

PROGRAM PECORA IV



Application of Remote Sensing Data to Wildlife Management

October 10-12, 1978

Downtown Holiday Inn, Sioux Falls, South Dakota

**Sponsored by
National Wildlife Federation**

in cooperation with

**U.S. Geological Survey
National Aeronautics and Space Administration
U.S. Fish and Wildlife Service
Canadian Wildlife Service
International Association of Fish and Wildlife Agencies**

**THE FOURTH
WILLIAM T. PECORA MEMORIAL SYMPOSIUM**

The theme of Pecora IV is the application of remote sensing data to wildlife management. This symposium is intended to stimulate an exchange of information on a broad range of applications through presentation of invited papers and poster sessions. The symposium is designed to be of interest and value even to those without current remote sensing expertise or responsibilities.

Remote sensing technology has shown great utility in natural resource inventory and management. Recently a new tool has been introduced which provides wildlife managers with new perspectives on the resources under their supervision. This tool, called Landsat, rapidly evolved under the auspices of the federal government, and its development was the personal goal of the late Dr. William T. Pecora, former Under Secretary of the U.S. Department of the Interior. The Pecora Memorial Symposium commemorates Dr. Pecora's contributions to the development of a national program for satellite investigations of earth resources. The symposium provides a forum for the transfer of information on the use of data acquired by satellite and aircraft from the research and development community to the user community.

This year, the symposium also serves as the forum for the presentation of the William T. Pecora Award which recognizes exceptional individual or group contributions towards a better understanding of the Earth through remote sensing. The award is sponsored jointly by the U.S. Department of the Interior and the National Aeronautics and Space Administration.

Pecora IV Coordinating Committee

Michael E. Berger, National Wildlife Federation, General Chairman
David M. Carnegie, U.S. Geological Survey, Program Chairman
Murray Felcher, National Aeronautics and Space Administration
Allan Marmelstein, U.S. Fish & Wildlife Service
Gene A. Thorley, U.S. Geological Survey
George Watson, Canadian Wildlife Service

2

GENERAL INFORMATION

REGISTRATION

Hotel Mall, Holiday Inn (Downtown)
Tuesday—8:00 a.m. to 5:00 p.m.
Wednesday—8:00 a.m. to 5:00 p.m.
Thursday—8:00 a.m. to 12:00 noon

PROCEEDINGS

Each person attending the symposium will receive by mail one copy of the proceedings as part of the registration fee. Additional copies may be ordered from the National Wildlife Federation, 1412 16th Street, N.W., Washington, D.C. 20036.

**EARTH RESOURCES OBSERVATION
SYSTEMS DATA CENTER TOURS**

Featured during the Symposium will be tours of the EROS Data Center. The tours through the modern Data Center will include user services' operations, applications assistance and training facilities, high volume photographic laboratories and equipment, and the central computer complex. Highlighting the tours will be a visit to the Data Analysis Laboratory. Demonstrations of interactive digital and analog image analysis equipment will be conducted to illustrate techniques for the analysis of wildlife habitats using satellite images. Applications scientists will be available to answer questions on specific image analysis techniques and equipment capabilities.

BUS AND TOUR SCHEDULES

Earth Resources Observation Systems Data Center (EROS)
Wednesday, October 11 and Thursday, October 12
Attendees interested in taking one of the tours should sign up at the EROS Data Center Desk located in the Registration Area.

3

SYMPOSIUM HOSPITALITY DESK

The Symposium Hospitality Desk is located in the Registration Area. Personnel will be on hand during registration hours to offer assistance on entertainment and the city of Sioux Falls.

EXHIBITS

Exhibits are located in the Embassy Room, off the Hotel Mall. Hours are: 8:00 a.m. - 5:00 p.m. Tuesday and Wednesday; and 8:00 a.m. - 3:00 p.m. on Thursday.

