

SUMMARY OF RESEARCH ACTIVITIES WITHIN THE NATIONAL PARK SERVICE AREAS
COOPERATING WITH THE U.W.-N.P.S. RESEARCH CENTER, 1987.

Badlands National Park

- I. Studies Conducted By Park Personnel.
 - A. Response of stands of common mullein to prescribed fire.
Resource Management Staff.
Initiated 1988.
Completion 1990.
- II. Studies Supported With National Park Service Funds.
 - A. Vegetation distribution in Badlands National Park, South Dakota, potential plant communities.
George R. Hoffinan, Univ. SD.
Initiated 1988.
Completion 1991.
- III. Studies Supported By Universities And Allied Funding Sources.
 - A. Bison reproductive ecology: Genetic consequences of insularization in a polygynous species.
Joel Berger, Univ. NV, Reno.
Initiated 1985.
Completion 1989.
 - B. A comparison of superposed fauna from Channel Sandstone of the Upper Brule Formation in the South Dakota Badlands.
Philip Bjork.
Initiated 1986.
Completion 1990.
 - C. Determination of the Nature of sedimentation and fossil entombment in oligocene aged sediments.
Thomas E. Guensburg, Southern IL Univ.
Initiated 1987.
Completion 1990.
 - D. Examination of the stratigraphic relations and fauna of the transition between the White River and Arikara Group, including paleomagnetic and fission track dating techniques.
Robert Hunt, Univ. NE.
Initiated 1988.
Completion 1989.
 - E. Dating geologic deposits in the Badlands using magnetic stratigraphy.
Donald R. Prothero, Occidental Coll., Los Angeles, CA.

Initiated 1986.
Completion 1989.

- F. Evolutionary relationships and biomechanics of Perissodactyls.
William P. Wall, GA Coll.
Initiated 1987.
Completion 1990.

IV. Studies Supported By Funds From Other Sources.

- A. Population status of bighorn sheep herd in Badlands National Park.
Ted Benzou, S.D. Dept. of Game, Fish, and Parks, Rapid City, SD.
Initiated 1987.
Completion 1989.
- B. Status of rare vascular plants - Visher's Buckwheat, Barr's Milkvetch and others.
David J. Ode, S.D. Dept. of Game, Fish, and Parks, Pierre, SD.
Initiated 1986.
Ongoing.

V. Publications.

- A. Agnew, W., D. W. Uresk, and R. M. Hansen. 1987. Arthropod consumption by small mammals on prairie dog colonies and adjacent ungrazed mixed grass prairie in Western South Dakota. Presentation at 8th Great Plains Wildl. Damage Control Workshop. 9 pp.
- B. Berger, Joel, and Michael Kock. 1988. Overwinter survival of carfentanil-immobilized male bison. J. Wildl. Dis. 24(3):555-556.
- C. Berger, Joel, and Carol Cunningham. 1988. Size related effects on search times in North American grassland female ungulates. Ecol. 69(1):177-183, February 1988.
- D. Berger, Joel, and Mary Peacock. 1988. Variability in size - weight relationships of Bison bison. J. Mammal. 69(3):618-624, August 1988.
- E. Cincotta, R. P., D. W. Uresk, and R. M. Hansen. 1987. A statistical model of expansion in a colony of black-tailed prairie dogs. Presentation at 8th Great Plains Wildl. Damage Control Workshop, April 1987, 6 pp.

- F. Kerley, Linda L. 1988. Microhabitat choice and biting flies in American bison (Bison bison): A test of multiple hypotheses. M.S. Thesis, Univ. NV, Reno. 44 pp.
- G. Kock, Michael D., and Joel Berger. 1987. Chemical immobilization of free ranging North American bison (Bison bison) in Badlands National Park, South Dakota. J. Wildl. Dis. 23(4):625-633.
- H. Olson, Vickie A. 1988. The steppe vegetation of the North Unit of Badlands National Park. M.S. Thesis, Univ. SD, Vermillion. 202 pp.
- I. Uresk, Daniel W., Rudy M. King, Anthony D. Apa, Michelle S. Deisch, and Raymond L. Linder. 1987. Rodenticidal effects of zinc phosphide and strychnine on non-target species. Presentation at 8th Great Plains Wildl. Damage Control Workshop April 28-30, 1987. 7 pp.
- J. Whisenant, Steven G. 1987. Effects of fire on mixed-grass plant communities in Badlands National Park, with annotated bibliography. Final progress report under National Park Service contract. 22 pp.
- K. Will-Wolf, Susan. 1975. Multivariate analysis of foraging site selection by flower feeding insects in a Western S.D. prairie. PhD. Thesis, Univ. WI, Madison. 500 pp.

Big Hole National Battlefield

- I. Studies Conducted By Park Personnel.
 - A. Plant community changes since the Battle in 1877. Park Staff. Initiated 1977. Ongoing.
- II. Studies Supported With National Park Service Funds.
 - A. Vertebrate inventory for Big Hole National Battlefield. Frederick Lindzey, Univ. WY. Initiated 1987. Completion 1988.

Bighorn Canyon National Recreation Area

- III. Studies Supported By University And Allied Funding Sources.
 - A. Distribution and habitat analysis of Bighorn Sheep in Bighorn Canyon National Recreation Area.

Sanford Schemnitz, NM State Univ, Las Cruces.
Source of Support: UW-NPS Res. Cen., Bur. Land
Manage. and other sources.
Initiated 1985.
Completion 1989.

- B. Riparian vegetation dynamics along the Bighorn River,
Wyoming.
Dennis H. Knight, Univ. WY.
Source of Support: UW-NPS Res. Cen.
Initiated 1987.
Completion 1988.

- C. Fire history on the Bighorn Canyon National Recreation
Area.
Dennis H. Knight, Univ. WY.
Source of Support: UW-NPS Res. Cen.
Initiated 1988.
Completion 1990.

IV. Studies Supported By Funds From Other Sources.

- A. Bighorn Cave research project.
Source of Support: Volunteers from various grottos.
Initiated 1985.
Ongoing.

V. Publications.

- A. Akashi, Yoshiko. 1988. Riparian vegetation dynamics
along the Bighorn River, Wyoming. M.S. Thesis, Univ WY,
Laramie. 245 pp.
- B. Coates, Kevin P. and Schemnitz. 1988. Habitat
utilization, interspecific interactions and status of a
recolonized population of Bighorn Sheep at a Wild Horse
Range. M.S. Thesis, NM State Univ, Las Cruces. 71 pp.
- C. Bighorn research project. Northwest Cave Research
Institute. Cave Inventory & Management Recommendations
report. 197 pp. 1987.

Bryce Canyon National Park

I. Studies Conducted By Park Personnel.

- A. Inventory of conflicts with wilderness management.
Park resource manager and ranger staff.
Initiated 1987.
Ongoing.
- B. Inventory of backcountry campsite conditions. Initiation
of monitoring program to track impacts to biological

resources from backcountry campsite use.
Park resource manager and ranger staff.
Initiated 1987.
Ongoing.

