



CONFERENCE PROGRAM

2nd Conference on Scientific Research
in the National Parks

26-30 November 1979
San Francisco, California

THIS
SECOND CONFERENCE ON
SCIENTIFIC RESEARCH IN THE NATIONAL PARKS
IS DEDICATED TO

WALTER A. WEBER

BORN MAY 23, 1906; DIED JANUARY 10, 1979

CHIEF SCIENTIFIC ILLUSTRATOR
U.S. NATIONAL PARK SERVICE
FROM 1936 TO 1941

WHOSE SPLENDID AND WIDELY RECOGNIZED
ARTISTRY OF WILDLIFE IN THEIR DIVERSIFIED FORMS
HAS PLAYED AN IMPORTANT ROLE IN FURTHERING
THE CONSERVATION GOALS OF THE DEPARTMENT OF THE
INTERIOR AND IN INSPIRING A WIDER INTEREST
IN OUR NATIVE WILDLIFE

CONFERENCE PROGRAM COMMITTEE

G. JAY GOGUE, CHAIRMAN
National Park Service, Atlanta, GA

PAUL J. GODFREY University of Massachusetts, Amherst	Terrestrial Biology: Botany, Resource Management, Coastal Biology
RAY HERRMANN National Park Service, Washington, DC	Physical Sciences
DONALD R. FIELD University of Washington, Seattle	Sociology
DOUGLAS H. SCOVILL National Park Service, Washington, DC	Anthropology-Archeology
LEO F. MARNELL National Park Service, West Glacier, MT	Aquatic Biology
MARY MEAGHER National Park Service, Yellowstone, WY	Terrestrial Biology: Zoology, Resource Management
CHARLES H. DOUGLAS University of Georgia, Athens	Information Sciences
RICHARD B. BOWSER National Park Service, Washington, DC	Technology
RICHARD HAMMERSCHLAG National Park Service, Washington, DC	Environmental Concerns in Urban, Impacted Parks
BARBARA B. CLARK National Park Service, Washington, DC	Environmental Education

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GENERAL INFORMATION

HEADQUARTERS

The Conference Headquarters and all sessions and official activities will be located in the Sheraton-Palace Hotel, 639 Market Street, San Francisco, California 94119 (Tel. 415/392-8600). The Headquarters Office will be located in *Room 244* and will be open from 8:00 a.m.-5:00 p.m. daily, Tuesday through Thursday, 27-29 November. Copies of manuscripts for inclusion in the *Conference Proceedings* should be left in the Headquarters Office during these hours.

REGISTRATION

Final registration and distribution of Conference badges, abstracts and programs will take place in the Main Lobby, in front of the Ralston Room, during the following hours:

Monday, November 26	1:00 p.m.-8:00 p.m.
Tuesday, November 27	8:00 a.m.-5:00 p.m.
Wednesday, November 28	8:00 a.m.-5:00 p.m.

The Conference registration fee includes coffee, name badges, Abstracts and Program. All participants must pay the registration fee. The fees are \$35; or \$20 for graduate and undergraduate students, and \$5 for spouse (not attending scientific sessions).

CONFERENCE SOCIAL

Plan to attend the "no-host" reception on Monday evening, November 26 from 7:00-8:00 p.m. in the *Comstock Room* on the second floor.

PROGRAM SCHEDULE

All sessions will begin on time and will follow the schedule printed in this Program. Coffee will be served at 9:45 a.m. on Tuesday and 10:10 a.m. on Wednesday and Thursday. Afternoon coffee will be served at 3:00 p.m. Tuesday through Thursday.

NATIONAL PARK SERVICE PUBLICATIONS

The National Park Service Publications table located in the Headquarters Office, *Room 244*, will contain sample copies of all currently available books. Conferees may register their requests for complimentary copies to be mailed to them following the Conference.

SPECIAL NATIONAL PARK SERVICE EXHIBIT

New resource management tools developed as spin-offs of industry. John Hoke, Urban Park Program Specialist, National Capital Region, will

be on hand to display materials and answer questions. *Upper French Parlor*.

SPECIAL CONFERENCE FIELD TRIP

A field trip has been planned to Gateway National Recreation Area and Golden Gate Park, offering conference participants the opportunity to visualize the creation of an urban park. Rolf Diamont, National Park Service, North Atlantic Region, is the field trip leader. Departure will be at 1:00 p.m. Thursday, November 29, with return in the late afternoon. A sign-up sheet will be posted on the bulletin board in the conference registration area. It may be necessary to limit the number of field trip participants. Sign up early.

FILM THEATRE

A film theatre will be in operation from 3:00 p.m. until 8:00 p.m. in the *Forty-Niner* on Monday, November 26, and during the same hours on Thursday, November 29, in *Parlor D*. A schedule of viewing times for each of the following 16 mm color films will be posted at the door of the respective rooms.

Sanctuary: Great Smoky Mountains—Good interior photography of the park with sounds and music and minimum of narration; conjures up appreciation of outdoors and solitude.

One Man's Alaska—Self-made lay naturalist lives alone on an Alaskan lake and narrates his knowledgeable observations on plants, animals and self-reliance. Good photography.

Katmai—Excellent visuals of different parts of the park and its animals; good geologic history.

Hawaii Volcanoes—Narrative over footage of Kilauea and Mauna Loa Volcanoes erupting on Island of Hawaii. Shows different physical expressions of eruptions during and after flows.

Glacier Bay—The Grand Design—Magnificent photography in this Alaskan wilderness area explains the succession of plant and animal life following the retreat of a glacier. From lichen to climax forest and the abundance of animal and bird life, the film is rich in the scenic beauty of this remote National Park site.

Stone Forest—A sensitively photographed film about Petrified Forest National Park which shows the changing moods of the desert and tells the story of petrification, the process by which fallen trees turn to stone. Time lapse photography details the formation of crystals and a section of the film deals with the early Indian tribes who once inhabited the area.

Lehman Caves National Monument—Beautiful underground color photography is complemented by an interesting narrative which explains singular effects in Lehman Caves. The film creates a better understanding of both the beauty and the importance of the great caves of America as well as their geologic story.

A Question of Quality—Background on the Sequoia National Park; covers old logging problems, visitor management, campsite rehabilitation, controlled burning, history of park's establishment.

The Wolf and the Whitetail—A parallel study of the timber wolf and the whitetailed deer and their predator/prey relationship. A rarely witnessed birth of twin deer fawns and the rearing process of the whitetail are shown. At the same time, we see wolf pups emerge from their birth den and explore the complex structure of the wolf pack and its teaching techniques.

Offshore Onshore—Oil and gas from offshore fields will play a larger role over the next 20 years in helping to supply our energy needs. In the U.S., the “frontiers” are basically Alaska and the Atlantic coast. This film presents the questions asked by people in frontier areas who are apprehensive of this new development and looks at what can be learned from the experience in the Gulf of Mexico and the North Sea where oil and gas development off shore have taken place.

John Muir’s High Sierra—This film allows one to wander about a mountain range during the cycle of the seasons, to tumble with melting snowfed rivers on their journey to the sea and to listen to the varying rhythms of the rain. This film tells of a man and his vision that in wilderness is the preservation of the world.

A Matter of Understanding—The Coyote—The life and habits of the much-misunderstood coyote are explored here in an enlightening study that demonstrates that the animal preys on livestock only when natural food sources dwindle. . .and that encourages coyote control through the selective removal of killer animals only. Here, too, is a tragic glimpse at several other species—also misunderstood and now endangered—that have been pushed aside by man.

Secret Return—Research documentary by an NPS scientist on the nesting activity of a loggerhead sea turtle, never before captured on film. A night viewing device was used for some shots.

MONDAY EVENING, NOVEMBER 26

7:00 CONFERENCE SOCIAL. "No-Host" Reception *Comstock Room*

TUESDAY MORNING, NOVEMBER 27

OPENING PLENARY SESSION. *Ralston Room*

8:00 **Opening Remarks.** G. JAY GOGUE, Conference Chairman, Regional Chief Scientist, National Park Service, Atlanta, GA.

Welcoming Remarks. ARTHUR GENTILE, Executive Director, American Institute of Biological Sciences, Arlington, VA.

SPECIAL ADDRESSES:

The Role of Science and Technology in the Administration of the National Parks System. WILLIAM WHALEN, Director, National Park Service, Washington, DC

Why Science In and Around National Parks? ROBERT L. HERBST, Assistant Secretary, Fish and Wildlife and Parks, Department of Interior, Washington, DC.

COFFEE BREAK

9:45 **SPECIAL ADDRESSES:**

Science in Management: A Delicate Balance. NATHANIEL P. REED, Former Assistant Secretary, Fish and Wildlife and Parks, Department of Interior.

Preserving Ecological Values in National Parks. A. STARKER LEOPOLD, Professor Emeritus, University of California.

The Anthropologist and the Bear—A Fable for the Modern Social Scientist. MICHAEL ORBACH, Associate Director of Social Sciences, University of California, Santa Cruz.

Sociology and Park Ecosystems. FREDERICK L. CAMPBELL, Department of Sociology, University of Washington, Seattle.

TUESDAY AFTERNOON, NOVEMBER 27

Concurrent Paper Sessions

ANTHROPOLOGICAL CONCERNS IN THE NATIONAL PARKS

DOUGLAS H. SCOVILL, National Park Service, Washington, DC, presiding. *Parlor C.*

1:00 1. RAMSEY, ELEANOR MASON. University of California, Berkeley. The role of living memories in the identification and interpretation of cultural resources.

1:20 2. KETCHIN, ANNE-FORREST. University of Colorado, Boulder. The social and cultural components of "damage" to public lands: the Indian Peaks Wilderness Area (Front Range, Colorado).

TUESDAY AFTERNOON

- 1:40 3. BICKEL, POLLY McW. and SALLY S. SALZMAN*. San Francisco, CA, and *Burlingame, CA. New developments in northwestern California anthropology: studies in Redwood National Park.

ATMOSPHERIC RESOURCES. RAY HERRMANN, National Park Service, Washington, DC, presiding. *Parlor D.*

- 1:00 4. WIERSMA, G. BRUCE and KENNETH W. BROWN. U.S. Environmental Protection Agency, Las Vegas, NV. Recommended pollutant monitoring system for biosphere reserves.
- 1:20 5. YARBOROUGH, KEITH A. National Park Service, Santa Fe, NM. Air quality monitoring in the Southwest Region National Park Service.
- 1:40 6. MATHEWS, RAYMOND, JR., GARY LARSON and DAVID SILSBEE. National Park Service, Gatlinburg, TN. Atmospheric deposition studies in the Great Smoky Mountains National Park.
- 2:00 7. BROWN, KENNETH W. and G. BRUCE WIERSMA. U.S. Environmental Protection Agency, Las Vegas, NV. Pollutant monitoring in the Olympic National Park biosphere reserve.
- 2:20 8. STEPHENS, N. THOMAS, GARY LARSON* and T.F. ALBEE. Virginia Polytechnic Institute and State University, Blacksburg, and *National Park Service, Gatlinburg, TN. A study of ambient air quality and visibility in National Parks.
- 2:40 9. SKELLY, JOHN M., STEVE DUCHELLE and LANCE W. KRESS. Virginia Polytechnic Institute and State University, Blacksburg. Impact of photochemical oxidant to white pine in the Shenandoah, Blue Ridge Parkway and Great Smoky Mountains National Parks.
- 3:00 COFFEE.
- 3:30 10. VOGLER, DETLEV R. US Department of Agriculture, Forest Service, San Francisco, CA. Ozone and conifer injury in Sequoia and Kings Canyon National Parks.
- 3:50 11. SCHECHTER, HOWARD R. IIT Research Institute, Chicago, IL. A study of impact of man-made noise on natural sounds.
- 4:10 12. HERRIMAN, WALTER, BRIAN McHUGH, GARLAND MOORE and KEITH A. YARBOROUGH. National Park Service, Santa Fe, NM. Air quality related values study at Chaco Canyon National Monument.
- 4:30 13. MALM, WILLIAM, ERIC WALTHER, MARVIN KLIENE and KENNETH O'DELL. US Environmental Protection Agency, Las Vegas, NV. Visibility in the Southwest.
- 4:50 14. WILLIAMS, WAYNE T. The Black Apple Institute, Quincy, CA. Long distance transport of air pollution into Sequoia, Kings Canyon, Yosemite and Lassen National Parks.
- 5:10 15. WILKENING, MARVIN. New Mexico Tech, Socorro. Electrical properties of air in the Carlsbad Caverns.

TUESDAY AFTERNOON

- 5:30 16. MORGAN, D.L. and W.F. SLUSSER. California State University, Fresno. The diurnal wind regime in the Central High Sierra.

COASTAL SYSTEMS. S. DUNCAN HERON, Duke University, Durham, NC, presiding. *Golden Gate*.

- 1:00 17. WEISHAR, LEE and WILLIAM WOOD. Purdue University, West Lafayette, IN. Systematic changes in beach profile and near-shore topography.
- 1:20 18. WOOD, WILLIAM, LEE WEISHAR and STEPHEN DAVIS. Purdue University, West Lafayette, IN. Storm impact on systematic changes in beach and nearshore topography.
- 1:40 19. BERELSON, WILLIAM M. and S. DUNCAN HERON, JR. Duke University, Durham, NC. A comparison between a pleistocene and a holocene barrier island: Harkers Island and Shackelford Banks, Cape Lookout National Seashore.
- 2:00 20. GARROW, HOLLY CRANDALL. Dickinson College, Carlisle, PA. Sedimentology of two small washover deposits at Padre Island National Seashore, Texas and Assateague Island National Seashore, Maryland.
- 2:20 21. OTVOS, ERVIN G., JR. Gulf Coast Research Laboratory, Ocean Springs, MS. Santa Rosa Island, NW Florida and the Mississippi-Alabama barrier islands— genetic comparisons.
- 2:40 22. SHABICA, STEPHEN and CHARLES SHABICA*. National Park Service, NSTL Station, MS, and *Northeastern Illinois University, Chicago. Human related shoreline changes in Petit Bois Island wilderness, Gulf Islands National Seashore.
- 3:00 COFFEE.
- 3:30 23. ELEUTERIUS, LIONEL, JOHN CALDWELL and STEPHEN SHABICA*. Gulf Coast Research Laboratory, Ocean Springs, MS, and *National Park Service, NSTL Station, MS. A phytosociological study of Horn and Petit Bois Islands, Miss.
- 3:50 24. DAVIS, STEPHEN and WILLIAM WOOD. Purdue University, West Lafayette, IN. Vegetative establishment on an artificial beach.
- 4:10 25. GODFREY, PAUL J.*, LISA BLUMENTHAL, KAREN BLUTH, JOANN CLARKE, DEBORAH GIESLER, MELINDA GODFREY, DOUGLAS SPICHER and ELIZABETH WHITE. *University of Massachusetts, Amherst, and Duke University Marine Laboratory, Beaufort, NC. Geobotanical (vegetation and stratigraphy) studies in Cape Lookout and Cape Hatteras National Seashores, NC.
- 4:30 26. BENEDICT, MARK A. and PAUL J. GODFREY. University of Massachusetts, Amherst. The ecology of *Spartina Patens* and its relationship to the management of East Coast barrier beaches.
- 4:50 27. STALTER, RICHARD. St. John's University, Jamaica, NY. The plant communities of Sandy Hook, New Jersey with emphasis on *Ilex Opaca*.

