozoic magmatic systems.
R. Christiansen and W. Hildreth, US Geological Survey.
Source of Support: US Geological Survey.
Initiated 1983.
Completion ?.
- V¹. Comparative study of cenozoic volcanogenic rocks in YNP and Japan and for development of exploration model of geothermal resources in Japan.
T. Ohguchi, Research Institute of Underground Research, Akita Univ.
Source of Support: ?.
Initiated 1983.
Completion ?.
- W¹. Evolution of magma chemistry in the Absaroka Volcanics.
J. Stout, University of Minnesota.
Source of Support: McKenna Foundation.
Initiated 1983.
Completion ?.
- X¹. Depositional setting, diagenesis, and petroleum potential of the Permian Shedhorn Sandstone, S.W. Montana and N.W. YNP.
J. Thornburg, University of Colorado.
Source of Support: ARCO Exploration Co.
Initiated 1983.
Completion ?.
- Y¹. Physical processes in large silicic magma systems.
D. Dzurisin, US Geological Survey.
Source of Support: U.S. Geological Survey.
Initiated 1983.
Completion ?.
- Z¹. A study of Yellowstone caldera using tiltmeters.
J. Levine and C. Meertens, University of Colorado.
Source of Support: Air Force Geophysics.
Initiated 1983.
Completion ?.
- A¹¹. Multi-year visitor services study: Assessment of current interpretation; mapping of visitor use of same: Evaluation of effectiveness.
G. Machlis, University of Idaho.
Source of Support: USS Arizona Natural History.
Initiated 1983.

Completion ?.

Zion National Park

- I. Studies Conducted By Park Personnel.
 - A. Tunnel stress monitoring.
Larry L. Hays, Resource Management Specialist.
Initiated 1978.
Ongoing.
 - B. Peregrine Falcon monitoring; nesting and fledging success.
Larry L. Hays, Resource Management Specialist.
Initiated 1978.
Ongoing.

- II. Studies Supported With Park Service Funds.
 - A. Peregrine Falcon survey and eggshell recovery.
James Enderson, Colorado College with the Peregrine Fund.
Initiated 1984.
Completion ?.

- IV. Studies Supported By Funds From Other Sources.
 - A. Utah State ambient benthological monitoring.
Michael K. Reichert, Bureau of Water Pollution Control.
Source of Support: State Funds.
Initiated 1979.
Ongoing.
 - B. Utah flora project.
Stanley L. Welsh, Brigham Young University.
Source of Support: Private Funds.
Initiated 1960.
Ongoing.
 - C. Erg margin process and products; intertonguing of the Kayenta and Navajo Formations.
Marlene F. Tuesink, Northern Arizona University.
Source of Support: Chevron, Sigma Xi, and Friday Lunch Club.
Initiated 1984.
Ongoing.
 - D. A stratigraphic and petrographic study of the Moenave Formation, Zion National Park.
Elizabeth Queen, Stephen F. Austin State University.
Source of Support: Private Funds.
Initiated 1984.

Completion ?.

- E. Yucca - Yucca moth interactions.
John F. Addicott, University of Alberta.
Source of Support: National Science and Engineering Council of
Canada; National Geographic Society.
Initiated 1980.
Ongoing.
- F. Search for Microcaddis Fly Ochrotichia zioni.
Milton W. Sanderson, Northern Arizona University.
Source of Support: Private Funds.
Initiated 1985.
Completion ?.