- C. Inventory and monitoring of Peregrine Falcon aeries.
Park resource manager and SCA volunteer.
Initiated 1986.
Ongoing.
- D. Follow-up of deer exclosure vegetation study.
Park biological technician and other park staff.
Initiated ?
Ongoing.
- E. Proposed burn area inventory and monitoring.
Park biological technician and other park staff.
Initiated ?
Ongoing.

II. Studies Supported With National Park Service Funds.

- A. Evaluation of the study of mining noise/Alton Coal fields.
WASO Energy, Mining and Minerals; Jim Foch, private contractor. Original study contracted and paid for by Utah International, Inc.; BBN, private contractor.
Initiated 1986.
Ongoing.
- B. Effects of mining operations on night skies (modeling).
WASO Air Quality; Systems Applications, Inc., private contractor; Utah International, Inc.
Initiated 1988.
Ongoing.
- C. Plant community distribution and dynamics.
Dave Roberts, Linda Gottschalk, Greg Hallsten, Utah State University, Univ. WY and Park resource manager.
Initiated 1986.
Ongoing.
- D. Historical vegetation, fuel loads and integrated resource information systems for Bryce Canyon National Park.
Dave Roberts, UT State Univ.
Initiated 1988.
Ongoing.
- E. Inventory and evaluation of Bryce Canyon water resources.
WASP Water Resources; Will Mast, researcher, Park staff.
Initiated 1987.
Ongoing.

- F. Analysis of community composition and habitat of Pediomelum pariense in Bryce Canyon National Park.
Dave Roberts, Utah State Univ.
Initiated 1988.
Ongoing.
 - G. Visitor services survey.
Gary Machlis, Univ. of ID.
Initiated 1988.
Ongoing.
 - H. Cryptogams as air pollution indicator.
Jayne Belknap, Canyonlands National Park.
Initiated 1988.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
- A. Conglomerate clasts as stratigraphic indicator.
Tom Harkins, Univ. CA.
Initiated 1987.
Ongoing.
 - B. Depositional environments of Kaiparowits and Claron Formations.
Patrick Goldstrand, Univ. NV, Reno.
Initiated 1988.
Ongoing.
 - C. Regional stratigraphic etiology.
Douglas J. Mullett, Kent State Univ.
Initiated 1988.
Ongoing.
 - D. Correlations of paleocene and upper cretaceous sedimentologic patterns.
Janet Pitman and Blair Jones, USGS, Reston, VA.
Initiated 1988.
Ongoing.
 - E. Geologic history of southern Utah, late cretaceous.
Jeffrey G. Eaton, Museum of Northern AZ.
Initiated 1988.
Ongoing.
 - F. Small mammals inventory.
Mike Bogan, Nat'l Ecol. Cen. and park staff.
Initiated 1988.
Ongoing.

Southeast Utah Group Parks:
Arches and Canyonlands National Parks and
Natural Bridges National Mounument

- I. Studies Conducted By Park Personnel.
- A. Long term monitoring program: This includes inventory and monitoring of the following components in each habitat type in each district or unit of the Southeast Utah Group: birds (including nesting raptors), small mammals, carnivores, vegetation, herpetofauna, and water quality. Park staff, coordinated by Tim Graham, PhD. and Jayne Belnap.
Initiated 1982.
Ongoing.
 - B. Peregrine falcon monitoring.
Park staff, UT Div. Wildl. Res.
Initiated 1983.
Ongoing.
 - C. Bighorn sheep monitoring.
Park staff.
Initiated 1980.
Ongoing.
 - D. Effects of fire and rahabilitation studies in riparian and mixed grassland/shrubland and habitats at Spanish Bottom along the Colorado River.
Kate Kitchell, Resource Management Specialist.
Initiated 1988.
Ongoing.
 - E. The effect of different planting treatments on the survival of blackbrush (Coleogyne ramosissima) seedlings along road shoulders in Canyonlands National Park.
Kate Kitchell, Resource Management Specialist.
Initiated 1988.
Ongoing.
 - F. Biotic succession following the 1982 Bulter Wash Fire and Salt Creek Fire.
Kate Kitchell and Jeff Connor, Natural Resource Specialist.
Initiated 1982.
Ongoing.
 - G. 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. Blackbrush (*Coleogyne ramossissima*) propagation techniques for application in reclamation of disturbed areas.
Harrison Hughes and Eugene Weglenski, CO State Univ.
Initiated 1988
Completion 1989.
 - B. An analysis of composition, distribution, and habitat use of reintroduced desert bighorn sheep in Arches National Park, Utah.
Gar Workman and Shirlene Haas, UT State Uni.
Initiated 1987.
Completion 1989.
 - C. Quaternary studies in Glen Canyon NRAS and Canyonlands National Park.
Larry Agenbroad and Jim Mead, Northern AZ Univ.
Initiated 1985.
Completion 1989.
 - D. Archeological investigations of selected sites in the Needles District of Canyonlands National Park.
Alan Schroedl, P-III Associates
Initiated 1985.
Completion 1989.
 - E. S. ruin stabilization in Canyonlands National Park and Natural Bridges National Monument.
Nickens and Associates.
Initiated 1984.
Completion 1987.
 - F. Water resources assessment in the Needles District and adjacent BLM lands.
Ecosystem Research Institute.
Initiated 1985.
Ongoing.
 - G. 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. Ecology of potholes on the Colorado Plateau: effect of acid deposition on rock pool communities in and near Arches National Park, Utah
Tim Graham.
Source of Support: WASO-Air Quality, NPS.

- Initiated 1988.
Completion 1993.
- B. Ecology of rattlesnakes in disturbed environments: Crotalus viridis concolor (Midget faded rattlesnake) densities and movement patterns in the vicinity of the residence/visitor center area of Natural Bridges National Monument, Utah.
Tim Graham.
Source of Support: NPS Rocky Mountain Region Resource Management.
Initiated 1988.
Completion 1990.
- C. Interactions between Fraxinus anomala (Single leaf ash) and Tropidosteptes sp. (Hemiptera:Miridae): the effect of auto exhaust and road dust on susceptibility to herbivore damage.
Tim Graham.
Source of Support: Southeast Utah Group ONPS.
Initiated 1987.
Completion 1991.
- D. Coleogyne ramosissima seedling establishment: the roles of substrate, and nearness to other seedlings and shrubs on black brush seedling survival.
Tim Graham.
Source of Support: Southeast Utah Group ONPS.
Initiated 1988.
Completion 1990.
- E. Effectiveness of the herbicide Garlon-3A on Tamarix ramosissima: the role of season of application on tamarisk mortality.
Tim Graham.
Source of Support: Southeast Utah Group ONPS.
Initiated 1988.
Completion 1990.
- F. Population ecology of Erigeron kachinensis in Natural Bridges National Monument: survey and population dynamics.
Jayne Belnap.
Source of Support: Southeast Utah Group ONPS.
Initiated 1988.
Completion 1993.
- G. Rare plant plan for Canyonlands and Arches National Park and Natural Bridges National Monument.
Jayne Belnap.
Source of Support: Southeast Utah Group ONPS
Initiated 1987.

Completion 1989.