TUESDAY AFTERNOON

- 5:10 28. WAGNER, RICHARD H. National Park Service, San Francisco, CA. A northern coastal prairie remnant on Point Reyes Peninsula, California.

ENVIRONMENTAL EDUCATION. BARBARA B. CLARK, National Park Service, Washington, DC, presiding. *Parlor E.*

- 1:00 29. MCGRAW, DONALD J. Sequoia Kings Canyon National Parks, CA. Hunting live dinosaurs in Grand Canyon in 1937: on the role of the popular press and the advancement of science.
- 1:20 30. TANACREDI, JOHN T. and KENNETH DAVIES*. Gateway National Recreation Area, Brooklyn, NY and *Cornell University Cooperative Extension, New York, NY. My dome, sweet dome: geodesic greenhouses with an interpretive connection.
- 1:40 31. SCHOENFELD, A. CLAY. The University of Wisconsin, Madison. What environmental communication research suggests for interpretive programs in the National Parks.
- 2:00 32. PHILLIPS, JEANNETTE H. Georgia Department of Natural Resources, Brunswick. A sensory approach to salt marsh education.
- 2:20 33. PHILLIPS, ORA GAIL and JEANNETTE PHILLIPS. Georgia Department of Natural Resources, Brunswick. Environmental education in Sapelo Island National Estuarine Sanctuary.
- 2:40 34. SAVELAND, ROBERT N. The University of Georgia, Athens. Environmental education and research opportunities on the Georgia Coast.

EXOTIC SPECIES. JOHN G. DENNIS, National Park Service, Washington, DC, presiding. *Lower French Parlor.*

- 1:00 35. SINGER, FRANCIS and STUART COLEMAN. National Park Service, Gatlinburg, TN. Ecology and management of European Wild Boar in Great Smoky Mountains National Park.
- 1:20 36. HUFF MARK H. University of Washington, Seattle. The effect of the European Wild Boar (*Sus scrofa*) on woody vegetation of Gray Beech Forest in the Great Smoky Mountains.
- 1:40 37. BRATTON, SUSAN, FRANCIS SINGER, MARK HARMON and PETER WHITE. National Park Service, Gatlinburg, TN. Rooting impacts of the European Wild Boar on the vegetation of Great Smoky Mountains National Park during a year of mast failure.
- 2:00 38. SINGER, FRANCIS. National Park Service, Gatlinburg, TN. A comparison among feral pigs and European wild boar populations.
- 2:20 39. WARSHAUER, FREDERICK R. University of Hawaii at Manoa, Honolulu. An overview of the feral pig problem in Hawaii Volcanoes National Park.

TUESDAY AFTERNOON

- 2:40 40. JACOBI, JAMES D. University of Hawaii, Honolulu. Changes in a native alpine grassland in Haleakala National Park following disturbance by feral pigs.
- 3:00 COFFEE.
- 3:30 41. BARON, JILL. National Park Service, Washington, DC. Vegetation impact by feral hogs, Gulf Islands National Seashore, Mississippi.
- 3:50 42. WALTERS, JIM. Grand Canyon National Park, AZ. Movements and home ranges of feral burros on the Tonto Plateau-Grand Canyon National Park.
- 4:10 43. BENNETT, PETER*, ARTHUR PHILLIPS, GEORGE RUFFNER, STEVEN CAROTHERS and ROY JOHNSON*. *National Park Service, Cooperative Parks Service Unit, University of Arizona, Tucson, and Museum of Northern Arizona, Flagstaff. Effects of burro foraging on four types of Grand Canyon vegetation.
- 4:30 44. WAUER, ROLAND H. and JOHN G. DENNIS. National Park Service, Washington, DC. Impacts of feral burros upon the breeding avifauna at Bandelier National Monument, New Mexico.
- 4:50 45. DENNIS, JOHN G. National Park Service, Washington, DC. The relationship of research to resolution of a high interest natural resource issue—management of free-roaming burros on natural park system lands.
- 5:10 46. WOOD, GENE W. and MARK A. MURPHY. The Belle W. Baruch Forest Science Institute of Clemson University, Georgetown, SC. Impact of feral ungulates on Shackleford Bank, Cape Lookout National Seashore, North Carolina.

FIRE ECOLOGY. BRUCE KILGORE, National Park Service, San Francisco, CA, presiding. *Ralston Room.*

- 1:00 47. RAUW, DENISON. National Park Service Cooperative Studies Unit, University of Washington, Seattle. Interpreting the natural role of fire: Implications for fire management policy.
- 1:20 48. OMI, PHILIP N. Colorado State University, Fort Collins. Fire and resource management in Mesa Verde National Park.
- 1:40 49. LAVEN, RICHARD D. Colorado State University, Fort Collins. Ecological implications for National Park fire management: a case study of the Ouzel fire, Rocky Mountain National Park.
- 2:00 50. BOTTI, STEPHEN and TOM NICHOLS*. Yosemite National Park, CA, and *Sequoia and Kings Canyon National Parks, Three Rivers, CA. The Yosemite and Sequoia-Kings Canyon prescribed natural fire program.
- 2:20 51. MARTIN, ROBERT E., CRAIG M. OLSON and JAMES SLEZNICK, JR.*. Silviculture Laboratory, Bend, OR, and *Lava Beds National Monument, Tulelake, CA. Prescribed burning and fire planning at Lava Beds National Monument.

TUESDAY AFTERNOON

- 2:40 52. BONNICKSEN, THOMAS M. and EDWARD C. STONE*. University of Wisconsin, Madison, and *University of California, Berkeley. Reconstructing presettlement forests in National Parks: a new approach.
- 3:00 COFFEE.
- 3:30 53. PARSONS, DAVID J. Sequoia and Kings Canyon National Parks, Three Rivers, CA. Fire history in the foothill zone of Sequoia National Park.
- 3:50 54. HEMSTROM, MILES A. Forestry Sciences Laboratory, Corvallis, OR. Fire in the forests of Mount Rainier National Park.

INTERACTION BETWEEN MAN AND ANIMALS IN PARKS. A Sociology Session. Stephen R. Kellert, Yale University, New Haven, CT. presiding. *The Forty-Niner*.

- 1:00 55. BROWN, PERRY*, BEVERLY L. DRIVER and GLENN E. HAAS. *Oregon State University, Corvallis, and US Forest Service, Fort Collins, CO. Value of wildlife to wilderness uses.
- 1:20 56. CHEEK, NEIL H., JR and DONALD R. FIELD*. University of Washington, Seattle, and *National Park Service and University of Washington, Seattle. Meanings of animals among backcountry hikers in Alaska.
- 1:40 57. SHAW, WILLIAM W. University of Arizona, Tucson. Managing wildlife in National Parks for human benefits.
- 2:00 58. MARTINKA, CLIFF. Glacier National Park, West Glacier, MT. Measuring effects of human presence on wildlife.
- 2:20 59. REAM, CATHERINE H. University of Montana, Missoula. Backcountry interactions of people and wildlife.
- 2:40 60. EAGAR, JANE T. University of Tennessee, Knoxville. Aggression in human-bear interactions: the influence of setting.
- 3:00 COFFEE
- 3:30 61. McARTHUR, KATHERINE L. Glacier National Park, West Glacier, MT. Behavior of grizzly bears in relation to people in Glacier National Park.

RESOURCE MANAGEMENT AND PLANNING. EDWARD E. STARKEY, National Park Service, Oregon State University, Corvallis, presiding. *Comstock Room*.

- 1:00 62. WAUER, ROLAND H. National Park Service, Washington, DC. The role of the National Park Service Natural Resources (field) Manager.
- 1:20 63. DRIVER, CHAS. H. and WILLIAM BRADLEY. University of Washington, Seattle. Multi-agency management of a common resource (elk).

TUESDAY AFTERNOON

- 1:40 64. LEATHERMAN, STEPHEN P., ROLF DIAMONT* and WILLIAM GREGG**. National Park Service Cooperative Research Unit, University of Massachusetts, Amherst, *Golden Gate National Recreation Area, San Francisco, CA, and **National Park Service, Washington, DC. The conference concept in park planning.
- 2:00 65. JOHNSON, R. ROY and LOIS T. HAIGHT. Cooperative National Park Studies Unit, University of Arizona, Tucson. The importance of biotic lists and population information to resource management.
- 2:20 66. FRIES, NANCY L. and Q. NICHOLAS WHELAN*. National Park Service, Denver, CO, and *National Park Service, Ventura, CA. Multidisciplinary approach to resources management planning for Channel Islands National Monument.
- 2:40 67. COLE, GLEN F. Voyageurs National Park, International Falls, MN. Mission oriented research in newly established Voyageurs National Park.
- 3:00 COFFEE
- 3:30 68. HENDRICKSON, WILLIAM H. Indiana Dunes National Lakeshore, Porter, IN. Perspectives on the development of alternatives for a resource management plan for Indiana Dunes National Lakeshore.
- 3:50 69. WRIGHT, R. GERALD and LYNNE ZEITLIN-HALE. National Park Service, Anchorage, AK. A conceptual ecological model of Glacier Bay, Alaska and its implications for resource management.
- 4:10 70. DAVIS, GARY E. National Park Service, Homestead, FL. Recreational and commercial fisheries in Everglades National Park: an ecosystem approach to resource management.
- 4:30 71. DAWSON, RICHARD H. National Park Service, Homestead, FL. Fisheries management in Everglades National Park: scientific data and public input.
- 4:50 72. BRISCOE, B.W.*, L.N. CARBYN and G.C. TROTTIER. *Parks Canada, Winnipeg, Manitoba, and Canadian Wildlife Service, Edmonton, Alberta. Applications of a large mammal system study for natural resource management in Riding Mountain National Park, Canada.
- 5:10 73. PETERSON, ROLF O. and JOHN M. MOREHEAD*. Michigan Technological University, Houghton, and *Isle Royale National Park, Houghton, MI. Isle Royale wolves and national park management.

ARCHEOLOGICAL RESEARCH AT KNIFE RIVER INDIAN VILLAGES NATIONAL HISTORIC SITE. F. A. CALABRESE, National Park Service, Lincoln, NE, presiding. *Parlor C.*

TUESDAY AFTERNOON

- 2:00 74. CALABRESE, F.A. National Park Service, Lincoln, NE. An overview of the archeological research program at Knife River Indian Villages National Historic Site.
- 2:20 75. AHLER, STANLEY A. and TIMOTHY WESTON. University of North Dakota, Grand Forks. Archeological reconnaissance and test excavation in the Knife River Indian Villages National Historic Site, North Dakota.
- 2:40 76. NICKEL, ROBERT. National Park Service, Lincoln, NE. Designing a magnetic survey.
- 3:00 COFFEE
- 3:30 77. REITEN, JON. University of North Dakota, Grand Forks. Quaternary geology of the Knife River Indian Villages National Historic Site.
- 3:50 78. WOOD, W. RAYMOND. University of Missouri, Columbia. The John Evans 1796-1797 map of the Missouri River.
- 4:10 79. THIESSEN, THOMAS D. and W. RAYMOND WOOD*. National Park Service, Lincoln, NE, and *University of Missouri, Columbia. Ethnohistorical research pertaining to the Knife River Indian Villages National Historic Site.
- 4:30 80. TRIMBLE, MICHAEL K. University of Missouri, Columbia. An ethnohistorical interpretation of the spread of smallpox in the northern plains utilizing concepts of disease ecology.
- AVIAN STUDIES.** WILLIAM B. ROBERTSON, National Park Service, Everglades National Park, Homestead, FL, presiding. *Parlor E.*
- 3:30 81. WEISBROD, A.R. National Park Service, Washington, DC. The land birds of Lituya Bay: Old habitats in a new land.
- 3:50 82. JAMES, DOUGLAS, M. JOSEPH LOCKERD, CHARLES R. PRESTON and KIMBERLY G. SMITH*. University of Arkansas, Fayetteville, and *Utah State University, Logan, Avian community relationships at the Buffalo National River in Arkansas.
- 4:10 83. ROBERTSON, WILLIAM B., JR., MARY J. ROBERTSON* and BARBARA C. KITTLESON** National Park Service, Homestead, FL, *Homestead, FL, and **Lakeland, FL. Social structure in a sooty tern colony.
- 4:30 84. NORTON, ROBERT L. Virgin Islands Ecological Research Station, St. John. Ecology and distribution of birds with emphasis on Columbidae in the Northern US Virgin Islands.
- 4:50 85. McCLELLAND, RILEY, DAVID SHEA* and HARRIET ALLEN**. University of Montana, Missoula, *US Forest Service, Powers, OR, and **Glacier National Park, West Glacier, MT. Numbers, morphology, and movement patterns of bald eagles at autumn concentrations in Glacier National Park, Montana.

TUESDAY AFTERNOON

- 5:10 86. BROWN, BRYAN T. and R. ROY JOHNSON*. Grand Canyon National Park, AZ, and *Cooperative National Park Studies Unit, University of Arizona, Tucson. Importance of the Colorado River in Grand Canyon National Park as a corridor for migratory passeriformes.