TUESDAY

MORNING OPENING SESSION

10:00 - 10:30 International Ballroom-West, Holiday Inn (Downtown)

Presiding: Michael E. Berger, National Wildlife Federation, Washington, D.C., General Chairman

Welcoming Remarks: The Honorable Harvey Wollman, Governor of the State of South Dakota
The Honorable Richard Knobe, Mayor of the city of Sioux Falls

Opening Remarks: Thomas L. Kimball, Executive Vice President, National Wildlife Federation, Washington, D.C.
Henry W. Menard, Director, U.S. Geological Survey, Reston, Virginia

4

TECHNICAL SESSION I—CURRENT TECHNOLOGY

10:30 - 11:30 International Ballroom-West

Presiding: Donald T. Lauer, EROS Data Center, Sioux Falls, South Dakota

Overview of Remote Sensing—Robert N. Colwell, University of California, Berkeley, California

TUESDAY LUNCHEON

Starlight Room, Holiday Inn (Downtown)

11:30 a.m. - 1:30 p.m.

Toastmaster: Al Schock, President, Nordica International, Sioux Falls, South Dakota

KEYNOTE ADDRESS

Dr. W. Leslie Pengelly, President, The Wildlife Society, Missoula, Montana



AFTERNOON

TECHNICAL SESSION I—CURRENT TECHNOLOGY (Cont'd)

1:30 - 5:00 p.m. International Ballroom-West

Presiding: Donald T. Lauer, EROS Data Center, Sioux Falls, South Dakota

Current Wildlife Habitat Analysis Techniques—Dwight Smith, Colorado State University, Fort Collins, Colorado

Review of Remote Sensing Terminology, Systems, Data, and Analysis Techniques—Staff of the EROS Data Center, Sioux Falls, South Dakota

OPENING RECEPTION (Cash Bar)

Holidome, Holiday Inn (Downtown)

6:00 - 7:30 p.m.

5

WEDNESDAY

MORNING

TECHNICAL SESSION II—HABITAT ANALYSIS

8:30 - 10:00 International Ballroom-West, Holiday Inn (Downtown)
Presiding: H. Dennison Parker, U.S. Fish and Wildlife Service, Fort Collins, Colorado

Remote Sensing for Regional Habitat Analysis in the United States—H. Dennison Parker, U.S. Fish and Wildlife Service, Fort Collins, Colorado

Remote Sensing for Site-Specific Habitat Analysis in the United States—Merte P. Meyer, University of Minnesota, St. Paul, Minnesota

Remote Sensing for Wildlife Habitat Analysis in Canada—Glen Adams, Canadian Wildlife Service, Saskatoon, Saskatchewan

POSTER SESSION A—HABITAT ANALYSIS

10:00 a.m. - 12:30 p.m. International Ballroom-East

[A-1] *Habitat Mapping and Inventory for Ecological Characterization in the Chenier Plain of Louisiana and Texas*—Robert R. Baumann, Louisiana State University, Baton Rouge, Louisiana; James B. Johnston, U.S. Fish and Wildlife Service, NSTL Station, Mississippi, and James G. Gosselink, Louisiana State University, Baton Rouge, Louisiana.

[A-2] *The Interpretation of Available Winter Wildlife Habitat From Landsat Imagery*—Robert G. Best and Signe Sather-Blair, South Dakota State University, Brookings, South Dakota

[A-3] *Production of Vegetation Type Maps from Landsat Digital Data*—Roy Frye, Kirby Brown, Carl Frenness, Don McCarty, C.A. McMahan and Sue Anderson, Texas Parks and Wildlife Department, Austin, Texas.

[A-4] *Measuring Trout Habitat as an Indication of Population on Large-Scale Aerial Color Photographs*—Wally Greentree, U.S. Forest Service, Fort Collins, Colorado.

[A-5] *Applications of Small Format Photography for Habitat Mapping of Small Areas*—Elizabeth Hertz, University of Michigan, Ann Arbor, Michigan.

[A-6] *Remote Sensing-Aided Assessment of Wild Turkey Habitat in Mendocino County, California*—Edwin F. Katbah, University of California, Berkeley, California; and Walter Graves, California Department of Fish and Game, Chico, California.

[A-7] *A Proposed Method of Horizontal Habitat Quantification for Use in Open Canopy Communities*—Jeffrey Keller and Milo Richmond, Cornell University, Ithaca, New York.

[A-8] *The Use of Landsat Imagery in Estimating the Food Available to Refuging Lesser Snow Geese*—Erwin E. Klaas, Iowa State University, Ames, Iowa; William H. Anderson, Technicolor Graphic Services, Inc., Sioux Falls, South Dakota; and Robert B. Frederick, Iowa State University, Ames, Iowa.