- H. Sensitivity of cryptogamic crusts and rock lichens on the Colorado Plateau to gaseous, wet and dry air pollutants.
Jayne Belnap.
Source of Support: WASO-Air Quality, NPS.
Initiated 1987.
Completion 1990.
- I. Investigations of endangered fishes in Cataract Canyon in Canyonlands National Park.
Rich Valdez, Bio/West, Inc.
Source of Support: Bur. Recl.
Initiated 1986.
Completion 1988.
- J. Study of Mancos Milkvetch, (Astragalus humillimus).
John L. Anderson.
Source of Support: U.S. Fish and Wildlife Service.
Initiated 1988.
Ongoing.
- K. Study of Permian stratigraphy in the White Rim sandstone in Elaterite Basin.
David Loope.
Source of Support: Univ. of NE.
Initiated 1988.
Ongoing.
- L. Investigations of burrowing wolf spiders in Arches National Park.
Gary L. Miller.
Source of Support: Univ. MS.
Initiated 1987.
Ongoing.
- M. Investigations of joints around Salt Valley anticline and Cache Valley.
Ortrud Fette.
Source of Support: Univ. of AZ.
Initiated 1988.
Ongoing.
- N. Evolutionary significance of a particular DNA sequence from the Kangaroo Rat, D. ordii.
Karl C. Lark, Univ. UT.
Source of Support: Nat'l Instit. of Health.
Initiated 1983.
Ongoing.

- O. Eriogonum inflatum, the allocation of limiting resources between reproduction and survival in life history variants of Eriogonum inflatum.
Nona R. Chiariedllo, Univ. UT.
Source of Support: ?
Initiated 1983.
Ongoing.
- P. Research on the endangered Colorado Squawfish in Canyonlands National Park.
Bob Williams, Bur. Rec.
Source of Support: Bur. Rec.
Initiated 1984.
Ongoing.
- Q. Research project on the interactions between yucca, its pollinator and its seed predator.
John F. Addicott, Univ. Alberta.
Source of Support: Nat. Sci. and Eng. Res., Council of Canada.
Initiated 1981.
Ongoing.
- R. An analysis of pothole water in Canyonlands National Park.
Stanley I. Dodson, Univ. WI.
Source of Support: ?
Initiated 1984.
Ongoing.

Capitol Reef National Park

- I. Studies Conducted By Park Personnel
 - A. Impact of livestock on Capitol Reef National Park ecosystems: vegetation changes on upland riparian benches in lower Hall's Creek.
Norman R. Henderson, Resource Management Specialist.
Initiated 1987.
Ongoing.
 - B. Impact of livestock on a population of Sclerocactus wrightiae.
Norman R. Henderson, Resource Management Specialist.
Initiated 1986.
Ongoing.
 - C. Coliform bacteria in tinajas of the Waterpocket Fold: changes correlated with the presence of cattle in Capitol Reef National Park.
Norman R. Henderson, Resource Management Specialist.

Initiated 1986.
Ongoing.

- D. Grazing effects on the grasslands of Capitol Reef National Park.
Norman R. Henderson, Resource Management Specialist.
Initiated 1984.
Ongoing.
- E. Grazing effects on tinaja vegetation in the lower Halls Creek region of Capitol Reef.
Norman R. Henderson, Resource Management Specialist.
Initiated 1988.
First phase completed 1988.

II. Studies Supported With National Park Service Funds.

- A. Presettlement grassland composition of Capitol Reef National Park using phytolith analysis.
Richard Fisher, UT State Univ.
Initiated 1987.
Ongoing.
- B. Abundance and distribution of Tamarisk along the Fremont River within Capitol Reef National Park.
Mark Pistrang, Duke Univ., School of For. and Environ. Studies.
Initiated 1986.
Completion 1988.
- C. Vegetation communities of Capitol Reef National Park.
Ken Heil, San Juan Coll., Farmington, NM.
Initiated 1986.
Completion 1989.
- D. Ecological characterization/biological assessment of the tinaja ecosystems of the Waterpocket Fold.
James Haefner, UT State Univ.
Initiated 1987.
Completion 1990.
- E. Livestock grazing impacts on riparian areas within Capitol Reef National Park.
Richard C. Barth, Soil-Plant Systems.
Initiated 1984.
Completion 1988.
- F. Domestic livestock grazing and range evaluation within Capitol Reef National Park.
Mike Davis, Production Ecology.
Initiated 1984.
Completion 1989.

- G. Ecology and distribution of newly introduced Bighorn Sheep within Capitol Reef National Park.
Gar Workman, UT State Univ.
Initiated 1984.
Completion 1989.
 - H. Livestock grazing effects on small mammal populations within Capitol Reef National Park.
Steve Rosenstock, Wingate Ecol. Serv.
Initiated 1988.
Completion 1991.
 - I. Livestock grazing effects on avian populations within Capitol Reef National Park.
David Willey, Private Consultant.
Initiated 1988.
Completion 1991.
- III. Studies Supported By Universities And Allied Funding Sources.
- A. Some responses of soil microphytic crusts to livestock trampling.
Neil West, UT State Univ.
Source of Support: USDA Coop. States Research Service.
Initiated 1986.
Completion 1991.
 - B. A biogeographical analysis of the grasshoppers of the Great Basin.
James MacMahon, UT State Univ.
Source of Support: UT State Univ.
Initiated 1984.
Completion 1989.
 - C. Analysis of the upper Permian and Triassic Strata.
Diane Kamola, Univ. UT.
Source of Support: Univ. UT.
Initiated 1984.
Completion 1988.
- IV. Studies Supported By Funds From Other Sources.
- A. Habitat assessment and criteria for the Peregrine Falcon in Southeastern Utah.
Dr. Clayton White, Brigham Young Univ.
Source of Support: UT Div. Wildl. Res.
Initiated 1987.
Ongoing.
 - B. Basalt Dikes in Capitol Reef National Park.
Anne Gartner, U.S. Geol. Surv.
Source of Support: U.S. Geol. Surv.

- Initiated 1984.
Completion 1988.
- C. Sedimentology of the Upper Triassic Chinle Formation, Southeastern Utah.
Russell Dubiel, U.S. Geol. Surv.
Source of Support: U.S. Geol. Surv.
Initiated 1980.
Ongoing.
- D. Macroinvertebrate (Benthos) Monitoring Program.
Michael Reichert, Bur. of Water Pollution Control, UT Dept. of Health.
Source of Support: State Water Pollution Control and Fed. EPA 106 grant.
Initiated 1977.
Ongoing.
- E. Effects of altered flows on the fish populations of the Fremont River within Capitol Reef National Park.
Dr. Thomas Hardy, UT State Univ.
Source of Support: Wayne County Water Conservancy Dist.
Initiated 1988.
Completion 1989.
- F. Effects of altered flows on the macroinvertebrates of the Fremont River within Capitol Reef National Park.
Dr. Richard Bauman, Brigham Young Univ.
Source of Support: Wayne County Water Conservancy Dist.
Initiated 1988.
Completion 1989.
- G. Effects of altered flows on the riparian vegetation of the Fremont River within Capitol Reef National Park.
Dr. Stanley Welsh, Brigham Young Univ.
Source of Support: Wayne County Water Conservancy Dist.
Initiated 1988.
Completion 1988.

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 Arch. Cen., Lincoln, NE.
Source of Support: Custer Battlefield Historical and Museum Assoc.
Initiated 1983.
Ongoing.