SOCIAL ADJUSTMENTS TO NATIONAL PARK ENVIRONMENTS: IMPLICATIONS FOR POLICY. A Sociology Session. ROBERT G. LEE, University of Washington, Seattle, presiding. *The Forty-Niner*.

- 4:00 87. BONNICKSEN, THOMAS M. and THOMAS S. ROBINSON. University of Wisconsin, Madison. A biosocial perspective on policy evaluation.
- 4:20 88. HAMILTON, LAWRENCE. University of New Hampshire, Durham. Social aspects of technical rock climbing.
- 4:40 89. BARRELL, ROBERT L. National Park Service, Honolulu, HI. The social landscape of Hawaii volcanoes.
- 5:00 90. MOORE, GREG. National Park Service, San Francisco, CA. A park that people shaped.

THE EFFECTS OF NATURAL IMPACTS ON CULTURAL RESOURCES. ROGER E. KELLY, National Park Service, San Francisco, CA, presiding. *Parlor C*.

- 4:40 91. WARE, JOHN A., National Park Service, Santa Fe, NM. The assessment of freshwater inundation impacts on cultural resources: an experimental approach.
- 5:10 92. KELLY, ROGER E. and JIM MAYBERRY*. National Park Service, San Francisco, CA, and *The University of Arizona, Tucson. Trial by fire: effects of NPS burn programs upon archeological resources.

WEDNESDAY MORNING, NOVEMBER 28

SPECIAL ADDRESSES. *Ralston Room*

- 8:00 The Resource Must Come First. EDWIN P. PISTER, Fishery Biologist, California Department of Fish and Game.
Research Strategy in Urbanized National Parks. JOHN ANDRESON, Director of Urban Forestry Studies Program, University of Toronto, Ontario, Canada.

Concurrent Paper Sessions

AQUATIC SYSTEMS. LOIS RANDALL, US Fish and Wildlife Service, Kalispell, MT, presiding. *Royal Suite 260.*

- 8:50 93. LIND, OWEN T. and CAROL A. BANE. Baylor University, Waco, TX. Aquatic ecosystems Big Bend National Park: biological and chemical indicators of water quality.
- 9:10 94. HARGIS, JACK R. University of Minnesota, Duluth. Establishing biological criteria for water quality management in the Voyageurs National Park.
- 9:30 95. COLBURN, ELIZABETH A. University of Wisconsin, Madison. Adaptive strategies of aquatic organisms in Death Valley waters.
- 9:50 96. WIEGERT, RICHARD G. and CONRAD E. WICKSTROM*. University of Georgia, Athens, and *Emory University, Atlanta, GA. Effect of brine fly grazing on thermal algal-bacterial mats of Yellowstone National Park.
- 10:10 COFFEE
- 10:40 97. HAUER, RICHARD and JACK A. STANFORD. University of Montana Biological Station, Bigfork. Distributional patterns of aquatic macroinvertebrates in the Kintla Drainage, Glacier National Park.
- 11:00 98. FOGGIN, G. THOMAS, III and B. RILEY McCLELLAND. University of Montana, Missoula. The influence of Kokanee salmon migrations and human use patterns upon the hydrochemical and bacteriological characteristics of Lower McDonald Creek, Glacier National Park, Montana.
- 11:20 99. LARSON, DOUGLAS W. and N. STAN GEIGER*. US Army Corps of Engineers, Portland, OR, and *Beak Consultants Inc., Portland, OR. Species composition and vertical distribution of pelagic zone phytoplankton in Crater Lake, Oregon: 1940-1979.
- 11:40 100. ABELL, DANA L. University of California, Davis. Species diversity in benthic invertebrate associations of the Kaweah River in Sequoia National Park, California.

AVIAN STUDIES. (continued) WILLIAM B. ROBERTSON, National Park Service, Everglades National Park, Homestead, FL, presiding. *Parlor E.*

WEDNESDAY MORNING

- 8:50 101. TIAGWAD, TAMARA E., CRAIG M. OLSON and ROBERT E. MARTIN. Silviculture Laboratory, Bend, OR. Response of breeding bird populations to fire in big sagebrush-ponderosa pine transition community.
- 9:10 102. SOUTHERN, WILLIAM E. Northern Illinois University, DeKalb, IL. Red fox predation on breeding gulls at South Manitou Island, Sleeping Bear Dunes National Lakeshore.
- 9:30 103. LESTER, AMY, RILEY McCLELLAND and JAMES LOWE. University of Montana, Missoula. Numerical response of woodpeckers and their effects on mountain pine beetles in lodgepole pine in northwestern Montana.
- 9:50 104. HUNT, GEORGE L., JR. University of California, Irvine. Management of seabird resources in the Channel Islands National Monument.
- 10:10 COFFEE
- 10:40 105. Van RIPER, CHARLES, III. University of Hawaii, Honolulu. The investigation of avian malaria in Hawaii's National Parks.

EARTH SCIENCES. WAYNE HAMILTON, Zion National Park, Springdale, UT, presiding. *Royal Suite 262.*

- 8:50 106. KELLER, E., A. MacDONALD and T. TALLY. University of California, Santa Barbara. Effect of large organic debris on channel morphology and process in the streams of Redwood National Park.
- 9:10 107. ROGERS, J. DAVID. University of California, Berkeley. The development of natural rock arches at Arches National Park, Utah.
- 9:30 108. McKENZIE, G.D. and R.G. GOODWIN. Ohio State University, Columbus. Development of collapsed glacial topography in Adams Inlet, Alaska.
- 9:50 109. OSBORN, GERALD. University of Calgary, Alberta, Canada. Holocene glacier fluctuations in Waterton-Glacier International Peace Park.
- 10:10 COFFEE
- 10:40 110. MILLER, JULIA M.G. University of California, Santa Barbara. Evidence for precambrian glaciation in the Death Valley region.
- 11:00 111. SCHIEBOUT, JUDITH A. Louisiana State University, Baton Rouge. The stratigraphic and paleogeographic importance of paleocene and early eocene deposits in Big Bend National Park, Texas.
- 11:20 112. DES MARAIS, DAVID J. Menlo Park, CA. The contribution of Lilburn Cave to the natural history of Sequoia-Kings Canyon National Parks.

WEDNESDAY MORNING

- 11:40 113. JOHNSON, DONALD LEE. Santa Barbara Museum of Natural History, Santa Barbara, CA. Running Springs: a late pleistocene-holocene fossil complex on San Miguel Island, California.

EXOTIC SPECIES. (continued) JOHN G. DENNIS, National Park Service, Washington, DC, presiding. *Lower French Parlor.*

- 8:50 114. KEIPER, RONALD R., MARY BETH MOSS and STAMITIS M. ZERVANOS*. The Pennsylvania State University, Mont Alto, and *The Pennsylvania State University, Reading. Daily and seasonal activity patterns of feral ponies on Assateague Island.
- 9:10 115. KEIPER, RONALD R. The Pennsylvania State University, Mont Alto. Effect of management on the behavior of feral Assateague Island ponies.
- 9:30 116. THOMAS, L.K., JR. Prince William Forest Park, Triangle, VA. The management of exotic plants.
- 9:50 117. THOMAS, L.K., JR. Prince William Forest Park, Triangle, VA. Winter growth of Japanese honeysuckle (*Lonicera Japonica* Thunb.) on Theodore Roosevelt Island, District of Columbia.
- 10:10 COFFEE
- 10:40 118. EWEL, JOHN, DENNIS OJIMA and WILLIAM DeBUSK. University of Florida, Gainesville. Ecology of a successful exotic tree in the Everglades.
- 11:00 119. YOSHINAGA, ALVIN Y. University of Hawaii at Manoa, Honolulu. Establishment of introduced plant species in Kipahulu Valley, Haleakala National Park.
- 11:20 120. HOCHBERG, M.C., S.A. JUNAK, R.N. PHILBRICK and S.L. TIMBROOK. Santa Barbara Botanic Garden, Santa Barbara, CA. Historical changes in the vegetation of Anacapa Island.
- 11:40 121. GARDNER, DONALD E. and RAYMOND E. BURGE*. Hawaii Volcanoes National Park, and *National Park Service, NSTL Station, MS. Approaches to the biocontrol of certain exotic trees using vascular wilt fungi.

FIRE ECOLOGY. (continued) PHILIP W. RUNDEL, University of California, Irvine, presiding. *Ralston Room.*

- 8:50 122. RAKESTRAW, L., MICHAEL S. COFFMAN and JAMES FERRIS. Michigan Technological University, Houghton. Fire and logging history of Voyageurs National Park.
- 9:10 123. HARMON, MARK. National Park Service, Gatlinburg, TN. Fire history and ecology of western Great Smoky Mountains National Park.
- 9:30 124. AHLSTRAND, GARY M. National Park Service Cooperative Park Studies Unit, Texas Tech University, Lubbock. Fire history of a relict mixed conifer forest.

WEDNESDAY MORNING

- 9:50 125. MOIR, WILLIAM H. Thorne Ecological Institute, Boulder, CO. Two centuries of fire in the High Chisos, Big Bend National Park, Texas.
- 10:10 COFFEE
- 10:40 126. VEIRS, STEPHEN D., JR. Redwood National Park, Arcata, CA. The role of fire in Northern Coast Redwood Forest vegetation dynamics.
- 11:00 127. WEST, NEIL E. Utah State University, Logan. Frequency and size of fires in relation to ecosystem variables in Zion National Park.
- 11:20 128. HUFF, MARK H. University of Washington, Seattle. Climatic factors influencing lightning fires in Olympic National Park.
- 11:40 129. BAKER, GAIL A., PHILIP W. RUNDEL and DAVID J. PARSONS*. University of California, Irvine, and *Sequoia National Park, Three Rivers, CA. Water stress and phenology of foothill zone shrubs in relation to fire management.

PLANT ECOLOGY PAUL J. GODFREY, University of Massachusetts, Amherst, presiding. *Sample Room.*

- 8:50 130. SMATHERS, GARRETT. National Park Service Cooperative Park Studies Unit, Western Carolina University, Cullowhee, NC. One hundred years of plant succession on a crater floor in Hawaii.
- 9:10 131. KLUBNIKIN, KHERYN. California State University, Fullerton. An analysis of the distribution of national parks and other reserves relative to vegetation types in California.
- 9:30 132. EWEL, JOHN, DENNIS OJIMA and WILLIAM DeBUSK. University of Florida, Gainesville. Seed fluxes among Everglades ecosystems.
- 9:50 133. JANKE, ROBERT A. Michigan Technological University, Houghton. Post-fir succession in the boreal forest of Isle Royale National Park.
- 10:10 COFFEE
- 10:40 134. SEEMANN, J.R. and J.A. BERRY*. Stanford University, Stanford, CA, and *Carnegie Institution of Washington, Stanford, CA. Studies of the physiological ecology of desert annual plants in Death Valley National Monument.
- 11:00 135. HOPPE, STEVEN, PATTIE McDANIEL, DAVID CLINE, STEWART WITZEMAN, DAVID PIEROTTI, SUSAN HAMOR, JAMES ROMINGER, AUGUSTUS COTERA AND RICHARD FOUST. Northern Arizona University, Flagstaff. Trace element cycling in Grand Canyon National Park.

WEDNESDAY MORNING

- 11:20 136. GORDON, BRUCE R. and DONALD L. HAUXWELL. Humboldt State University, Arcata, CA. Soils associated with prairie and forest plant communities in the Bald Hills of Redwood National Park.

RECENT INTERPRETATIONS OF THE ANASAZI CULTURE. JOHN D. SCHELBERG, National Park Service, Albuquerque, NM, presiding. *Parlor C.*

- 8:50 137. SCHELBERG, JOHN D. The Chaco Center, Albuquerque, NM. Social complexity in Chaco Canyon.
- 9:10 138. INGMANSON, JOHN EARL. Mesa Verde National Park, CO. A summary of Chacoan cultural traits.
- 9:30 139. SMITH, JACK E. University of Colorado, Denver. A re-evaluation of prehistoric water control at Mesa Verde.

RESOURCE MANAGEMENT AND PLANNING. (continued) EDWARD E. STARKEY, National Park Service, Oregon State University, Corvallis, presiding. *Comstock Room.*

- 8:50 140. DOUGLAS, CHARLES L. and LESLIE D. WHITE. Cooperative National Park Resources Studies Unit, University of Nevada, Las Vegas. Research and management of bighorn sheep in Joshua Tree National Monument.
- 9:10 141. ROBINSON, WILLIAM L., LLOYD W. FANTER*, ALBERT G. SPALDING and STEVE L. JONES. Northern Michigan University, Marquette, and *US Army Corps of Engineers, Detroit, MI. Biological impacts of political mismanagement of white-tailed deer in Pictured Rocks National Lakeshore.
- 9:30 142. CORNELLY, JOHN E. Malheur National Wildlife Refuge, Burns, OR. Aversive conditioning of campground coyotes in Joshua Tree National Monument.
- 9:50 143. HASTINGS, BRUCE C. and BARRIE K. GILBERT. Utah State University, Logan. Aversive conditioning of black bears in the backcountry of Yosemite National Park.

SPECIAL POPULATIONS IN PARKS, A Sociology Session. FRANCIS P. NOE, National Park Service, Atlanta, GA, presiding. *The Forty-Niner.*

- 8:50 144. KELLEY, JOHN R. University of Illinois. Race, resources, and outdoor recreation.
- 9:10 145. DRABICK, LAWRENCE W. North Carolina State University, Raleigh. Old folks in the National Parks, a special population with special needs.
- 9:30 146. LITTLE, WILLIAM. Atlanta University, Atlanta, GA. Social and recreation needs of a low-income black community.

WEDNESDAY MORNING

- 9:50 147. HENNEBERGER, JOHN. Chattahoochee National Recreation Area. A case study of planning for special user groups: Chattahoochee National Recreation Area.