[A-9] *Utilization of Landsat Data for the National Wetland Inventory of Alaska*—Arthur J. LaPerriere, U.S. Fish and Wildlife Service, Anchorage, Alaska.

[A-10] *Use of Multispectral Aerial Photography for Assessing Takahé Habitat*—J. Mills, New Zealand Department of Scientific and Industrial Research, Lower Hutt, New Zealand; and D. Fowler, New Zealand Department of Internal Affairs, Wellington, New Zealand.

[A-11] *An Inventory and Assessment of Wildlife Habitat in Grand Canyon National Park Using Remote Sensing Techniques*—David A. Mout, University of Arizona, Tucson, Arizona; and Roy R. Johnson, U.S. Park Service, Grand Canyon National Park, Arizona.

[A-12] *Trend Analysis of Vegetation in Louisiana's Atchafalaya River Basin*—C.P. O'Neil, U.S. Geological Survey, NSTL Station, Mississippi.

[A-13] *Quantitative Evaluation of Deer Habitat*—Norman E. Roller, Environmental Research Institute of Michigan, Ann Arbor, Michigan.

[A-14] *Remote Sensing for Wildlife Habitat, Old Crow Flats, Yukon, Canada*—D. Russell and D. Mossop, Yukon Game Branch, Whitehorse, Yukon; and C. Goodfellow, Canada Center for Remote Sensing, Ottawa, Ontario.

[A-15] *Analysis of Vegetation Change Following Wildfire Upon Wildlife Habitat*—Larry J. Sugarbaker, University of Michigan, Ann Arbor, Michigan.

[A-16] *Landsat Imagery for Wildlife Habitat Inventory Mapping*—Charles T. Taylor and W. Theodore Mealon, Jr., University of Southern Mississippi, Hattiesburg, Mississippi.

AFTERNOON

TECHNICAL SESSION III—ANIMAL CENSUS AND POPULATION DYNAMICS

1:30 - 3:00 International Ballroom-West

Presiding: J.D. Heyland, Environment Canada, Ottawa, Ontario

Imaging Remote Sensing Systems for Animal Census—J.D. Heyland, Environmental Canada, Ottawa, Canada.

Telemetry for Animal Tracking and Animal Physiology Studies—W.W. Cochran, Illinois Natural History Survey, Urbana, Illinois.

Radar Techniques for Wildlife Management—W.J. Richardson, Environmental Research Associates, Toronto, Ontario.

POSTER SESSION B—ANIMAL CENSUS AND POPULATION DYNAMICS

3:00 - 5:30 International Ballroom-East

[B-1] *Utilization of Color-Infrared Aerial Photography to Characterize Prairie Potholes*—Robert G. Best, South Dakota State University, Brookings, South Dakota.

[B-2] *Comparative Efficiencies of Telemetry and Visual Techniques for Studying Ungulates, Grouse, and Raptors on Energy Development Lands in Southeastern Montana*—D. Biggins, U.S. Fish and Wildlife Service, Sheridan, Wyoming and E.J. Pritchler, Peter Kiewit and Sons, Sheridan, Wyoming.

[B-3] *Locating and Identifying Blackbird-Starling Roosts by Multi-spectral Remote Sensing*—Olin E. Bray, U.S. Fish and Wildlife Service, Bowling Green, Kentucky; C. Edward Knittle, U.S. Fish and Wildlife Service, Denver, Colorado; and John R. Jack and Robert L. Bowman, National Aeronautics and Space Administration, Cleveland, Ohio.

[B-4] *Use of Landsat for Evaluation of Waterfowl Habitat in the Prairie Pothole Region*—David S. Gilmer, U.S. Fish and Wildlife Service, Jamestown, North Dakota; and John E. Colwell and Edgar A. Work, Environmental Research Institute of Michigan, Ann Arbor, Michigan.

[B-5] *Technology of Radio Tracking for Various Bird and Mammal Species*—P.L. Hegdal, U.S. Fish and Wildlife Service, Denver, Colorado; T.A. Gatz, Bureau of Land Management, Bismark, North Dakota; and C.E. Knittle and J.F. Besser, U.S. Fish & Wildlife Service, Denver, Colorado.