- B. Geomorphologist study of deep ravine.
C. Vance Haynes, Univ. AZ.
Source of Support: Custer Battlefield Historical and Museum Assoc.
Initiated 1985.
Ongoing.
- C. Forensic analysis of human bones found on Custer Battlefield as a result of 1984 and 1985 archeological survey.
Source of Support: Custer Battlefield Historical and Museum Assoc.
Initiated 1984.
Ongoing.

Dinosaur National Park

- I. Studies Conducted By Park Personnel.
 - A. Peregrin Falcon recovery program.
Resource Management Specialist and other staff, CO Div. Wildl.
Initiated 1977.
Ongoing.
 - B. Baseline vertebrate survey.
Resource Management Specialist and other park staff, Nat'l Ecol. Cen.
Initiated 1987.
Ongoing.
 - C. Bighorn Sheep movement and habitat selection.
Resource Management Specialist and other staff.
Initiated 1984.
Ongoing.
 - D. Fire effects studies (vegetation, breeding birds, small mammals).
Resource Management Specialist and other staff.
Initiated 1984.
Ongoing.
 - E. Baseline vegetation studies.
Resource Management Specialist and other staff.
Initiated 1983.
Ongoing.
 - F. River campground impact monitoring.
River Ranger and other staff.
Initiated 1979.
Ongoing.

- G. Mormon Cricket population monitoring.
Resource Management Specialist and other staff.
Initiated 1982.
Ongoing.
- H. Live fuel moisture in sagebrush.
Resource Management Specialist and other staff.
Initiated 1987.
Ongoing.
- I. Apatosaurus excavation.
Paleontologist and staff.
Initiated 1985.
Ongoing.
- J. Quarry cliff face excavations.
Paleontologist and staff.
Initiated 1952.
Ongoing.
- K. Morrison microvertebrates excavation.
Paleontologist and staff.
Initiated 1985.
Ongoing.
- II. Studies Supported With National Park Service Funds.
 - A. Air quality monitoring (visibility).
Air Resource Specialists, Fort Collins, CO and park staff.
Initiated 1978.
Ongoing.
 - B. Inventory of plant species of special concern and the general flora of Dinosaur National Monument.
David Kuntz, CO Nat. Areas Inv.
Initiated 1987.
Ongoing.
- III. Studies Supported By Universities And Allied Funding Sources.
 - A. Morrison microvertebrates.
George Engelmann, Univ. NE, Omaha.
Source of Support: Univ. NE, and 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 Wildl. Serv.
Initiated 1981.
Ongoing.

- B. Population monitoring of endangered fish, Utah.
Stephen Cranney, UT Div. of Wildl. Res.
Source of Support: UT Div. Wildl. Res.
Initiated 1985.
Ongoing.
- C. Winter habitat study of endangered fish, Green River.
Richard Valdez, BIO/WEST, Inc., Logan, Utah.
Source of Support: U.S. Bur. Rec. and U.S. Fish and
Wildl. Serv.
Initiated 1986.
Ongoing.
- D. Winter habitat study of endangered fish, Yampa River.
Ed Wick, John Hawkins, CO State Univ.
Source of Support: U.S. Bur. Rec. and U.S. Fish and
Wildl. Serv.
Initiated 1986.
Ongoing.
- E. Endangered fishes investigations.
Thomas Nesler, CO Div. Wildl.
Source of Support: CO Nongame Checkoff Funds and U.S.
Fish and Wildl. Serv.
Initiated 1987.
Ongoing.
- F. Vertebrate baseline study.
Michael Bogan, Nat'l Ecol. Cen., USFWS.
Source of Support: U.S. Fish and Wildl. Serv.
Initiated 1987.
Ongoing.
- G. Taxonomic re-evaluation of the genus Ameletus (mayflies).
Thomas Fink, Univ. UT.
Source of Support: Univ. UT.
Initiated 1987.
Ongoing.
- H. Food habits and predator-prey relationships of Colorado
squawfish.
Steven Hiebert, Stephen Grabowski, U.S. Bur. Rec.
Source of Support: U.S. Bur. Rec.
Initiated 1987.
Ongoing.
- I. Evaluation of the introduction of bonytail chub.
Tom Chart, Steve Cranney, UT Div. of Wildl. Res.
Source of Support: U.S. Bur. Rec.
Initiated 1988.
Ongoing.

V. Publications

- A. Tyus, H. M., C. A. Karp and K. A. Paulin. 1987. An assessment of instream flow needs of rare and endangered fishes in the Yampa River, Colorado. U. S. Fish and Wildl. Serv. and CO River Fishes Proj., 1680 W. Hwy. 40, Rm. 1210, Vernal, UT 84078. (Authors note: this report is preliminary and should not be cited).
- B. Tyus, H. M. and W. L. Minckley. 1988. Migrating Mormon crickets, *Anabrus simplex* (Orthoptera: Tettigoniidae), as food for stream fishes. Great Basin Nat. 48:25-30.
- C. Bogan, M. A., R. B. Finley Jr. and S. J. Petersburg. In press. The importance of biological surveys in managing public lands in the western United States. Proc. U.S. Forest Service Symposium, Manage. of Amphibians, Reptiles and Small Mammals in N. Amer., Flagstaff, AZ. July 1988.
- D. Muth, R. T., T. P. Nesler and A. F. Wasowicz. 1988. Marking Cyprinid larvae with Tetracycline. Amer. Fish. Soc. Symp. 5:89-95.
- E. Nesler, T. P., R. T. Mjth and A. F. Wasowicz. 1988. Evidence for baseline flow spikes as spawning cues for Colorado Squawfish in the Yampa River, Colorado. Amer. Fish. Soc. Symp. 5:68-79.
- F. Chart, T. 1988. The evaluation of successful introduction of bonytail chub in the Green River, Utah. UT Div. Wildl. Res., Salt Lake City.

Fort Laramie National Historic Site

II. Studies Supported By University And Allied Funding Sources.

- A. Vertebrate inventory and analysis.
David M. Armstrong, University of Colorado.
Source of Support: University of Wyoming-National Park Service Research Center.
Initiated: 1987.
Completion: 1988

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. 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: NPS, USFS, USF&WS.

- Initiated 1978.
Ongoing.
- B. Geology of Glacier National Park.
James Whipple.
Source of Support: U.S. Geological Survey.
Initiated 1979.
Ongoing.
- C. Border station water chemistry.
Jack Stanford, Yellow Bay Biological Station, Bigfork,
Montana.
Source of Support: University of Montana.
Initiated 1983.
Ongoing.
- V. Publication.
- A. Keating, K. A. 1986. Historical grizzly bear trends in
Glacier National Park, Montana. Wildl. Soc. Bull. In
press.
- B. Keiter, Robert B. 1986 Legal considerations in
challenging external threats to Glacier National Park.
Envir. Manage., 11(1):121-126.

Glen Canyon National Recreation Area

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

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.
 - B. Cumulative effects model for human intervention on Bald Eagle habitat.
Donald A. Anderson, University of Wyoming.

Initiated 1987.
Completion 1988.