URBAN ENVIRONMENTAL STUDIES. RICHARD HAMMERSCHLAG, National Park Service, Washington, DC, presiding. *Golden Gate.*

- 8:50 148. OLKOWSKI, WILLIAM and HELGA OLKOWSKI. John Muir Institute, Berkeley, CA. Analyzing pest management practices using energy analysis.
- 9:10 149. DULLEA, MARK. Lowell National Historical Park, Lowell, MA. Towards energy self-sufficiency: the Lowell approach.
- 9:30 150. RHOADS, ANN F. and PAUL W. MEYER. Morris Arboretum, Philadelphia, PA. Stress factors affecting the growth of trees in Independence National Historical Park.
- 9:50 151. SHERALD, JAMES L. Ecological Services Laboratory, Washington, DC. A practical therapeutic technique for Dutch Elm Disease.
- 10:10 COFFEE
- 10:40 152. KARNOSKY, D.F., M.K. REDENBAUGH*, D.D. LANGE, and R.D. WESTFALL*. Cary Arboretum, Millbrook, NY, and *State University of New York, Syracuse. Progress in elm tissue culture.
- 11:00 153. KOSTKA, STANLEY J. and JAMES L. SHERALD. Ecological Services Laboratory, Washington, DC. Use of electrical resistance as a measure of vigor in white pine.
- 11:20 154. SHERALD, JAMES L. and SUZANNE S. HEARON. Ecological Services Laboratory, Washington, DC. An association of bacteria with shade tree leaf scorch in the National Capital Region.
- 11:40 155. HAMMERSCHLAG, RICHARD S. Ecological Services Laboratory, Washington, DC. Successful planting of an urban park.

HUMAN DEFINITIONS OF PARKS AND RECREATION SETTINGS, A Sociology Session. RABEL J. BURDGE, University of Illinois, Champagne Urbana, presiding. *The Forty-Niner.*

- 10:40 156. MACHLIS, GARY E. and WILLIAM R. BURCH*. University of Idaho, Moscow, and *Yale University, New Haven, CT. Tourism in National Parks—cycles of myth and behavior.
- 11:00 157. ENGEL, RONALD J. Meadville/Lombard Theological School, Chicago, IL. Sacred Sands: the civil religion of the Indiana Dunes.
- 11:20 158. WHITE, ROBERT G. and RICHARD SCHREYER, Utah State University, Logan. Nontraditional uses of National Parks.

HUMAN IMPACT ON NATURAL RESOURCES. PAUL A. BUCKLEY, National Park Service, Boston, MA, presiding. *Comstock Room.*

WEDNESDAY MORNING

- 10:40 159. SCHREINER, EDWARD. Olympic National Park, Port Angeles, WA. Plant succession after trampling in four high elevation plant communities of Olympic National Park.
- 11:00 160. SUMMER, REBECCA M. University of Colorado, Boulder. Soil sensitivity and resource management of the alpine tundra, Rocky Mountain National Park, Colorado.
- 11:20 161. LEMONS, JOHN. New England College, Henniker, NH. Vegetative change and visitor use in a subalpine meadow, Yosemite National Park, CA.
- 11:40 162. MacLEOD, SUSAN A. Sequoia and Kings Canyon National Parks, Three Rivers, CA. Measuring impacts of visitor use on backcountry camp areas.

RECENT STUDIES IN ARCTIC ANTHROPOLOGY. ZORRO BRADLEY, Cooperative Park Studies Unit, University of Alaska, Fairbanks, presiding. *Parlor C.*

- 10:40 163. KETZ, JAMES A. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Native placenames in eastern Prince William Sound, Alaska.
- 11:00 164. SCZAWINSKI, TIMOTHY and WILLIAM SHEPPARD. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Reindeer herding and traditional subsistence on the Seward Peninsula.
- 11:20 165. HANSEN, SUSAN K. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Alaska native historical sites and the supernatural world.
- 11:40 166. MARCOTTE, JAMES R. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Physiographical aspects of Chugach Eskimo settlement pattern.

VISUAL PERCEPTION OF NATIONAL PARK LANDS, A Sociology Session. WILLIAM H. KEY, University of Denver, Denver, CO, presiding. *Parlor D.*

- 10:40 167. PALMER, JAMES F. University of Massachusetts, Amherst. A visual quality inventory along a national scenic trail.
- 11:00 168. LEIKER, KAREN K., WILLIAM C. MALM*, and JOHN V. MOLENAR**. National Park Service, Denver, CO, *Environmental Protection Agency, Las Vegas, NV, and **University of Nevada, Las Vegas. National Park Service visibility perception study.
- 11:20 169. PALMER, JAMES F. University of Massachusetts, Amherst. Perceived attributes characterizing national scenic trail environments.

WEDNESDAY MORNING

- 11:40 170. BAUMGARTNER, ROLAND, University of Colorado, Boulder. Combined dominant visual landscape types, Indian Peaks, Colorado. A new approach to characterize the visual resource of our environment.

WEDNESDAY AFTERNOON, NOVEMBER 28

Concurrent Paper Sessions

ANIMAL ECOLOGY. MARY MEAGHER, National Park Service, Yellowstone National Park, WY, presiding. *Parlor D.*

- 1:00 171. MILLER, RONALD I. Harvard University, Cambridge, MA. Towards an understanding of species changes in isolated wildlife communities.
- 1:20 172. KUSHLAN, JAMES A. and MARILYN S. KUSHLAN. National Park Service, Homestead, FL. Water levels and alligator nesting in the Everglades.
- 1:40 173. HOCHBERG, F.G. Santa Barbara Museum of Natural History, Santa Barbara, CA. Land molluscs on the Channel Islands National Monument.
- 2:00 174. WHEATON, JENNIFER. Florida Department of Natural Resources Marine Research Laboratory, St. Petersburg. Ecology of gorgonians (*Octocorallia: gorgonacea*) at Dry Tortugas, Florida.
- 2:20 175. GLADFELTER, ELIZABETH H. West Indies Laboratory, St. Croix, US VI. Calcium carbonate deposition in reef building corals.
- 2:40 176. BRADFORD, DAVID F. University of California, Los Angeles. Ecology of a high-elevation ectotherm: the mountain yellow-legged frog (*Rana muscosa*).
- 3:00 COFFEE
- 3:30 177. GEHLBACH, FREDERICK R. Baylor University, Waco, TX. Pond succession and cannibalism: tiger salamander populations on the north rim of Grand Canyon National Park.
- 3:50 178. BREDEN, FELIX. University of Chicago, Chicago, IL. Population structure and ecology of the Fowler's Toad, *Bufo woodhousei fowleri*, in the Indiana Dunes National Lakeshore.
- 4:10 179. DES MARAIS, DAVID J. NASA, Moffett Field, CA. A detailed chemical record of the plants and insects in the bat ecosystem is preserved in the caves near Carlsbad, New Mexico.

EARTH SCIENCES. (continued) WAYNE HAMILTON, Zion National Park, Springdale, UT. *Royal Suite 262.*

WEDNESDAY AFTERNOON

- 1:00 180. ROGERS, J. DAVID. University of California, Berkeley. Potential instability of Rainbow Bridge National Monument, Utah—a rock mechanics viewpoint.
- 1:20 181. BENTLEY, FREDERICK W. and WAYNE L. HAMILTON. National Park Service, Denver, CO. Study and remedial solution for Mt. Carmel Tunnel Zion National Park, Utah.
- 1:40 182. ROGERS, J. DAVID. University of California, Berkeley. Evidence of cataclysmic erosional events in the Grand Canyon of the Colorado River, Arizona.
- 2:00 183. GOODMAN, RICHARD E. and J. DAVID ROGERS. University of California, Berkeley. Massive rock toppling in Grand Canyon, Arizona.

EXOTIC SPECIES. (continued) JOHN G. DENNIS, National Park Service, Washington, DC, presiding. *Lower French Parlor.*

- 1:00 184. JORDAN, JAMES W., STEVEN W. CAROTHERS, C.O. MINCKLEY, HOWELL D. USHER. Museum of Northern Arizona, Flagstaff. Influences of exotic fishes on native ichthyofauna of Grand Canyon National Park and vicinity.
- 1:20 185. STEVENS, W. FREDERICK and A.R. WEISBROD*. San Juan Environmental Studies, Friday Harbor, WA. and *National Park Service, Washington, D.C. Management considerations of European rabbit biology in San Juan Island National Historical Park, Washington.
- 1:40 186. BAKER, JAMES K. Hawaii Field Research Center, Hawaii Volcanoes National Park, HI. Studies on the ecological impact of introduced roof rats upon native flora in Hawaii Volcanoes National Park.
- 2:00 187. PETERSEN, PHILLIP, CLYDE J. HURST and JOHN O. EVANS. Utah State University, Logan. Investigation of some herbicides for salt cedar control.

FIRE ECOLOGY. (continued) JAMES K. AGEE, National Park Service and University of Washington, Seattle, presiding. *Ralston Room.*

- 1:00 188. RUNDEL, PHILIP W., DAVID J. PARSONS*, and GAIL A. BAKER. University of California, Irvine, and *Sequoia National Park, Three Rivers, CA. The role of shrub structure and chemistry in the flammability of chaparral shrubs.
- 1:20 189. HARMON, MARK. National Park Service, Gatlinburg, TN. The distribution and dynamics of forest fuels in the low elevation forests of Great Smoky Mountains National Park.
- 1:40 190. LARSON, BRUCE C. and CHADWICK DEARING OLIVER. University of Washington, Seattle. Forest dynamics and fuelwood supply of the Stehekin Valley, North Cascades National Park Complex.

WEDNESDAY AFTERNOON

- 2:00 191. ROMME, WILLIAM H. and DENNIS H. KNIGHT. University of Wyoming, Laramie. Fire and landscape diversity in Yellowstone National Park.
- 2:20 192. GREENLEE, JASON, JAMES VILLEPONTEAUX*, ELIZABETH SHEEKEY**, RUSSEL GREENBERG***, and MARGO RUBEL***. Fire and Land Management Enterprises, Boulder Creek, CO, *US Forest Service, Forks of Salmon, CA, **National Park Service, Three Rivers, CA, and ***University of California, Berkeley. Natural fire in the Sierra Nevada, California.
- 2:40 193. SMITH, CLIFFORD W., TERRY P. PARMAN and KIRK WAMPLER. University of Hawaii at Manoa, Honolulu. Impact of fire in a tropical submontane seasonal forest.
- 3:00 COFFEE
- 3:30 194. DeBENEDETTI, STEVEN H. Sequoia and Kings Canyon National Parks, Three Rivers, CA. Vegetative succession following fire in a subalpine meadow of the Southern Sierra Nevada: one year post-burn.
- 3:50 195. OMI, PHILIP N. Colorado State University, Fort Collins. Fuel dynamics in two natural fires in Sequoia-Kings Canyon National Parks.
- 4:10 196. PURCELL, ALICE, ROGER SCHONES* and EDWARD STARKEY. Oregon State University, Corvallis and *University of Florida, Gainesville. The effects of prescribed burning on mule deer wintering at Lava Beds National Monument.
- 4:30 197. TAYLOR, DALE L. and ALAN HERNDON. National Park Service, Homestead, FL. Effect of fire on slash pine communities within Everglades National Park.
- 4:50 198. OLSON, CRAIG M., ROBERT E. MARTIN and ARLEN H. JOHNSON. Silviculture Laboratory, Bend, Oregon. The effects of prescribed fire on the vegetation of Lava Beds National Monument, California.
- 5:10 199. MASTROGIUSEPPE, RONALD J. University of Idaho, Moscow. Prescribed fire effects, Crater Lake National Park.
- 5:30 200. FOXX, TERALENE S. and LOREN D. POTTER*. Los Alamos, NM, and *University of New Mexico, Albuquerque. Fire ecology at Bandelier National Monument.

FISHERIES RESOURCES. DAVID FOSTER, National Park Service, Ozark National Scenic Riverways, Van Buren, MO, presiding. *Royal Suite 260.*

- 1:00 201. PETERSON, LARRY C. and LOIS C. RANDALL. US Fish and Wildlife Service, Kalispell, MT. A method for analyzing physical, chemical, and biological aspects of small cold-water streams for baseline inventory.

WEDNESDAY AFTERNOON

- 1:20 202. SCHMIDT, THOMAS W. National Park Service, Homestead, FL. Preliminary observations on fish predator-prey interactions in the Shark River Estuary, Everglades National Park.
- 1:40 203. KAYA, CALVIN M. and LYNN R. KAEDING. Montana State University, Bozeman. Effects of geothermal effluents on the fishery of the Firehole River, Yellowstone National Park.
- 2:00 204. KINGSTON, NEWTON, KENNETH L. DIEM and DOUGLAS MITCHUM. University of Wyoming, Laramie. *Diphyllobothrium cor-diceps*: a tapeworm problem in Yellowstone Lake fishes. New investigations into the life cycle.
- 2:20 205. USHER, HOWELL D., STEVEN W. CAROTHERS, JAMES W. JORDAN, and C.O. MINCKLEY. Museum of Northern Arizona, Flagstaff. Some aspects of the life history and seasonal distribution of the Speckled Dace, *Rhinichthys osculus* Girard, in the Colorado River, and selected tributaries, Grand Canyon National Park, Arizona.
- 2:40 206. MINCKLEY, C.O., S.W. CAROTHERS, J.W. JORDAN, and H.D. USHER. Museum of Northern Arizona, Flagstaff. Observations on the humpback chub, *Gila cypha*, within the Colorado and Little Colorado Rivers, Grand Canyon National Park, Arizona.
- 3:00 COFFEE
- 3:30 207. ESTES, R. DON. Tennessee Technological University, Cookeville. The implications of a taxonomic study of brook trout *Salvelinus fontinalis* (Mitchill) on their management in the Great Smoky Mountains National Park.
- 3:50 208. MOORE, STEPHEN, BROMFIELD RIDLEY, and GARY LARSON*. Tennessee Technological University, Cookeville, and *National Park Service, Gatlinburg, TN. Population responses of brook trout concurrent with reductions in numbers of exotic trout from areas of six streams in the Great Smoky Mountains National Park.
- 4:10 209. SWEENEY, JEFF, GARY LARSON*, and BROMFIELD RIDLEY. Tennessee Technological University, Cookeville, and *National Park Service, Gatlinburg, TN. Population structure of allopatric and sympatric rainbow trout and brook trout in selected streams in the Great Smoky Mountains National Park.