[B-6] *Tracking Marine Mammals by Satellite*—Jacqueline G. Jennings, National Marine Fisheries Service, LaJolla, California and Walter F. Gandy, National Marine Fisheries Service, NSTL Station, Mississippi.

[B-7] *Identification of Ross' Goose Colonies from Landsat Imagery*—R.H. Kerbes, Canadian Wildlife Service, Saskatoon, Saskatchewan.

[B-8] *Radio-Telemetry Techniques for the Investigation of the Behavior and Demography of Wild Turkeys*—William F. Porter, Donald B. Sirtif, and David A. Hamilton, University of Minnesota, Minneapolis, Minnesota.

[B-9] *Use of Landsat Data for Determining Breeding Success of Arctic Nesting Geese*—Henry M. Reeves, U.S. Fish and Wildlife Service, Washington, D.C.

[B-10] *Wetland Inventory and Condition Evaluation Techniques*—Norman E. Roller, John E. Colwell, and Robert A. Shuchman, Environmental Research Institute of Michigan, Ann Arbor, Michigan.

[B-11] *Assessment of Humpback Whale Stocks Using Vertical Photographs*—Gerald P. Scott and Howard E. Winn, University of Rhode Island, Kingston, Rhode Island.

[B-12] *Aerial Photogrammetry: A Method for Defining Blacktailed Prairie Dog Colony Dynamics*—H.P. Tietjen, J.F. Glahn, and K.A. Fagerstone, U.S. Fish and Wildlife Service, Denver, Colorado.

[B-13] *Behavioral Influences on Metered Heart Rates of White-tailed Deer*—Nadine Jacobsen, University of California, Davis, California.

[B-14] *Operational Thermal Census of Ungulates as a Function of Latitude, Climate, Terrain, Ungulate Size and Habitat Type*—Marc Wide, INTERA Environmental Consultants, Ltd., Ottawa, Ontario.

[B-15] *Wildlife Censusing Using Reflectance Spectra*—Clair L. Wyatt, ManMohan Trivedi, and David R. Anderson, Utah State University, Logan, Utah.

RECEPTION (CASH BAR)

Holidome, Holiday Inn (Downtown)
6:30 p.m. - 7:30 p.m.

PECORA AWARD BANQUET

International Ballroom, Holiday Inn
(Downtown)

7:30 p.m. - 9:30 p.m.

Toastmaster: Everett R. Brue, Vice President, National Wildlife Federation, Sioux Falls, South Dakota

GUEST SPEAKER

The Honorable Russell W. Peterson, Director, Office of Technology Assessment, U.S. Congress, Washington, D.C.



THURSDAY

MORNING

TECHNICAL SESSION IV—INTEGRATED RESOURCES PLANNING AND ANALYSIS

8:30 - 10:00 International Ballroom-West, Holiday Inn (Downtown)

Presiding: R.S. Driscoll, U.S. Forest Service, Fort Collins, Colorado.

Integrated Resource Inventory for the Resource Planning Act—R.E. Francis and R.S. Driscoll, U.S. Forest Service, Fort Collins, Colorado.

A Look at Remote Sensing for Canadian Integrated Resource Surveys—Carolyn Goodfellow, Canada Center for Remote Sensing, Ottawa, Ontario, and M. Wickware, Environment Canada, Burlington, Ontario.

Remote Sensing for Assessing Wildlife Values in Relation to Other Resources and Developments—Adrian Farmer, U.S. Fish and Wildlife Service, Fort Collins, Colorado.

POSTER SESSION C—INTEGRATED RESOURCES PLANNING AND ANALYSIS

10:00 a.m. - 12:30 p.m. International Ballroom-East

[C-1] *Characterization of Terrestrial Vertebrate Habitats Using Remotely Sensed Imagery*—Duane A. Asherin, James E. Roelle, and Henry L. Short, U.S. Fish and Wildlife Service, Fort Collins, Colorado.

[C-2] *Use of Remote Sensing Techniques on the Ohio River in West Virginia by the U.S. Fish and Wildlife Service*—Roger L. Collins and David B. Harris, U.S. Fish and Wildlife Service, Elkins, West Virginia.