- 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, Maryland.
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 Wildl. Serv.
Initiated 1978.
Ongoing.
- D. Life history strategies of the Montane vole, Microtus
montanus.
Frederick J. Jannett, Jr., Science Museum of Minnesota,
St. Paul.
Initiated 1978.
Ongoing.

Grant-Kohrs Ranch National Historic Site

- III. Studies Supported By Universities And Allied Funding Sources.
- A. Heavy metal concentrations in Clark Fork River.
Vicki Watson, Univ. MI.
Initiated 1985.
Ongoing.

- IV. Studies Supported By Funds From Other Sources.
 - A. Ground water movement and heavy metal concentration levels relative to water levels in the Clark Fork River.
Tom Brooks, U.S. Geol. Surv.
Initiated 1986.
Ongoing.

Jewel Cave National Monument

- I. Studies Conducted By Park Personnel.
 - A. Breeding bird survey and inventory.
Tim Schantz, Park Ranger.
Initiated 1987.
Ongoing.
- II. Studies Supported With National Park Service Funds.
 - A. Hydrologic study of Jewel Cave and Wind Cave.
E. Calvin Alexander, Jr., and Marsha Davis, Univ. MN.
Initiated 1985.
Completion 1988.
 - B. Water budget of Jewel Cave and Wind Cave.
E. Calvin alexander, Jr., and Scott Alexander, Univ. MN.
Initiated 1988.
Ongoing.
 - C. Minerals assessment of Jewel Cave.
Rusty Dersch, USFS, and Mike Wiles, Park Ranger
Cooperative funding with the United States Forest Service.
Initiated 1988.
Ongoing.
- III. Studies Supported By Universities And Allied Funding Sources.
 - A. Arthropods in Wind Cave and Jewel Cave.
Charles H. Butterfield and Mark A. Quinn, SD State Univ.
Initiated 1988.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
 - A. Cave resources inventorying and radio location survey.
Northwest Cave Research Institute.
Donations and private funding.
Initiated 1988.
Ongoing.
 - B. Microscopic analysis of hydromagnesite balloons.
Rick Olson
Private funding.
Initiated 1988
Ongoing.

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, Univ. ND, 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, Univ. MN, 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.
Resource Management Specialist.
Initiated 1981.
Ongoing.

 - B. Distribution mapping of common and air pollution sensitive lichens.
Resource Management Specialist.
Initiated 1982.
Ongoing.

 - C. Affects of various herbicides and application rates on leafy spurge.
Resources Management Specialist.
Initiated 1983.
Ongoing.

 - D. Moth communities of the North Unit of Theodore Roosevelt National Park, North Dakota.
Resource Management Specialist.
Initiated 1984.
Ongoing.

 - E. The ecological role of lichens in Theodore Roosevelt National Park.
Resources Management Specialist.
Initiated 1984.
Ongoing.

- F. Isotopis (S) analysis of precipitation of the North Unit of Theodore Roosevelt National Park.
Ray W. Snow, North Unit District Naturalist.
Initiated 1985.
Ongoing.
- G. Breeding bird atlas of the North Unit of Theodore Roosevelt National Park and neighboring townships.
NPS staff.
Initiated 1985.
Ongoing.
- H. Range forage utilization and range condition trends in relation to large ungulate use at Theodore Roosevelt National Park.
Resource Management Specialist and staff.
Initiated 1982.
Ongoing.
- I. Distribution, extinction and establishment of prairie dog colonies over time in Theodore Roosevelt National Park.
Resource Management Specialist and staff.
Initiated 1952.
Ongoing.
- J. Nesting establishment, territoriality, and nesting success of raptor species of special concern.
Resource Management Specialist and staff.
Initiated 1984.
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, MT State Univ.
Initiated 1985.
Ongoing.
 - B. Survey of rare flora within Theodore Roosevelt National Park.
Alexis Duxbury and Carolyn Godfread, ND Nat. Heritage Prog.
Initiated 1987.
Ongoing.
 - C. Impacts of external development on the economic and aesthetic values of Theodore Roosevelt National Park.
G. Wallace and P. Reed, CO State Univ.
Initiated 1988.
Ongoing.

- III. Studies Supported By Universities.
- A. Reconstruction of ancient fluvial systems, paleosols, and paleoclimatology of Theodore Roosevelt National Park.
D. Fastovsky, University of Rhode Island; K. McSweeney, Univ. WI.
Initiated 1988.
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: Theodore Roosevelt Nature and History Association.
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.
- C. Historical origins and management history of feral horses in Theodore Roosevelt National Park.
I. Castle McLaughlin.
Source of Support: Theodore Roosevelt Nature and History Association.
Initiated 1987.
Completion 1988.
- D. Affects of cattle grazing on understory production and seedling establishment in wooded draws in western North Dakota.
Rocky Mountain Forest and Range Experiment Station personnel.
Source of Support: U.S. Forest Service.
Initiated 1982.
Ongoing.
- E. Formation of columnar jointing in rock overlying burning coal veins.
Donald Coates, U.S. Geol. Surv.
Source of Support: U.S. Geol. Surv.
Initiated 1986.
Ongoing.
- F. The effects of air contaminants on the vegetation of Theodore Roosevelt National Park and adjoining areas.
David Bilderback, Univ. MT.

Source of Support: North Dakota Air Quality Trust.
Initiated 1986.
Ongoing.

V. Publications

- A. Distribution, movements, habitat usage, food habits, and associated behavior of reintroduced elk in Theodore Roosevelt National Park.
Sullivan, Mark G. 1988.
M.S. Thesis, MT State Univ.

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 1990.
- E. Canada thistle colony dynamics on prairie dog towns.
Park Research Biologist.
Initiated 1984.
Completion 1988.
- F. Fire's effect on cacti.
Park Research Biologist.
Initiated 1985.
Completion 1988.
- G. Climate of Wind Cave.
Kay Rohde, Jim Pisarowicz, Jim Nepstad and various park seasonals.

Initiated 1985.
Ongoing.

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 1988.
- 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 1988.
- C. Vertebrate paleontology in Wind Cave National Park.
James E. Martin, SD School of Mines and Tech.
Initiated 1985.
Completion 1989.
- D. Hydrologic study of Jewel and Wind Caves.
E. Calvin Alexander, Univ. MN.
Initiated 1985.
Completion 1988.
- E. The mammalian predator community of Wind Cave National Park.
Dr. Robert Taylor and Mike Rowell, UT State Univ.
Initiated 1988.
Completion 1990.
- F. A survey of raptorial avian predators in Wind Cave National Park.
Lynn Hetlet (former NPS employee and WICA).
Initiated 1988.
Completion 1988.
- G. Water budget for Wind and Jewel Cave.
E. Calvin Alexander, Univ. MN.
Initiated 1988.
Completion 1990.

III. Studies Supported By Universities And Allied Funding Sources.

- A. Riparian habitats in Wind Cave National Park.
Theodore L. Maguder, Univ. of Hartford.
Source of Support: Univ. of Hartford and personal funds of researcher.
Initiated 1981.
Terminated due to health problems.