HUMAN IMPACT ON NATURAL RESOURCES. (continued) PAUL A. BUCKLEY, National Park Service, Boston, MA, presiding. *Com-stock Room*.

- 1:00 210. DUEK, J. LEE and B. KIM MORTENSEN. University of Arizona, Tucson. Assessing the impact of visitor use on vegetation and soils of Saguaro National Monument.
- 1:20 211. REID, WILLIAM H. University of Texas, El Paso. Vegetative structure, physical environment and disturbance in White Sands National Monument, New Mexico.

WEDNESDAY AFTERNOON

- 1:40 212. WHITTAKER, PAUL and SUSAN BRATTON. National Park Service, Gatlinburg, TN. A comparison of surface impact by hiking and horseback riding on four trail surfaces in Great Smoky Mountains National Park.
- 2:00 213. SPENCER, EDWARD L. and ROGER J. STEARN. Appalachian Mountain Club, Gorham, NH. Vegetative and soil responses on the Appalachian National Scenic Trail.
- 2:20 214. BARKER, J.R., C.A. CALL, C.M. MCKELL. Utah State University, Logan. Problem assessment and vegetative rehabilitation of view points at Bryce Canyon National Park.
- 2:40 215. MIDDLETON, BETH. Apostle Islands National Lakeshore, Bayfield, WI. Human traffic and response of beach vegetation at Apostle Islands National Lakeshore.
- 3:00 COFFEE
- 3:30 216. BRATTON, SUSAN, RAYMOND MATHEWS, JR. and PETER WHITE. National Park Service, Gatlinburg, TN. Cades Cove, an overview; the impacts of an agricultural area within a natural area.
- 3:50 217. TIPTON, WILLIAM M. National Park Service, Estes Park, CO. A case evaluation of excessive bivouac use, Rocky Mountain National Park.
- 4:10 218. MILESTONE, JAMES F. San Francisco, CA. The influence of modern man on the stream system of Yosemite Valley.
- 4:30 219. BRATTON, SUSAN and LINDA STROMBERG. National Park Service, Gatlinburg, TN. Firewood gathering impacts in back-country campsites in Great Smoky Mountains National Park.
- 4:50 220. NICHOLS, ROSEMARY. Duke University, Durham, NC. The environmental impact of Leconte Lodge, Great Smoky Mountains National Park.
- 5:10 221. TILMANT, JAMES T. National Park Service, Homestead, FL. An ecological assessment of Biscayne National Monument's coral reefs in relation to recreational use.

PLANT ECOLOGY. (continued) SUSAN P. BRATTON, National Park Service, Great Smoky Mountains National Park, Gatlinburg, TN, presiding. *Sample Room.*

- 1:00 222. MASTROGIUSEPPE, RONALD J. and JOY D. MASTROGIUSEPPE*. University of Idaho, Moscow, and *Washington State University, Pullman. *Pinus balfouriana* in the Klamath Mtns. and in Sequoia-Kings Canyon National Parks.
- 1:20 223. HANSEN, KATHERINE. University of Colorado, Boulder. The instability of the conifer species within the forest-tundra ecotone, Niwot Ridge, Colorado.
- 1:40 224. LAING, CHARLES CORBETT. Ohio Northern University, Ada. Clonal senescence as a factor in the population dynamics of *amphiphila breviligulata*, marram grass, in the Indiana Dunes.

WEDNESDAY AFTERNOON

- 2:00 225. DOUGLAS, DOROTHY. Earlham College, Richmond, IN. Demography of *Salix setchelliana*—a prostrate willow of Alaskan gravel bars.
- 2:20 226. STEENBERGH, W.F. and CHARLES H. LOWE. Cooperative National Park Resources Studies Unit, University of Arizona, Tucson. The Saguaro giant cactus: an updated ecological perspective.

PROBLEMS AND OPPORTUNITIES: THE CASE OF THE PARK VISITOR, A Sociology Session. DARRYLL R. JOHNSON, National Park Service and University of Washington, Seattle, presiding. *Parlor E.*

- 1:00 227. PHILLEY, M. PETER and STEPHEN McCOOL. University of Montana, Missoula. Law enforcement perceptions and practices in the National Parks.
- 1:20 228. VAN DOREN, CARLTON and LARRY GUSTKE. Texas A & M University, College Station. Expected changes in national park visitation; a spatial perspective.
- 1:40 229. RENTZ, LEE and RICHARD SCHREYER. * Beaver Lake Media Center, Syracuse, NY, and *Utah State University, Logan. Park visitor responses to natural hazards.
- 2:00 230. WESTOVER, THERESA and MICHAEL CHUBB. Michigan State University, East Lansing. Crime and conflict in urban recreation areas.

PUTTING RIVER RECREATION RESEARCH TO WORK, A Sociology Session. DAVID W. LIME, Forest Service, St. Paul, MN, presiding. *The Forty-Niner.*

- 1:00 231. CHILMAN, K.C., L.F. MARNELL* and D. FOSTER**. Southern Illinois University, Carbondale, *Glacier National Park, West Glacier, MT, and **Ozark National Scenic Riverways, Van Buren, MO. An integrated field research program as part of carrying capacity strategy for Ozark Riverways.
- 1:20 232. JENSEN, MARVIN O. National Park Service, Grand Canyon. Information from the social sciences: a critical need of back-country managers.
- 1:40 233. SHELBY, BO. Oregon State University, Corvallis. River research and politics: what has happened in the Grand Canyon?

RECENT STUDIES IN ARCTIC ANTHROPOLOGY. (Continued) ZORRO BRADLEY, University of Alaska, Fairbanks, presiding. *Parlor C.*

- 1:00 234. GRAUMAN, MELODY WEBB. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Alaska native historic sites: An overview of the Anasca 14(h)(1) project.
- 1:20 235. ARUNDALE, WENDY H. Cooperative Park Studies Unit, University of Alaska, Fairbanks. The Anasca 14(h)(1) project research design.

WEDNESDAY AFTERNOON

- 1:40 236. LIBBEY, DAVID and LINDA M. MEDLOCK. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Ethnoarcheological site documentation in the Neetsi Qwichin area of Arctic Alaska.
- 2:00 237. HANSEN, SUSAN. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Oral traditions and starvation sites on the Yukon-Kushkokwim Delta.
- 2:20 238. PEDERSEN, SVERRE, WILLIAM SCHNEIDER and DAVID LIBBEY. Cooperative Park Studies Unit, University of Alaska, Fairbanks. Native livelihood and dependence on the north slope of Alaska.
- 2:40 239. SACKETT, RUSSELL H. Cooperative Park Studies Unit, University of Alaska, Fairbanks. The Chilkat Tlingit: A historical overview.

URBAN ENVIRONMENTAL STUDIES (continued) RICHARD HAMMERSCHLAG, Ecological Services Laboratory, Washington, DC, presiding. *Golden Gate.*

- 1:00 240. SPENCER, EDWARD L. and JENNIFER F. ELY. Appalachian Mountain Club, Gorham, NH. Evaluation of composting techniques to treat human wastes at campsites along the Appalachian National Scenic Trail.
- 1:20 241. SIKORA, L.J., G.B. WILLSON and J.F. PARR. US Department of Agriculture, Beltsville, MD. Modification of the Beltsville method of composting for local situations.
- 1:40 242. PATTERSON, JAMES C. and JOHN R. SHORT. Ecological Services Laboratory, Washington, DC. Raw waste recycling through static pile composting.
- 2:00 243. MURRAY, JACK J., SHARON B. HORNICK and JAMES C. PATTERSON*. US Department of Agriculture, Beltsville, MD, and *Ecological Services Laboratory, Washington, DC. Use of sewage sludge compost in the vegetation of urban lands.
- 2:20 244. SHORT, JOHN R., J.E. FOSS* and J.C. PATTERSON. Ecological Services Laboratory, Washington, DC., and *University of Maryland, College Park. Soil properties of the mall in Washington, D.C.
- 2:40 245. HORNICK, SHARON B. *, JAMES C. PATTERSON and RUFUS L. CHANEY*. Ecological Services Laboratory, Washington, D.C., and *US Department of Agriculture, Beltsville, MD. An evaluation of urban garden soil, vegetation, and soil amendments.
- 3:00 COFFEE
- 3:30 246. DAVIS, RUSSELL C., JAMES C. PATTERSON and JOHN R. SHORT. Ecological Services Laboratory, Washington, DC. Static pile composting—bacteriological contamination of the soil solution.

WEDNESDAY AFTERNOON

- 3:50 247. SIEGER, THOMAS L. and JOHN T. TANACREDI*. University of Massachusetts, Amherst, and *National Park Service, Brooklyn, NY. Contribution of polynuclear aromatic hydrocarbons to Jamaica Bay ecosystem attributable to municipal wastewater effluents.
- 4:10 248. WESTER, HORACE V., CHARLES H. WATKINS and RUSSELL C. DAVIS. Ecological Services Laboratory, Washington, DC. Predation, a major co-factor to chlorine pollution for ecological disruption in the upper Potomac and Anacostia estuaries and environmental guidelines for control of problem.
- 4:30 249. FLEMING, PEGGY, Rock Creek Park, Washington, DC. Plant and animal diversification in an urban park through the development of meadows.
- 4:50 250. SIEGEL, LOU, HAROLD SILVERSTEIN, and BONNIELOU GAY*. John Dewey High School, Brooklyn, NY, and *Gateway National Recreation Area, Brooklyn, NY. To build a marsh.
- 5:10 251. GAY, BONNIELOU and JOSEPH ENRICO*. Gateway National Recreation Area, Brooklyn, NY, and *Long Island University, Southampton, NY. Transplanting the valuable marsh grass *spartina alterniflora* in an environmentally stressed area.

BACKCOUNTRY AND WILDERNESS. A Sociology Session. GEORGE STANKEY, Forest Service, Missoula, MT, presiding. *The Forty-Niner.*

- 2:00 252. VAN WAGTENDONK, JAN W. National Park Service, Yosemite National Park, CA. Visitation trends in Yosemite National Park.
- 2:20 253. GILBERT, RICHARD. Forest Service, Darrington, WA. Dispersed winter recreation use in the Badger Pass backcountry of Yosemite National Park.
- 2:40 254. KRAUSHAAR, JAMES, DAVID PARSONS* and THOMAS STOHLGREN*. California State University, Sacramento, and *Sequoia and Kings Canyon National Parks, Three Rivers, CA. Nature and extent of differences between actual and planned backcountry use in Sequoia and Kings Canyon National Parks.
- 3:00 COFFEE
- 3:30 255. WASHBURNE, RANDEL F. Forest Service, Missoula, MT. Perceptions of wilderness management problems and research needs among National Park managers.

APPLICATIONS OF REMOTE SENSING TECHNIQUES. THOMAS R. LYONS, National Park Service, Albuquerque, NM, presiding. *Parlor C.*

- 3:30 256. EBERT, JAMES I. and ALBERTO A. GUTIERREZ. National Park Service, Albuquerque, NM. Cultural resources remote sensing in the eastern deciduous woodland: experiments at Shenandoah National Park.

WEDNESDAY AFTERNOON

- 3:50 257. DRAGER, DWIGHT L. and THOMAS R. LYONS. National Park Service, Albuquerque, NM. Projecting archeological site concentrations from cover-type maps developed from remote sensing data.
- 4:10 258. FANALE, ROSALIE. National Park Service, Albuquerque, NM. Remote sensing sampling methods for ethnographic and ethnohistoric research.
- 4:30 259. WEYMOUTH, JOHN W. University of Nebraska, Lincoln. Analysis of magnetic surveying data from archaeological sites at Ninety Six N.H.S., South Carolina.
- 4:50 260. EHRENHARD, JOHN E. National Park Service, Tallahassee, FL. Remote sensing: its use in the cultural resource reconnaissance program of the Big Cypress National Preserve, Florida.
- 5:10 261. EHRENHARD, ELLEN B. National Park Service, Tallahassee, FL. A practical application of remote sensor methodologies utilized during the cultural resource inventory of Ninety Six National Historic Site, South Carolina.

ENDANGERED AND THREATENED SPECIES. A.R. WEISBROD, National Park Service, Washington, DC, presiding. *Lower French Parlor.*

- 3:30 262. BASS, ORON L., JR., GARY PATTERSON and WILLIAM LOFTUS. National Park Service, Homestead, FL. Monitoring of endangered and threatened species in South Florida National Parks.
- 3:50 263. JACKSON, JEROME A. Mississippi State University, Mississippi State. Status review of endangered and threatened species in the Gulf Islands.
- 4:10 264. BUCKLEY, PAUL A. and FRANCINE G. BUCKLEY. National Park Service, Boston, MA. Roseate Tern: Our newest threatened species?
- 4:30 265. BURNHAM, WILLIAM. The Peregrine Fund of Cornell University, Fort Collins, CO. Peregrine falcon release and recovery activity in National Parks.
- 4:50 266. WHITE, PETER. National Park Service, Gatlinburg, TN. Rare plant monitoring in Great Smoky Mountains National Park.
- 5:10 267. THOMAS, L.K., JR. Prince William Forest Park, Triangle, VA. The decline and extinction of a rare plant species, Virginia Mallow (*sida hermaphrodita* (L.) Rusby), on National Park Service areas.

ENERGETICS ANALYSIS/SYSTEMS MODELING. JOHN ALEXANDER, University of Florida, Gainesville, presiding. *Parlor E.*

- 3:30 268. ALEXANDER, JOHN F., JR. University of Florida, Gainesville. Energetics analysis and park planning.

WEDNESDAY AFTERNOON

- 3:50 269. HENSLICK, JOHN. University of Florida, Gainesville. Energy analysis of alternative park transportation plans.
- 4:10 270. ROGNSTAD, RALPH, JR. University of Florida, Gainesville. A regional approach to National Park planning.
- 4:30 271. SWANEY, DENNIS. University of Florida, Gainesville. Computer simulation of an energy-based ecologic-economic model of the Redwood National Park Region.