[C-3] *Relevance of Landsat to Kangaroo Management in Queensland, Australia*—A. Falconer and G.J.E. Hill, University of Queensland, St. Lucia, Australia.

[C-4] *Use of Remote Sensing Data to Interactively Simulate Wildlife Habitat Quality*—Peter F. Ffolliott and William O. Rasmussen, University of Arizona, Tucson, Arizona.

[C-5] *Multilevel Data Acquisition and Analysis for Wildlife Habitat Inventories*—Brian T. Fine, Electromagnetic Systems Laboratories, Inc., Sunnyvale, California; and John Bosworth, Bureau of Land Management, Anchorage, Alaska.

- [C-6] *Environment Monitoring for Remote Natural Areas—Great Smokey Mountain National Park*—R. Hermann and D.L. Stoneburner, National Park Service, Atlanta, Georgia; G.L. Carson and R.C. Mathews, National Park Service, Gatlinburg, Tennessee; and R.E. Burge, National Park Service, NSTL Station, Mississippi.
- [C-7] *Aerial Survey in Determination of Community Feeding Preferences of Red Kangaroos*—B.S. Low, University of Michigan, Ann Arbor, Michigan.
- [C-8] *An Analysis of Vegetation Communities in the Lower Columbia River Basin*—John G. Lyon, University of Michigan, Ann Arbor, Michigan.
- [C-9] *Integrated Resource Planning*—H.F. Olsen, Queensland Fisheries Service, Brisbane, Australia.
- [C-10] *Quantitative Wildlife Habitat Evaluation Using High Altitude Color Infrared Aerial Photographs*—Lawrence R. Pettinger, Technical Graphic Services, Inc., Sioux Falls, South Dakota; and Adrian Farmer and Mel Schamberger, U.S. Fish and Wildlife Service, Fort Collins, Colorado.
- [C-11] *Inventory of Prairie Dog Habitat: An Approach and Case Study*—Anthony M. Rekas and Horton Struve, U.S. Army Corps of Engineers, Vicksburg, Mississippi.
- [C-12] *Riparian Wildlife Habitat Analysis in Arid and Semi-Arid Regions*—J. Rodiek and M.M. McCarthy, University of Arizona, Tucson, Arizona.
- [C-13] *Imaging Processing Applications to Western Wildlife Habitat Inventory*—Craig Tom, HRB-Singer, Inc., Fort Collins, Colorado.
- [C-14] *Wildlife Habitat Mapping from Color Aerial Photography in Central Arizona*—B. Dean Treadwell and David A. Moutat, University of Arizona, Tucson, Arizona.
- [C-15] *A Computerized Wildlife Habitat Information System*—James F. Williamson, Jr., R.A. Mead, and J.B. Whelan, Virginia Polytechnic Institute, Blacksburg, Virginia.
- [C-16] *Mapping Grizzly Bear Habitat Using Landsat I Imagery and Computer-Assisted Technologies*—John J. Craighead, University of Montana, Missoula, Montana; and Ned Buchman, Public Technology, Inc., Washington, D.C.

**AFTERNOON
TECHNICAL SESSION V—PRESENT NEEDS AND FUTURE
APPLICATIONS**

1:30 - 3:30 International Ballroom-West

Presiding: Allan Marmelstein, U.S. Fish and Wildlife Service, Washington, D.C.

Present Needs for Effective Utilization of Remote Sensing Data in Federal Natural Resource Decision Making—The Honorable Robert L. Herbst, Assistant Secretary-Fish, Wildlife and Parks, U.S. Department of the Interior, Washington, D.C.