- B. Archeological Neotaphonomy: Understanding the formation processes of faunal assemblages, the Wind Cave Taphonomy Project.
Galen R. Burgett, Univ. NM and Univ. WY.
Initiated 1984.
Completion 1989.
 - C. Hydrology and hydrochemistry of the Pahasapa Limestone.
John Rohde, WA State Univ.
Source of Support: WA State Univ.
Initiated 1984.
Completion 1989.
 - D. Genetic variability versus colony size in Black-tailed Prairie Dogs.
James G. Daley, Univ. MD.
Source of Support: Univ. MD, NSF and personal funds.
Initiated 1987.
Completion 1989.
 - E. Repopulation of Black-tailed Prairie Dog towns after artificial reduction.
Matthew C. Radcliffe, Univ. MD.
Source of Support: Univ. MD, NSF and personal funds.
Initiated 1987.
Completion 1989.
 - F. Geologic History of Wind Cave.
Arthur and Margaret Palmer.
State Univ. NY.
Initiated 1978.
Ongoing.
- IV. Studies Supported By Funds From Other Sources.
- A. Social behavior of prairie dogs.
John L. Hoogland, Univ. MD.
Source of Support: NSF 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 Univ. NY.
Source of Support: NIH.
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 Wicker, CO State Univ.
Source of Support: NSF.
Initiated 1984.
Completion 1988.
- D. Investigations of structural stability in the Wind Cave Ecosystem.
Kirsten Krueger, CO State Univ.
Source of Support: NSF.
Initiated 1985.
Completion 1988.
- E. The role of prairie dogs and bison in determining the abundance and species composition of grasshoppers in Wind Cave National Park.
Richard A. Redak, CO State Univ.
Source of Support: NSF.
Initiated 1985.
Completion 1989.
- F. Grazing patterns of American bison in the mixed-grass prairie ecosystem.
Ron Green, CO State Univ.
Source of Support: NSF.
Initiated 1985.
Completion 1989.
- G. Plant-animal interactions: The role of native herbivores in selection of grazing adapted plant.
Elizabeth Painter and J. L. Detling, CO State Univ.
Source of Support: NSF.
Initiated 1981.
Completion 1988.
- H. Marked individuals in range plant studies.
Kirsten Krueger and E. L. Painter, CO State Univ.
Source of Support: Personal Resources of Investigators.
Initiated 1985.
Completion 1988.
- I. Exploration and mapping of Wind Cave.
John Scheltens, D. Springhetti, J. Nepstad and other NPS seasonals.
Initiated 1974.
Ongoing.
- J. Madison formation hydrology in Wind Cave.
U.S. Geol. Surv.
Initiated 1988.
Ongoing.

V. Publications

- A. Archer, S., M. G. Garrett and J. K. Detling. 1987. Rates of vegetation change associated with prairie dog grazing in North American mixed-grass prairie. *Vegetatio* 72:159-166.
- B. Bakalowicz, M. J., D. C. Ford, T. E. Miller, A. N. Palmer and M. V. Palmer. 1987. Thermal genesis of dissolution caves in the Black Hills, South Dakota. *Bull. Geol. Soc. Am.* 99:729-738.
- C. Blank, J. L., R. J. Nelson and A. Buchberger. 1988. Cytochrome oxidase activity in brown fat varies with reproductive response and use of torpor in deer mice. *Physiol. and Behav.* 43:1-6.
- D. Blank, J. L. and Claude Desjardins. 1986. Photic cues induce multiple neuroendocrine adjustments in testicular function. *Amer. Physiol. Soc. No.* 0363-6119/86:199-206.
- E. Cid, Maria S. 1987. Prairie dog and bison grazing effects on maintenance of attributes of a prairie dog colony. PhD. Thesis, CO State Univ., Fort Collins. 97 pp.
- F. Day, Thomas A. 1988. Modification of individual plant and community water and nitrogen relations by grassland herbivores. PhD. Thesis, CO State Univ., Fort Collins. 134 pp.
- G. Desjardins, C., F. H. Bronson and J. L. Blank. 1986. Genetic selection for reproductive responsiveness in deer mice. *Nat.* 322(6075): 172-173.
- H. Detling, J. K. 1987. Grass response to herbivory. Reprinted from: *Integrated Pest Management on Rangeland: A Shortgrass Prairie Perspective.* J. L. Capinera (ed.) Westview Press, Boulder, CO.
- I. Garrett, M. G. and W. L. Franklin. 1988. Behavioral ecology of dispersal in the black-tailed prairie dog. *J. Mamm.* 69(2):236-250.
- J. Green, Wendy C. 1987. Mother-daughter interactions in american bison: factors associated with individual variation. PhD. Thesis, City Univ. NY. 202 pp.
- K. Hetlet, Lynn A. 1988. A survey of raptorial avian predators in Wind Cave National Park. Wind Cave "in-house" report. 15 pp.

- L. Holland, Elisabeth A. 1988. Plant carbon allocation and nitrogen cycling in a perennial grassland: the role of herbivory. Ph.D. Thesis, CO State Univ., Fort Collins. 110 pp.
- M. Klukas, R. W. 1988. Management of prairie dog populations in Wind Cave National Park. From: Eighth Great Plains Wildlife Damage Control Workshop Proceeding-- April 1987. Printed in: Forest Service, USDA Gen. Tech. Rept. RM-154:50-52.
- N. Krueger, Kirsten A. 1988. Grassland Stability: and experimental analysis of local resistance and resiliences. Ph.D. Thesis, CO State Univ., Fort Collins. 64 pp.
- O. Loughry, W. J. 1988. Population differences in how black-tailed prairie dogs deal with snakes. Behav. Ecol. and Sociol., 22:61-67.
- P. Rothstein, Aron. 1988. Social organization in juvenile bison bulls: non-linear dominance and dyadic associations. Ph.D. Thesis, City Univ. NY. 99 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 and monitoring.
Mary Meagher.
Initiated 1980.
Ongoing.
 - D. Study of thermal features and geology of Yellowstone National Park.
Roderick A. Hutchinson.
Initiated 1974.
Ongoing.
 - E. Gypsy Moth.
J. Sweaney, National Park Service and Scott Tunnock, USFS.
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.
Kenneth L. Diem, Univ. WY, Laramie.
Source of Support: Univ. WY.
Initiated 1949.
Ongoing.
 - B. Ecological studies on parasites of the Gibbon elk herd.
David E. Worley, MT State Univ., Bozeman.
Source of Support: MT Agri. Experiment Station.
Initiated 1978.
Ongoing.
 - C. Diatoms in hot springs and thermal streams in Yellowstone.
Samuel R. Rushforth, Brigham Young Univ.
Source of Support: Brigham Young Univ.
Initiated 1982.
Ongoing.
 - D. Distribution of shore bugs and brine flies at Sylvan Springs, Yellowstone National Park.
V. Resh and M. Barnby, Univ. WA.
Source of Support: Univ. CA.
Initiated 1983.
Ongoing.
 - E. Aquatic invertebrates of Yellowstone National Park.
G. Roemhild, MT State Univ.
Source of Support: MT State Univ.
Initiated 1983.
Ongoing.