HYDROLOGICAL STUDIES. JAMES F. QUINLAN, National Park Service, Mammoth Cave, KY, presiding. *Royal Suite 262.*

- 3:30 272. ROSENDAHL, PETER C. National Park Service, Homestead, FL. Freshwater flow determination within the Shark River Slough, Everglades National Park.
- 3:50 273. ROSE, PAUL W. and PETER C. ROSENDAHL, National Park Service, Homestead, FL. Application of landsat multispectral imagery to determine the spatial and temporal aspects of surface water distribution in the Shark River Slough, Everglades National Park.
- 4:10 274. ALEY, THOMAS and DAVID I. FOSTER*. Ozark Underground Laboratory, Protom, MO, and *Ozark National Scenic Riverways, Van Buren, MO. Deep secrets and dark problems; studies of Karst Springs in the Ozark National Scenic Riverways.
- 4:30 275. QUINLAN, JAMES F. National Park Service, Mammoth Cave, KY. Karst hydrologic studies in the Mammoth Cave National Park area, Kentucky: techniques, results, and environmental applications.
- 4:50 276. TUNNICLIFF, BROCK M. and STANLEY K. BRICKLER. University of Arizona, Tucson. Water quality analyses of the Colorado River corridor of the Grand Canyon.
- 5:10 277. FOUST, RICHARD, MARILYN MUROV, LAURIE BROWN and STEVE HOPPE. Northern Arizona University, Flagstaff. Chemical composition of selected water sources within Grand Canyon National Park.

RESOURCE ANALYSIS AND MAPPING. CHARLES DOUGLAS, University of Georgia, Athens, presiding. *Sample Room.*

- 3:30 278. MOUAT, DAVID A. and R. ROY JOHNSON. University of Arizona, Tucson. The importance of vegetation mapping for managing Park Service natural resources.
- 3:50 279. BUNIN, JANE and WILLIAM MOIR. Thorne Ecological Institute, Boulder, CO. A structural vegetation classification for inventory and habitat assessment.
- 4:10 280. WHITE, PETER. National Park Service, Gatlinburg, TN. Herbarium computerization project.

WEDNESDAY AFTERNOON

- 4:30 281. WHITEAKER, LOUIS D. University of Hawaii at Manoa, Honolulu. Vegetation map of the crater district, Haleakala National Park.
- 4:50 282. IVES, J.D., R. BAUMGARTNER, M. PLAM, S. BURNS, V. DOW, K. HANSEN, A. KETCHIN, D. LUFF, B. McCORD. University of Colorado, Boulder. The Indian Peaks environmental atlas, Colorado front range.
- 5:10 283. MOUAT, DAVID A., B. KIM MORTENSEN, KAREN L. REICHHARDT and PETER L. WARREN. University of Arizona, Tucson. Vegetation mapping at Grand Canyon National Park: an analysis of techniques.

ORV'S AND OTHER MOTORIZED VEHICLES, A Sociology Session. JOHN D. WELLMAN, Virginia Polytechnic and State University, Blacksburg, presiding. *The Forty-Niner*.

- 4:30 284. PERDUE, RICHARD R., RICHARD J. GITELSON, and RICKIE HAYGOOD. Texas A & M University, College Station. An assessment of public response to proposed revisions in the National Park Service snowmobile policy.
- 4:50 285. NOE, FRANCIS P., GREGORY J. BUHYOFF*, and JOHN D. WELLMAN*. National Park Service, Atlanta, GA, and *Virginia Polytechnic and State University Blacksburg. Perceived conflicts between ORV and Non-ORV visitors to Cape Hatteras National Seashore.
- 5:10 286. HEYWOOD, JOHN L. and ROBERT J. BADARACCO*. Ohio State University, Columbus, and *Tule River Times. The California desert: off-road vehicle use and public opinion—are they in balance.
- 5:30 287. McCOOL, STEPHEN F. University of Montana, Missoula. The off-road vehicle in natural environments: decision-oriented research needs.

THURSDAY MORNING, NOVEMBER 29

SPECIAL ADDRESSES. *Ralston Room*

8:00 Yellowstone: A Window Into the Earth. ROBERT B. SMITH, Professor of Geophysics, University of Utah, Salt Lake City.

Appropriate Technology: Our Hope for a Sustainable Future. KIRK MARCHWALD, Deputy Director, Office of Appropriate Technology, State of California.

Concurrent Paper Sessions

APPLICATION OF SOCIAL SCIENCE TO INTERPRETATION, A Sociology Session. ALAN WOGAR, US Forest Service, Berkeley, CA, presiding. *Golden Gate.*

8:50 288. KNOPF, RICHARD C. Forest Service, St. Paul, MN. Determinants of the quality of National Park interpretive services: A case study of Gettysburg National Military Park, Pennsylvania.

9:10 289. MACHLIS, GARY E. and DONALD R. FIELD*. University of Idaho, Moscow, and *National Park Service and University of Washington, Seattle. Foreign visitors and interpretation: A sociological look at the Japanese tourist.

9:30 290. ZUBE, ERVIN, JOSEPH H. CRYSTAL* and JAMES F. PALMER**. University of Arizona, Tucson. *National Park Service, Denver, CO, and **University of Massachusetts, Amherst. Visitor and staff perceptions of NPS visitor centers.

ENDANGERED AND THREATENED SPECIES. (continued) A.R. WEISBROD, National Park Service, Washington, DC, presiding. *Lower French Parlor.*

8:50 291. HARVEY, MICHAEL J. Memphis State University, Memphis, TN. Distribution, status, and ecology of endangered bats of Bufalo National River.

9:10 292. BANKO, PAUL C. National Park Service, Hawaii National Park. Nene reintroduction, management and research in Hawaiian National Parks.

9:30 293. BANKO, PAUL C. and WINSTON E. BANKO*. National Park Service, Hawaii National Park, and *National Park Service, La Conner, WA. Historical trends in passerine populations in Hawaii Volcanoes National Park and vicinity.

9:50 294. CONANT, SHEILA. University of Hawaii, Honolulu. Endangered birds in Hawaii's National Parks.

10:10 COFFEE

10:40 295. SMITH, CLIFFORD W. University of Hawaii, Honolulu. Endangered species in Hawaiian National Parks.

THURSDAY MORNING

- 11:00 296. FORD, JOHN I. and ROBERT A. KINZIE, III. University of Hawaii, Honolulu. Factors influencing the distribution of an endangered freshwater fish in streams in Haleakala National Park.
- 11:20 297. WOOD, JAMES C. National Park Service, Corpus Christi, TX. Incubation and imprinting of Kemp's Ridley sea turtle, *Lepidochelys kempi*.
- 11:40 298. SHABICA, STEPHEN. Coastal Field Research Laboratory, NSTL Station, MS. Sea turtle nesting in National Parks of the Southeast Region.

HUMAN IMPACT ON NATURAL RESOURCES/ORV's. STEPHEN P. LEATHERMAN, University of Massachusetts, Amherst, presiding. *Comstock Room.*

- 8:50 299. PALMER, JAMES F. and S.P. LEATHERMAN. University of Massachusetts, Amherst. Off-road vehicle usage on federally managed coastal parklands.
- 9:10 300. BRODHEAD, JOHN and PAUL J. GODFREY. University of Massachusetts, Amherst. Off-road vehicle effects on dunes and marshes of Cape Cod National Seashore, Massachusetts.
- 9:30 301. LEATHERMAN, STEPHEN P., ROBERT E. ZAREMBA and PAUL J. GODFREY. University of Massachusetts, Amherst. Effects of overwash and off-road vehicles on barrier beach migration: Nauset Spit, Cape Cod National Seashore.
- 9:50 302. BENEDICT, MARK A. and PAUL J. GODFREY. University of Massachusetts, Amherst. The preparation of an off-road recreational vehicle trail map of the province lands area of Cape Cod National Seashore.
- 10:10 COFFEE
- 10:40 303. LEATHERMAN, STEPHEN P. and ALAN J. STEINER. University of Massachusetts, Amherst. Recreational impacts on foredunes: Assateague I. National Seashore.
- 11:00 304. SHABICA, STEPHEN, RAYMOND BURGE, AMÉLIE BLYTH*, WAYNE VALENTINE* and MIKE FARLEY*. Coastal Field Research Laboratory, NSTL Station, MS, and *Gulf Islands National Seashore, Gulf Breeze, FL. Recovery of off-road vehicle disturbed ecosystems: beaches and grasslands.
- 11:20 305. BACCUS, JOHN T. and JACK K. HORTON. Southwest Texas State University, San Marcos. Status of studies on sedimentary and biotic processes at Padre Island National Seashore.
- 11:40 306. CARLSON, J.E., M.J. DUEVER and L.A. RIOPELLE. Ecosystem Research Unit, Naples, FL. Off-road vehicle impacts in the Big Cypress National Preserve.

HYDROLOGICAL STUDIES. (continued) JAMES F. QUINLAN, National Park Service, Mammoth Cave, KY, presiding. *Royal Suite 262.*

THURSDAY MORNING

- 8:50 307. SILSBEE, DAVID, GARY LARSON and RAYMOND MATHEWS, JR. National Park Service, Gatlinburg, TN. Physical and chemical characteristics of streams in Great Smoky Mountains National Park.
- 9:10 308. BRADFORD, WESLEY L. and RICK T. IWATSUBO. US Geological Survey, Menlo Park, CA. Water chemistry of the Redwood Creek and Mill Creek Basins, Redwood National Park, California.
- 9:30 309. LARSON, DOUGLAS W. and MARK E. FORBES*. US Army Corps of Engineers, Portland, OR, and *National Park Service, Crater Lake, OR. Optical properties of Crater Lake, Oregon: variation in Secchi disk transparency, 1937-1979.
- 9:50 310. MEYER, WILLIAM. US Geological Survey, Tacoma, WA. Geohydrologic studies—Indiana Dunes National Lakeshore, Indiana.
- 10:10 COFFEE
- 10:40 311. HARDY, MARK A. US Geological Survey, Indianapolis, IN. Effects of coal fly-ash disposal on water quality at the Indiana Dunes National Lakeshore, Indiana.
- 11:00 312. WILCOX, DOUGLAS A. Indiana Dunes National Lakeshore, Porter, IN. Salt intrusion at Pinhook Bog, Indiana Dunes National Lakeshore.
- 11:20 313. HENDRICKSON, WILLIAM H. and DOUGLAS A. WILCOX. Indiana Dunes National Lakeshore, Porter, IN. Relationship between some physical properties and the vegetation found in Cowles Bog National Natural Landmark, Indiana.
- 11:40 314. STOTTLEMYER, J. ROBERT. Michigan Technological University, Houghton. Neutralization of acid rain and natural wetland acids in the Pictured Rocks and Isle Royale ecosystems.

MAMMAL-HABITAT RELATIONSHIPS. DOUGLAS B. HOUSTON, National Park Service, Yellowstone National Park, WY, presiding. *Parlor D.*

- 8:50 315. COLLINS, PAUL W. Santa Barbara Museum of Natural History, Santa Barbara, CA. Food habits of the island fox on San Miguel Island.
- 9:10 316. O'FARRELL, THOMAS P. and JOAN T. O'FARRELL.* E.G. & G., Goleta, CA, and *Boulder City, NV. Responses of a Death Valley rodent population to variable food supplies and climatic extremes.
- 9:30 317. RUFFNER, GEORGE A. Museum of Northern Arizona, Flagstaff. Interrelationships between beaver (*castor canadensis*) and coyote willow (*salix exigua*) in Grand Canyon National Park.
- 9:50 318. COPPOCK, D.L., J.K. DETLING, J.L. DODD and M.I. DYER*. Colorado State University, Fort Collins, and *National Science Foundation, Washington, DC. Bison-prairie dog-plant interactions at Wind Cave National Park, South Dakota.

THURSDAY MORNING

10:10 COFFEE

10:40 319. WEAVER, JOHN. Bridger-Teton National Forest, Jackson, WY. Influence of food supply on coyote populations in Jackson Hole, Wyoming.

11:00 320. BAKER, D.L. and N.T. HOBBS. Colorado Division of Wildlife, Fort Collins. Nutritional quality of elk summer diets in Rocky Mountain National Park.

11:20 321. HOBBS, N.T., D.L. BAKER*, J.E. ELLIS and D.W. SWIFT. Colorado State University, Fort Collins, and *Colorado Division of Wildlife, Fort Collins. Nutritional evaluation of elk winter habitat in Rocky Mountain National Park.

PARKS AS SOCIAL SYSTEMS, A Sociology Session. NEIL H. CHEEK, JR., University of Washington, Seattle, presiding. *Forty-Niner*.

8:50 322. CLARK, ROGER N. Forest Service, Seattle, WA. The context for considering recreation areas as social systems.

9:10 323. JACOB, GERALD R. and THOMAS C. PARKER. Concept Design Associates, Salt Lake City, UT. Conflict and displacement among recreation activity subgroups.

9:30 324. HOESTEREY, JOHN W. National Park Service, Denver, CO. An application of gravity model concepts in modeling visitation to the backcountry of Grand Teton National Park.

PRESERVATION METHODS. DENNIS B. FENN, National Park Service, San Francisco, CA, presiding. *Parlor C*.

8:50 325. FENN, DENNIS B., JOHN R. DECK*, WALTER P. HERRIMAN** and JOHN R. VINCENT***. National Park Service, San Francisco, CA, *Western Archeological Center, Tucson, AZ, ** Chaco Canyon National Monument, Bloomfield, NM, and ***Adobe Consultant, Santa Fe, NM. Chemical stabilization methods.

9:10 326. POST, DONALD F., JOHN C. ROBBINS* and DENNIS B. FENN**. University of Arizona, Tucson, *National Park Service, Denver, CO, and **National Park Service, San Francisco, CA. Locating soil material for use in adobe stabilization at Fort Bowie National Historic Site.

9:30 327. BURKE, WILLIAM J. and RICHARD L. BRADSHAW. Arizona State University, Tempe. Preservation of rock art and adobe structures.

RESOURCE ANALYSIS AND MAPPING. (continued) CHARLES DOUGLAS, University of Georgia, Athens, presiding. *Sample Room*.

8:50 328. TOMRDLE, DALE. National Park Service, Denver, CO. Application of remote sensing technology to planning: A case study.