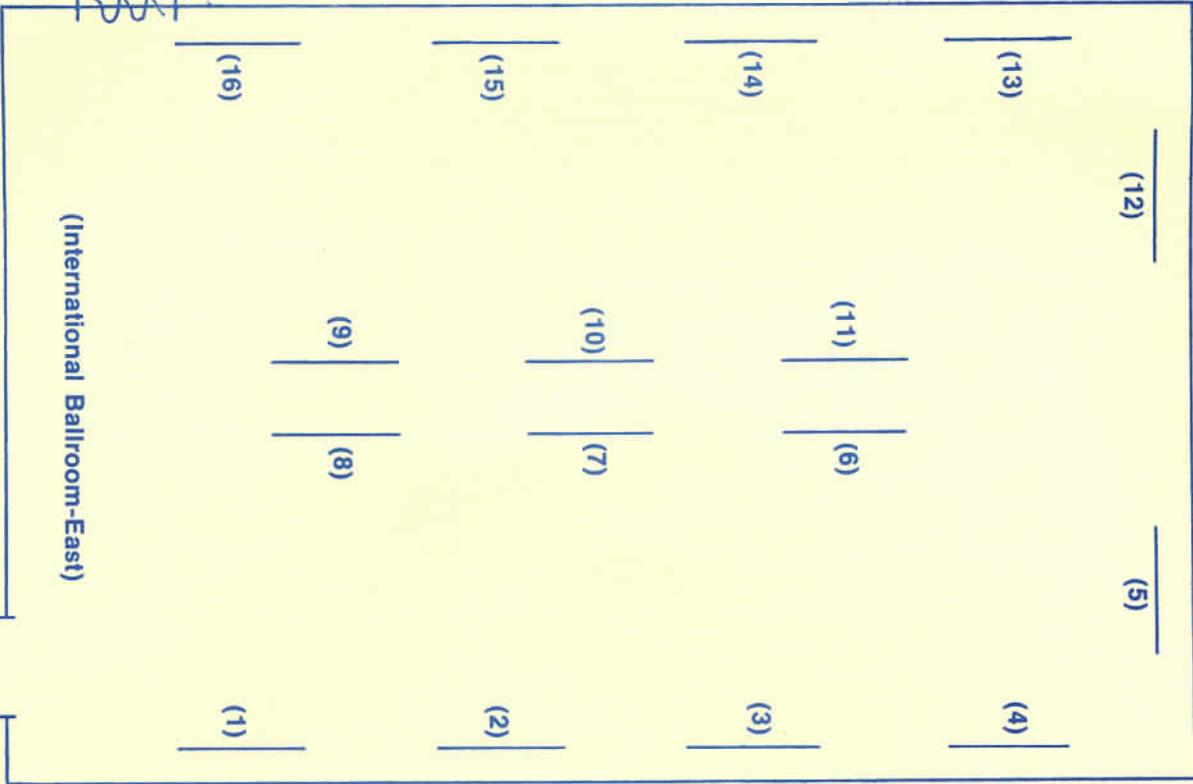
Future NASA Aerospace Systems and Their Potential Applications to Wildlife Management—The Honorable Robert A. Frosch, Administrator, National Aeronautics and Space Administration, Washington, D.C.

Remote Sensing for Wildlife Management in Perspective—Allan Marmelstein, U.S. Fish and Wildlife Service, Washington, D.C., and David M. Carmegie, EROS Data Center, Sioux Falls, South Dakota.

QUICK REFERENCE SCHEDULE

Day Time	Tuesday, October 10	Wednesday, October 11	Thursday, October 12
8:00		Technical Session II- Habitat Analysis International Ballroom- West	Technical Session IV- Integrated Resources Planning and Analysis International Ballroom- West
9:00			
10:00	Opening Session International Ballroom- West	Poster Session A- Habitat Analysis International Ballroom- East	Poster Session C- Integrated Resources Planning and Analysis International Ballroom- East
11:00	Technical Session I- Current Technology International Ballroom- West		
12:00	Luncheon Starlight Room		
1:00		BREAK	BREAK
2:00	Technical Session I- (Contd.) Current Technology International Ballroom- West	Technical Session III- Animal Census and Population Dynamics International Ballroom- West	Technical Session V- Present Needs and Future Applications International Ballroom- West
3:00		Poster Session B- Animal Census and Population Dynamics International Ballroom- East	
4:00			
5:00	BREAK		
6:00	Opening Reception Hollidome	BREAK	
7:00		Reception Hollidome	
8:00		Pecora Award Banquet International Ballroom	

Quick Reference — Poster Sessions



Poster Session A: Habitat Analysis, Wednesday, October 11,
10:00 a.m. - 12:30 p.m.
Poster Session B: Animal Census & Population Dynamics,
Wednesday, October 11, 3:00 p.m. - 5:30 p.m.
Poster Session C: Integrated Resources Planning & Analysis,
Thursday, October 12, 10:00 a.m. - 12:30 p.m.