- F. Cellobiase production in thermophilic bacteria and fungi.
J. Von Ashlefeldt, J. Mattoon and K. Andrews, Univ. CO.
Source of Support: Univ. CO.
Initiated 1982.
Ongoing.
- G. Ecology of hot springs microbial communities.
D. Ward, N. Revsbech, T. Tayne, K. Anderson and M. Bateson, MT State Univ.
Source of Support: NSF and MT State Univ.
Initiated 1977.
Ongoing.
- H. Nitrogen fixation in thermal algal-bacterial mats. C.
Wickstrom, Kent State Univ.
Source of Support: NSF and Kent State Univ.
Initiated 1982.
Ongoing.
- I. Primary productivity of thermal algal mats in Yellowstone National Park.
R. Wiegert, Univ. GA.
Source of Support: NSF and Univ. GA Found.
Initiated 1982.
Ongoing.
- J. U.S. - Japan seminar on terrestrial noble gases.
J. H. Reynolds, Univ. CA.
Source of Support: ?
Initiated 1986.
Ongoing.
- K. Precambrian geology of southwestern Beartooth Mountains.
Clarence Casella, Northern IL Univ.
Source of Support: None.
Initiated 1975.
Ongoing.
- L. Thermophilic diatoms from hot springs and geysers in Yellowstone National Park.
Ken J. Andrews, CO Coll.
Source of Support: CO Coll.
Initiated 1983.
Ongoing.
- M. Thermophillic DNA polymerases.
Michael Kriegler, Univ. CA and Cetus Corp.
Source of Support: ?
Initiated 1985.
Ongoing.

- N. Visitor perception of bear behavior in Yellowstone National Park.
Daniel Ropek, Eastern MI Univ.
Source of Support: E. Michigan Grad School.
Initiated 1986.
Ongoing.
- O. Public attitudes and behavior in relation to grizzly bears in National Parks.
Richard Trahan, Univ. N. CO.
Source of Support: Univ. N. CO.
Initiated 1985.
Ongoing.
- P. Role of arsenic in Yellowstone waters.
Jane M. Humphress, AZ State Univ.
Source of Support: AZ State Univ.
Initiated 1984.
Ongoing.
- Q. Alluvial fan development and sedimentation in the Mount Everts area.
James Schmitt, MT State Univ.
Source of Support: MT State Univ.
Initiated 1986.
Ongoing.
- R. Topographic survey of meandering rivers.
J. Dungan Smith, Univ. WA.
Source of Support: Univ. WA. (Salary)
Initiated 1986.
Ongoing.
- S. Characterization of soils in Yellowstone National Park.
Carl C. Trettin, MI Tech. Univ.
Source of Support: MI Tech. Univ. (80-84) NPS. (80-83)
Initiated 1980.
Ongoing.
- T. The relationship of climate to sedimentation rates in lakes and ponds.
H. E. Wright, Univ. MN.
Source of Support: UW-NPS Res. Cen. and Univ. MN.
Initiated 1986.
Ongoing.
- U. Late-Glacial and postglacial vegetation and climate of Jackson Hole and the Pinyon Peak Highlands, Wyoming.
Cathy Barnosky, Carnegie Mus. of Nat. Hist., Pittsburgh, PA.
Source of Support: UW-NPS Res. Cen.

Initiated 1985.
Ongoing.

IV. Studies Supported By Funds From Other Sources.

- A. Yellowstone Lake: an evaluation of patterns in productivity.
W. H. Romme, Fort Lewis College.
Source of Support: Univ. WY.
Initiated 1982.
Ongoing.
- B. Yellowstone secondary science teacher workshop.
Randy Brown, The Chattanooga Nature Center.
Source of Support: Lyndhurst Foundation.
Initiated 1987.
Completion 1988.
- C. Isotopic studies of noble gases in terrestrial samples and in natural nucleosynthesis.
John H. Reynolds, Univ. CA.
Source of Support: DOE.
Initiated 1981.
Completion ?
- D. Environmental assessment of heavy metal contamination in Yellowstone National Park.
Joann Silverstein, Univ. CO and Stephen Kline, Univ. CO.
Source of Support: Personal.
Initiated 1984.
Completion ?
- E. National Surface water survey - Western lakes study.
C. E. Runas, U.S. Environmental Prot. Agency.
Source of Support: EPA.
Initiated 1985.
Completion ?
- F. Substrate characterization of retrogressive oligotrophy in Yellowstone Lake, Yellowstone National Park.
Jerry L. Kaster, Univ. WI.
Source of Support: Center Great Lakes Studies and NPS.
Initiated 1983.
Completion ?
- G. Remote sensing imagery of turbid lake and sour creek resurging dome.
Steven C. Hansen, Ricks College.
Source of Support: ?
Initiated 1986.
Completion ?

- H. Life history of lake trout in Yellowstone National Park.
Fred P. Binkowski, Univ. WI, Milwaukee.
Source of Support: Center Great Lakes Studies.
Initiated 1986.
Completion ?
- I. Common Loon nesting status in Wyoming and Idaho.
Thomas P. Fitch, ID State Univ.
Source of Support: N. Amer. Loon Fund.
Initiated 1985.
Completion ?
- J. The isolation of microorganisms for biomining and related biotech. goals.
Jim H. Wolfram, Idaho Nat. Engineering Lab.
Source of Support: Bureau of Mines.
Initiated 1985.
Completion ?
- K. Film documentation of life history of Yellowstone Grizzly Bear and its present research.
Steven P. French, Yellowstone Grizzly Foundation.
Source of Support: Yellowstone Grizzly Foundation.
Initiated 1986.
Ongoing.
- L. The factors that limit elk populations in the Greater Yellowstone Ecosystem.
Charles Kay, UT State Univ.
Source of Support: Welder Wildlife Found.
Initiated 1986.
Ongoing.
- M. Migratory waterfowl survey.
Dave Lockman, Wyoming Game and Fish Department.
Source of Support: Wyoming Game and Fish Department.
Initiated 1971.
Ongoing.
- N. The comparative ethology of digger wasps in northern Wyoming.
Kevin M. O'Neill, MT State Univ.
Source of Support: Personal.
Initiated 1986.
Ongoing.
- O. Evaluation of habitat selection patterns in native cervidae: Elk (Bull elk ecology research)
Dr. James Peek, Univ. ID.
Source of Support: NPS and Rocky Mtn Elk Found.
Initiated 1986.

Completion ?

- P. Northern Yellowstone elk study.
Harold Picton, MT State Univ.
Source of Support: Gamboni Found, Rocky Mountain Elk Found and NPS.
Initiated 1984.
Completion: ?.
- Q. Applications of aversive conditioning techniques to Yellowstone Ecosystem Grizzly Bears.
Forrest Hammond, Wyoming Game and Fish Department.
Source of Support: U.S. Fish & Wildlife Service Sec. 6 matching funds.
Initiated 1986.
Completion ?
- R. The genetics and biogeography of Western North American fishes.
Mark J. Rosenfeld, Univ. UT.
Source of Support: ?
Initiated 1986.
Completion ?
- S. Genetic-taxonomic positions of native trout.
Dennis K. Shiozawa, Brigham Young Univ.
Source of Support: National Geographic, BYU, Monte Bean Mus., YNP Personnel.
Initiated 1987.
Completion ?
- T. Research of fluoride effects in wildlife and vegetation.
James L. Shupe, UT State Univ.
Source of Support: Utah Agr. Expt. Station, Private Industry.
Initiated 1956.
Ongoing.
- U. Observe historic Peregrine eyries.
Jay S. Sumner, Contract with Peregrine Fund.
Source of Support: ?
Initiated 1985.
Completion ?
- V. Radiotelemetry study of the Northern Yellowstone elk herd.
Jon Swenson, Montana Department of Fish, Wildlife and Parks.
Source of Support: Montana Department of Fish, Wildlife and Parks., Gamboni Foundation, Rocky Mountain Elk Foundation.
Initiated 1984.