THURSDAY MORNING

- 9:10 329. NYQUIST, MAURICE O. National Park Service, Denver, CO. Denver Service Center remote sensing program: experimental and operational.
- 9:30 330. STOTTLEMYER, J. ROBERT. Michigan Technological University, Houghton. Use of merged landsat digital data in resource mapping for Pictured Rocks National Lakeshore.
- 9:50 331. BURGE, RAYMOND, RAYMOND MATHEWS*, and DAVID SILSBEE*. Coastal Field Research Laboratory, NSTL Station, MS, and *Uplands Field Research Laboratory, Gatlinburg, TN. Remote air and water quality monitoring by satellite retrieved data in Great Smoky Mountains National Park.
- 10:10 COFFEE
- 10:40 332. OLMSTED, INGRID and LLOYD L. LOOPE. National Park Service, Homestead, FL. Determination of vegetation-hydroperiod-soil relationships in Taylor Slough (Everglades National Park) and vicinity.
- 11:00 333. BOWERS, JAN E., R. ROY JOHNSON, ARTHUR M. PHILLIPS, III* and BARBARA G. PHILLIPS*. University of Arizona, Tucson, and *Museum of Northern Arizona, Flagstaff. Resource values of the aquatic and riparian vegetation of Roaring Springs, Grand Canyon.
- 11:20 334. BACONE, JOHN A., RONALD K. CAMPBELL and GEROULD S. WILHELM*. Department of Natural Resources, Indianapolis, IN, and *The Morton Arboretum, Lisle, IL. Presettlement vegetation of the Indiana Dunes National Lakeshore.
- 11:40 335. WOODHOUSE, CHARLES D. Santa Barbara Museum of Natural History, Santa Barbara, CA. A natural resources study of Channel Islands National Monument, California: introduction.

SPECIAL SLIDE LECTURE ON THE ORIGINS AND DEVELOPMENT OF THE NATIONAL PARK IDEA *Parlor E.*

- 8:50 336. RUNTE, ALFRED. Baylor University, Waco, TX. The National Park idea: Historical misconceptions and ecological realities.

WORKSHOP. THE ASSOCIATION OF SYSTEMATICS COLLECTIONS. A

- 9:30 workshop on the use of the ASC Registry of Taxonomic Resources and Services, a computer assisted data base containing the names of biologists and biological collections; the individuals' areas of expertise and the services each is willing to provide. ASC personnel will also cover the use of their information service which provides answers to questions regarding the scientific use of state and federally controlled species. *Parlor E.*

ENVIRONMENTAL AND ARCHEOLOGICAL STUDIES IN THE NATIONAL PARKS. ADRIENNE B. ANDERSON, National Park Service, Denver, CO, presiding. *Parlor C.*

- 10:40 337. CARPENTER, SCOTT L. Magnetometer survey of Virginius Island, Harpers Ferry National Historical Park.

THURSDAY MORNING

- 11:00 338. JONES, BRUCE A. National Park Service, Lincoln, NE. Historic site archeology at Fort Charlotte, Grand Portage National Monument, Minnesota.
- 11:20 339. LYNOTT, MARK J. National Park Service, Lincoln, NE. Archeological investigations at Voyageurs National Park, Minnesota.
- 11:40 340. RICHNER, JEFFREY J. National Park Service, Lincoln, NE. Archeological investigations at Apostle Islands National Lakeshore, Wisconsin.

HUMAN BEHAVIOR AND PLANNING. A Sociology Session. ROGER N. CLARK, Forest Service, Seattle, WA, presiding. *Royal Suite 260.*

- 10:40 341. SHELBY, BO and DONALD W. WOLF. Oregon State University, Corvallis. Design, structure, and behavior at Crater Lake National Park.
- 11:00 342. CUTTER, SUSAN L., KARL F. NORDSTROM and GAIL A. KUCMA. Rutgers—The State University, New Brunswick, NJ. Social and environmental factors influencing beach recreation in urban parks.
- 11:20 343. TOMRDLE, DALE and LEE RENTZ*. National Park Service, Denver, CO, and *Beaver Valley Nature Center, Syracuse, NY. Projecting recreational use: a regional trends approach.

INFORMATION SYSTEMS AND VISITOR MONITORING PROGRAMS, A Sociology Session. CABY C. SMITH, National Park Service, Washington, DC, presiding. *Forty-Niner.*

- 10:40 344. DANGERMOND, JACK. Environmental Systems Research Institute, Redlands, CA. Environmental information handling techniques.
- 11:00 345. AANGEENBRUG, ROBERT, University of Kansas, Lawrence. The implications of NPS participation in Automated Cartographic Conference No. 4.
- 11:20 346. HORNBACK, KENNETH, National Park Service, Denver, CO. Public use monitoring in the National Parks.

INFORMATION TECHNOLOGY. RICHARD B. BOWSER, National Park Service, Washington, DC, presiding. *Golden Gate.*

- 10:40 347. McCURONE, JOHN D. Western Carolina University, Cullowhee, NC. SARRMC—A model for intraregional cooperation.
- 11:00 348. OKEEFE, TIMOTHY G. Forest Service, Washington, DC. Technology transfer assistance, US Forest Service.

THURSDAY MORNING

- 11:20 349. CHASE, D.D., G.S. STREVELER, G.D. McKENZIE* and R.G. Goodwin*. National Park Service, Gustavus, AK, and *The Ohio State University, Columbus. Winter research opportunities in Glacier Bay.
- 11:40 350. BERGTHOLD, PATRICIA M. and R. ROY JOHNSON*. Arizona State Parks, Phoenix, and *Cooperative National Park Studies Unit, University of Arizona, Tucson. The relationship of natural areas or National Park Lands to other natural areas.
- MAMMAL STUDIES.** CLIFFORD J. MARTINKA, National Park Service, Glacier National Park, West Glacier, MT, presiding. *Ralston Room.*
- 10:40 351. WEISBROD, A.R. and JOHN A. DRAGAVON*. National Park Service, Washington, DC, and *Washington State Department of Game, Seattle, WA. Mammal distribution and natural disturbance in a North Cascades glacial canyon.
- 11:00 352. SCHMIDLY, DAVID J. and BRIAN BARNETTE. Texas A & M University, College Station. The mammals of Big Thicket National Preserve.
- 11:20 353. LOCKERD, M. JOSEPH, DOUGLAS JAMES and JAMES E. DUNN. University of Arkansas, Fayetteville. Estimating small mammal populations at the Buffalo National River in Arkansas.
- 11:40 354. LABRODE, DAVID, LORRIE SPRAGUE and FRANCIS SINGER. National Park Service, Gatlinburg, TN. Reoccupation by beaver and the otter niche in Great Smoky Mountains National Park.

THURSDAY AFTERNOON

Concurrent Paper Sessions

- ECOSYSTEM STUDIES/INTERDISCIPLINARY APPROACH.** JERRY F. FRANKLIN, Forestry Science Laboratory, Corvallis, OR, presiding. *Comstock Room.*
- 1:00 355. FRANKLIN, JERRY F. Forestry Sciences Laboratory, Corvallis, OR. Ecosystem studies in the Hoh River drainage, Olympic National Park.
- 1:20 356. SWANSON, FREDERICK J. and GEORGE W. LIENKAEMPER. Forest Service, Corvallis, OR. Interactions among fluvial processes, forest vegetation, and aquatic ecosystems, South Fork Hoh River, Olympic National Park, Washington.
- 1:40 357. WARD, G. MILTON and KENNETH W. CUMMINS. Oregon State University, Corvallis. Habitat and food resources for invertebrate communities in South Fork Hoh River, Olympic National Park, Washington.

THURSDAY AFTERNOON

- 2:00 358. SEDELL, J.R., P.A., BISSON and J.A. JUNE*. Weyerhaeuser Company, Centralia, WA, and *University of Washington, Seattle. Ecology and habitat requirements of fish populations in South Fork Hoh River, Olympic National Park.
- 2:20 359. McKEE, ARTHUR, GEORGE LA ROI* and JERRY F. FRANKLIN**. Oregon State University, Corvallis, *University of Alberta, Edmonton, Alberta, Canada, and **Forest Service, Corvallis, OR. Structure, composition, and reproductive behavior of terrace forests, South Fork Hoh River, Olympic National Park.
- 2:40 360. LAMBERT, ROBIN LEE. Forestry Sciences Laboratory, Corvallis, OR. A biomass and nutrient analysis of fallen boles in terrace forests, Olympic National Park.
- 3:00 COFFEE
- 3:20 361. FRANKLIN, JERRY F., FREDERICK J. SWANSON and JAMES R. SEDELL*. Forest Service, Corvallis, OR, and *Weyerhaeuser Company, Centralia, WA. Relationships within the valley floor ecosystems in western Olympic National Park: a summary.
- 3:40 362. JENKINS, KURT J. and EDWARD STARKEY. Cooperative Park Studies Unit, Oregon State University, Corvallis. Home range and habitat use of non-migratory elk (*Cervus elaphus roosevelti*) in Olympic National Park, Washington.

ENDANGERED AND THREATENED SPECIES. (continued) A. R. WEISBROD, National Park Service, Washington, DC, presiding. *Lower French Parlor.*

- 1:00 363. PITTILLO, J. DAN. Western Carolina University, Cullowhee, NC. Management studies of endangered and threatened plants.
- 1:20 364. BRATTON, SUSAN and PETER WHITE. National Park Service, Gatlinburg, TN. Preservation and change—dilemmas of rare plant management in preserve systems.
- 1:40 365. SPINKS, JOHN L., JR. Fish and Wildlife Service, Washington, DC. Federal agency responsibilities under the Endangered Species Act.
- 2:00 366. GRANDY, JOHN W., IV. Defenders of Wildlife, Washington, DC. The Endangered Species Act: the political and environmental implications for federal agencies.
- 2:20 367. McILWAIN, JERRY P. Forest Service, Washington, DC. Management of endangered species—the Forest Service Program.
- 2:40 368. MERIKANGAS, JACQUELINE B. Heritage Conservation & Recreation Service, Denver, CO. Endangered species and the National Heritage Program—H.C.R.S.
- 3:00 COFFEE.

THURSDAY AFTERNOON

- 3:30 369. LICHVAR, ROBERT and MARK R. STROMBERG. Wyoming Natural Heritage Program, Cheyenne. Wyoming Natural Heritage Program—inventory methodology for updating, defining and mapping "rare" species.
- 3:50 370. HOLLAND, JAMES S. and DENNIS R. SCHRAMM. National Park Service, Denver, CO. Lake Mead and Death Valley rare plant studies.

ENVIRONMENTAL AND ARCHEOLOGICAL STUDIES IN THE NATIONAL PARKS. (continued) ADRIENNE B. ANDERSON, National Park Service, Denver, CO, presiding. *Parlor C.*

- 1:00 371. McMANAMON, FRANCIS P. Archeological survey of Cape Cod National Seashore—1979.
- 1:20 372. ANDERSON, ADRIENNE B. National Park Service, Denver, CO. On the relationship between Mesa Verde style architecture and Fremont style rock art.
- 1:40 373. SCOTT, LINDA J. Palynological Analysts, Montrose, CO. Palynological investigations at Curecanti National Recreation Area, Colorado.
- 2:00 374. STIGER, MARK A. National Park Service, Lincoln, NE. Altithermal adaptations in Curecanti National Recreation Area.
- 2:20 375. WRIGHT, GARY A. State University of New York, Albany. Environmental change and cultural variation: the view from the high country of northwestern Wyoming.
- 2:40 376. MARCEAU, THOMAS E. State University of New York, Albany. Excavations at Sheepster Bridge, a fishing camp, Yellowstone National Park, Wyoming.
- 3:00 COFFEE
- 3:30 377. REEVE, STUART A. State University of New York, Albany. Ethnobotanical models and archeology in Grand Teton and Yellowstone National Parks.
- 3:50 378. TIPPS, BETSY L. Washington State University, Pullman. Preinundation survey and excavations in Glen Canyon National Recreation Area, Utah.
- 4:10 379. BAKER, SUZANNE. Archaeological Consultants, San Francisco, CA. The Fort Mason sites: prehistoric archaeology in an urban environment.
- 4:30 380. EULER, ROBERT C., A. TRINKLE JONES, RICHARD W. EFFLAND* and SUSAN M. CHANDLER**. Grand Canyon National Park, AZ., *Archaeological Consulting Services, Ltd., Mesa, AZ, and **Centuries Research, Inc., Montrose, CO. The archaeology of the north rim of Grand Canyon.
- 4:50 381. GREENWOOD, ROBERTA S. Greenwood and Associates, Pacific Palisades, CA. Archaeological research on California's Channel Islands.

THURSDAY AFTERNOON

EXOTIC BIOTA PROBLEMS. Discussion session. BRUCE B. MOORHEAD,
1:00 Olympic National Park, Port Angeles, WA, presiding. *Parlor E.*

INFORMATION TECHNOLOGY. (continued) RICHARD B. BOWSER,
National Park Service, Washington, DC, presiding. *Golden Gate.*

1:00 382. WEAVER, THOMAS A. Los Alamos Scientific Laboratory,
Los Alamos, NM. NURE and the National Park Service.

1:20 383. MEENTS, JULIE K. and WILLIAM H. MOIR*. Hazleton En-
vironmental Sciences, Northbrook, IL, and *Thorne Ecological
Institute, Boulder, CO. Ground-based monitoring of plant and
animal communities.

1:40 384. LUFF, DAVID. University of Colorado, Boulder. Ecological
land classification: an integrated approach to land inventory for
possible national park management of the Indian Peaks Wilder-
ness Area.

2:00 385. RESHKIN, MARK, H. FELDMAN, W. E. KIEFER*, C. H.
KREKLER** and N.V. WEBER***. Indiana University Northwest,
Gary, *Central Michigan University, Mt. Pleasant, **Valparaiso
University, Valparaiso, IN, and ***Indiana University, South
Bend. Basic ecosystem studies of the Indiana Dunes National
Lakeshore.

2:20 386. HUNTER, SHONAH, ROSE LOCKERD, LINDA ALLRED, LARRY
B. BARBER, II, ELIZABETH CLARK, GRAHAM HAWKS, M. JOSEPH
LOCKERD, TIMOTHY A. NIGH and MARK PAULISSEN. University of
Arkansas, Fayetteville. Environmental evaluation of the Buffalo
National River using the Graber method.