Completion ?

- W. Ecology of Gallatin elk herd 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.
- X. Relative roles of food abundance and cover in determining habitat distribution of cutthroat trout.
Margaret A. Wilzbach, Univ. MD.
Source of Support: NSF, DOE, USGS, Salaries; Univ. MD.
Initiated 1986.
Completion ?
- Y. Systematics of the green algal family zygnemataceae.
Robert W. Hoshaw, Univ. AZ.
Source of Support: NSF.
Initiated 1982.
Completion ?
- Z. Fossil flora of the specimen ridge fossil forest.
Steven R. Manchester, IN Univ.
Source of Support: NSF.
Initiated 1984.
Completion ?
- A¹. Fire and landscape dynamics in Yellowstone National Park.
W. H. Romme, Fort Lewis College.
Source of Support: NSF.
Initiated 1984.
Completion ?
- B¹. Montana pine beetle infestation: cycling and succession in lodgepole pine forest.
W. H. Romme, Fort Lewis College.
Source of Support: UW-NPS Res. Cen.
Initiated 1980.
Completion ?
- C¹. Radionuclides in Yellowstone hydrothermal systems uranium-series geochronology in Yellowstone hydrothermal systems.
Neil C. Sturchio, Argonne National Laboratory.
Source of Support: USDOE Off Ener Sci.
Initiated 1985.
Completion ?
- D¹. Active and fossil geothermal systems. (Major Norris report with Rick Hutchinson).

Donald E. White, U.S. Geol. Surv.
Source of Support: U.S. Geol. Surv.
Initiated 1956.
Completion ?

E¹. Use of germanium/silicon ratios as tracer of the biogeochemical silica cycle.
M. O. Andreae, National Center for Atmospheric Research.
Source of Support: NSF.
Initiated 1984.
Completion ?

F¹. Heat flow in Yellowstone Lake.
David D. Blackwell, Southern Methodist University.
Source of Support: NSF.
Initiated 1985.
Completion ?

G¹. Arsenic in thermal spring ecosystems distribution and cycling.
Alice G. Chalmers, University of Georgia Marine Institute.
Source of Support: NSF.
Initiated 1986.
Completion ?

H¹. Chemical investigation of high temperature petroleum from calcite spring thermal area, Yellowstone National Park.
Charles Clifton, Oregon State University and Bernard Simonett, Oregon State University.
Source of Support: Petr. Migrat. Consor and NSF.
Initiated 1985.
Completion ?

I¹. Investigations of the gardner river rhyolite/basalt complex Yellowstone National Park, Wyoming.
Arnold G. Doden, IA State Univ.
Source of Support: Personal.
Initiated 1986.
Completion ?

J¹. Stream gaging to monitor heat and mass flux of hot-spring systems. (USGS Project 9980-00292, Hydrothermal Fluids)
R. O. Fournier, USGS.
Source of Support: ?
Initiated 1983.
Ongoing.

K¹. Fluid inclusions in hydrothermal, minerals from drill holes in Yellowstone National Park. (USGS Project 9980-00292)
Robert Fournier, USGS.

- Source of Support: USGS.
Initiated 1983.
Completion ?
- L¹. Hydrothermal activity in Yellowstone Park. (USGS Project 9980-00202)
Robert Fournier, USGS.
Source of Support: USGS.
Initiated 1960.
Ongoing.
- M¹. Surface chemistry of obsidian cliff glasses.
David W. Mock, MT State Univ.
Source of Support: MT NSF Epescor Proj.
Initiated 1986.
Completion ?
- N¹. Quarternary glacial geology in Yellowstone National Park.
Gerald M. Richmond, USGS.
Source of Support: USGS.
Initiated 1967.
Completion ?
- O¹. Welding features of the huckelberry ridge tuff.
J. K. Russell, University of British Columbia.
Source of Support: NSERC - Canada.
Initiated 1985.
Completion ?
- P¹. Geophysical studies of the Yellowstone caldera.
Robert E. Smith, Univ. UT.
Source of Support: USGS.
Initiated 1981.
Ongoing.
- Q¹. Studies of photosynthetic carbon metabolism in the thermophilic purple bacterium.
Michael T. Madigan, Southern IL Univ.
Source of Support: NSF.
Initiated 1986.
Completion ?
- R¹. Pathogenic naegleria from thermal springs.
William D. O'Dell, Univ. NE., Omaha.
Source of Support: NIH.
Initiated 1984.
Completion ?
- S¹. Isolation of microorganisms that produce extracellular proteases, amylases, lipases under highly alkaline conditions.

Bernie D. Steele, Univ. TN.
Source of Support: Eastman Kodak Research.
Initiated 1986.
Completion ?

- T¹. Taxonomy and ecology of ecto mycorrhizal macro-fungi of Grand Teton National Park and Yellowstone National Park.
Kent McKnight, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, MD.
Source of Support: USDA and UW-NPS Res. Cen. ARS, Univ. of Insbruck, BYU.
Initiated 1980.
Ongoing.

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.
- C. Spotted Owl monitoring.
Larry L. Hays, Resource Management Specialist.
Initiated 1987.
Ongoing

II. Studies Supported With Park Service Funds.

- A. Habitat requirements of the Virgin River Spinedace.
James E. Deacon, Univ. NV.
Initiated 1987.
Completion 1989.
- B. Vegetation communities of Zion National Park.
Kimball T. Harper, Brigham Young Univ.
Initiated 1987.
Completion 1990.
- C. Threatened and endangered plant survey.
Stanley L. Welsh, Endangered Plant Studies, Inc.
Initiated 1987.
Completion 1989.
- D. Hanging garden study.
Stanley L. Welsh, Endangered Plant Studies, Inc.

Initiated 1987.
Completion 1989.

- E. Riparian habitat study
Dean W. Taylor, Biosystems Analysis, Inc.
Initiated 1988.
Completion 1989.
 - F. Spotted Owl preliminary study
Joseph Murphy, retired, Brigham Young Univ.
Initiated 1987.
Completion 1989.
 - G. Biophysical parameters of backcountry camping.
Donald Murphy, Joe Murphy, Weber State College
Initiated ?
Completion ?
 - H. Preproposals to address water resource issues and planning
in Zion National Park.
Daniel D. Richter, James E. Mitchell, Duke Univ.
Initiated ?
Completion ?
- IV. Studies Supported By Funds From Other Sources.
- A. Utah flora project.
Stanley L. Welsh, Brigham Young Univ.
Source of Support: Private funds.
Initiated 1960.
Completion 1987; book published. A UTAH FLORA.
 - B. Genetic variation on isolated mesa tops.
Ron Baxter, Northern AZ Univ.
Source of Support: Unknown; some support given by Zion
National History Association.
Initiated 1988
Completion ?