2:40 387. BROWN, BRYAN T., KATHERINE A. BUTTERFIELD, R. ROY
JOHNSON* and M. SUSAN MORAN. Grand Canyon National Park,
AZ, and *Cooperative National Park Studies Unit, University of
Arizona, Tucson. Inventory and classification of surface water
resources in Grand Canyon National Park.

3:00 COFFEE

3:30 388. STUTZMAN, SUZANNE M. National Park Service, Denver,
CO. Using field surveys and computer techniques: a visual
resource inventory for Shenandoah National Park.

3:50 389. FLEET, HARVEY. National Park Service, Denver, CO. Data
base building: prospects, problems, and promise of digital car-
tography.

4:10 390. KRAUSHAAR, JAMES. California State University, Sacra-
mento. CARPS—Computer Assisted Reservation and Permit
System

4:30 391. SPENCER, EDWARD L. Appalachian Mountain Club,
Gorham, NH. Techniques for providing information to hikers on
the Appalachian National Scenic Trail.

THURSDAY AFTERNOON

- 4:50 392. McBRIDE, J.R. and D.F. JACOBS. University of California, Berkeley. Information gathering for vegetation preservation management: a case study Muir Wood National Monument.

INTERPRETING TRENDS FOR RIVER RECREATION PLANNING, A Sociology Session. ROBERT LUCAS, Forest Service, Missoula, MT, presiding. *Forty-Niner*.

- 1:00 393. LIME, DAVID W., RICHARD KNOPF and GEORGE L. PETERSON*. Forest Service, Minneapolis, MN, and *Northwestern University, Evanston, IL. The national river recreation study: growing new data base with exciting potential.
- 1:20 394. PETERSON, GEORGE L., DAVID W. LIME* and DOROTHY ANDERSON*. Northwestern University, Evanston, IL, and *Forest Service, Minneapolis, MN. Attractions of recreationists to rivers: a nationwide view.
- 1:40 395. BECKER, R.H., B.J. NIEMANN and W.A. Gates. University of Wisconsin, Madison. Displacement of users within a river system: social and environmental trade-offs.

MAMMAL STUDIES. (continued) CLIFFORD J. MARTINKA, National Park Service, Glacier National Park, West Glacier, MT, presiding. *Ralston Room*.

- 1:00 396. PELTON, MICHAEL R. The University of Tennessee, Knoxville. Population studies of black bears in Great Smoky Mountains National Park.
- 1:20 397. SHAFFER, MARK. Idaho State University, Pocatello. Minimum viable population sizes for the grizzly bear.
- 1:40 398. OLSON, A.E., H.B. PETERSON and J.L. SHUPE. Utah State University, Logan. Chronic fluoride toxicosis in Yellowstone National Park.
- 2:00 399. LESLIE, DAVID M., JR. University of Nevada, Las Vegas. Potential demographic consequences of transplants of desert bighorn sheep.
- 2:20 400. HUTCHINS, MICHAEL and CRAIG HANSEN*. University of Washington, Seattle, and *Iowa State University, Ames. Mother-infant interactions among free-ranging, non-native mountain goats (*Oreamnos americanus*) in Olympic National Park, Washington.
- 2:40 401. MOORHEAD, BRUCE B. and VICTORIA STEVENS*. Olympic National Park, Port Angeles, WA, and *University of Washington, Seattle. Introduction and dispersal of mountain goats in Olympic National Park, Washington.
- 3:00 COFFEE

THURSDAY AFTERNOON

- 3:30 402. JORDAN, PETER A. and MICHAEL L. WOLFE*. University of Minnesota, St. Paul, and *Utah State University, Logan. Numbers of moose at Isle Royale.
- 3:50 403. STEVENS, DAVID R. Rocky Mountain National Park, Estes Park, CO. Effect of elk on vegetation in Rocky Mountain National Park.

RESOURCE ANALYSIS AND MAPPING. (continued) CHARLES DOUGLAS, University of Georgia, Athens, presiding. *Sample Room.*

- 1:00 404. PHILLIPS, ARTHUR M., III, BARBARA G. PHILLIPS, PETER BENNETT* and KATHERINE BUTTERFIELD.** Museum of Northern Arizona, Flagstaff, *National Park Service Cooperative Park Studies Unit, University of Arizona, Tucson, and **National Park Service, Grand Canyon, AZ. Vegetation and flora of Grand Canyon National Park, Arizona.
- 1:20 405. JUNAK, S.A., M.C. HOCHBERG, R.N. PHILBRICK and S.L. TIMBROOK. Santa Barbara Botanic Garden, Santa Barbara, CA. Plant communities of Anacapa Island.
- 1:40 406. KURMIS, VILIS, L.C. MERRIAM and SARA WEBB. University of Minnesota, St. Paul. Primary plant communities in Voyageurs National Park, MN.
- 2:00 407. WETMORE, CLIFFORD. University of Minnesota, St. Paul. Lichens of Voyageurs National Park, Minnesota.
- 2:20 408. BOWERS, JANICE E. University of Arizona, Tucson. The flora of Organ Pipe Cactus National Monument.
- 2:40 409. BROWN, ROBERT THORSON. Michigan Technological University, Houghton. Base line terrestrial ecology of five Apostle Islands.
- 3:00 COFFEE
- 3:30 410. WAGGONER, GARY S. National Park Service, Denver, CO. A study of vegetational changes since establishment of Cape Cod National Seashore.
- 3:50 411. PITTILO, J. DAN and GARRETT A. SMATHERS. Western Carolina University, Cullowhee, NC. Vegetational diversity of the southern Appalachian Balsam Mountains.
- 4:10 412. BENEDICT, NATHAN B. and JACK MAJOR. University of California, Davis. Sierran subalpine meadows, Kern River Drainage, Sequoia National Park.
- 4:30 413. LOOPE, LLOYD L. National Park Service, Homestead, FL. The flora of south Florida: how securely is it preserved in National Parks?

QUALITY OF EXPERIENCES IN RIVER RECREATION, A Sociology Session. DAVID W. LIME, Forest Service, Minneapolis, MN, presiding. *The Forty-Niner.*

THURSDAY AFTERNOON

- 2:00 414. SCHREYER, RICHARD and JOSEPH ROGGENBUCK*. Utah State University, Logan, and *Virginia Polytechnic Institute and State University, Blacksburg. Visitor images of National Parks: the influence of social definitions of places upon perceptions and behavior.
- 2:20 415. UTTER, JACK G. and STEPHEN F. McCOOL. University of Montana, Missoula. Floater perceptions of river recreation use allocation mechanisms.
- 2:40 416. DITTON ROBERT B., ALAN R. GRAEFE and ANTHONY G. FEDLER. Texas A & M University, College Station. Recreational satisfaction at Buffalo National River.

ENVIRONMENTAL EDUCATION. Discussion session. BARBARA B. CLARK, National Park Service, Washington, DC, presiding. *Parlor E.*

RECREATION CARRYING CAPACITY: MANAGEMENT AND RESEARCH IMPLICATIONS. A Sociology Session. WILLIAM R. BURCH, JR., Yale University, New Haven, CT, presiding. *The Forty-Niner.*

- 3:30 417. STANKEY, GEORGE. Forest Service, Missoula, MT. Carrying capacity: some thoughts on the evolution of concepts.
- 3:50 418. SHELBY, BO. Oregon State University, Corvallis. Estimating recreational carrying capacity.
- 4:10 419. CHILMAN, KENNETH C. Southern Illinois University, Carbondale. A remeasurement of perceptions of crowding as a tool for recreational carrying capacity determination.
- 4:30 420. BULTENA, GORDON, PETER WOMBLE* and DONALD R. FIELD**. Iowa State University, Ames, *University of Washington, Seattle, and **National Park Service and University of Washington, Seattle. An examination of the sociological assumptions used in formulating policy for the backcountry at Mt. McKinley National Park, Alaska.
- 4:50 421. BURCH, WILLIAM R., JR. Yale University, New Haven, CT. The ecology of metaphor—spacing regularities for humans and other primates in urban and wildland habitats.
- 5:10 422. GATES, W.A., R.H. BECKER and B.J. NIEMANN, University of Wisconsin, Madison. Maintaining geographic specificity for riverway use assessment.

FRIDAY MORNING, NOVEMBER 30

CLOSING PLENARY SESSION. *Ralston Room*

SPECIAL ADDRESSES:

8:00 More than Little Critters: The Shared National Role of Science and Environmental Law. ZYGMUNT J.B. PLATER, Wayne State Law School.

Environmental Ethics. Speaker to be introduced at conference.

Botanical Knowledge and the Management of Natural Resources. ROBERT LINN, Senior Scientist, National Park Service.

National Parks and the Ecology of the National Interest. THEODORE W. SUDIA, Chief Scientist, National Park Service.

10:30 **CLOSE OF CONFERENCE**

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NOTE: The number following the author's name refers to the *paper number* rather than the page number. The papers are numbered consecutively, 1 through 422, from beginning to end of the scientific program.

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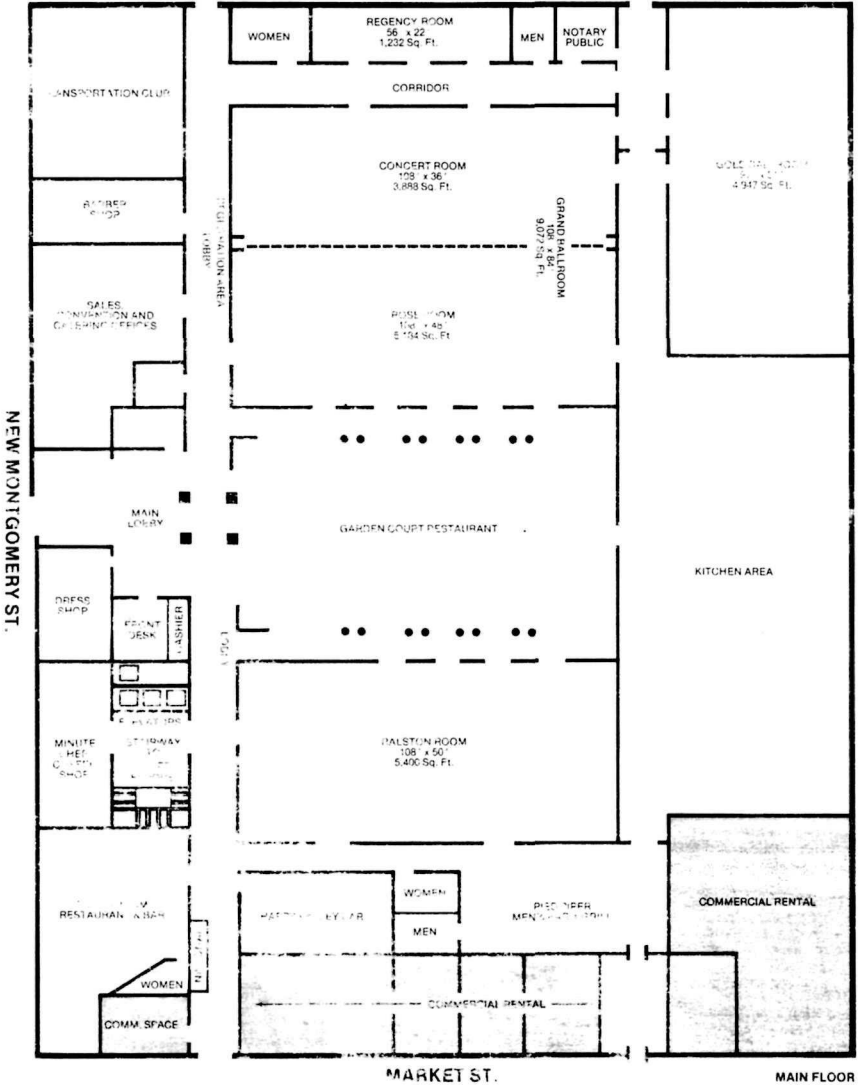


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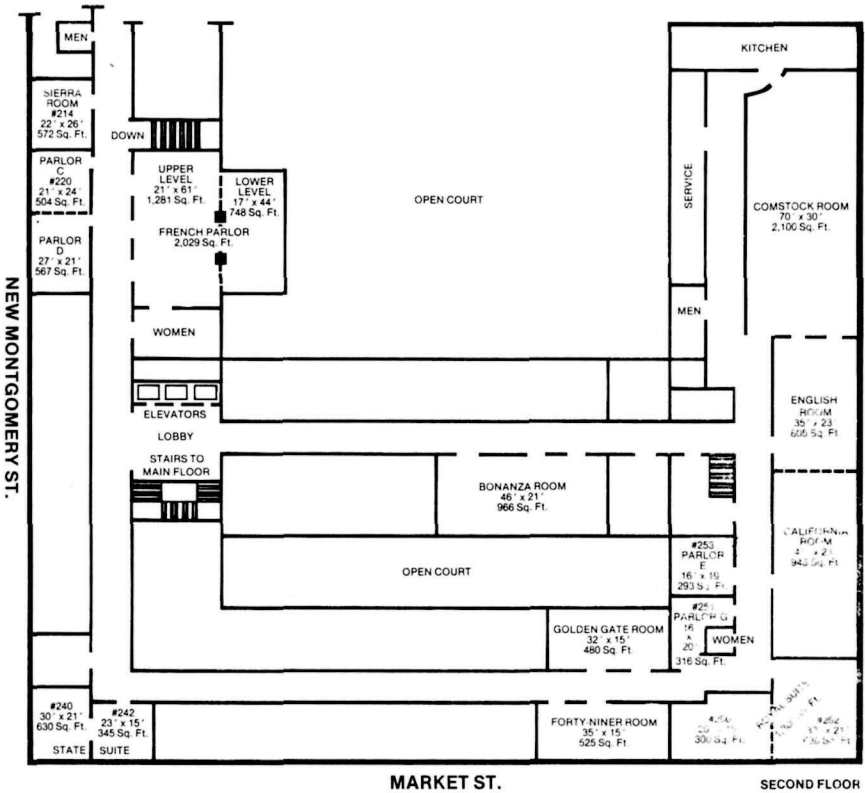
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