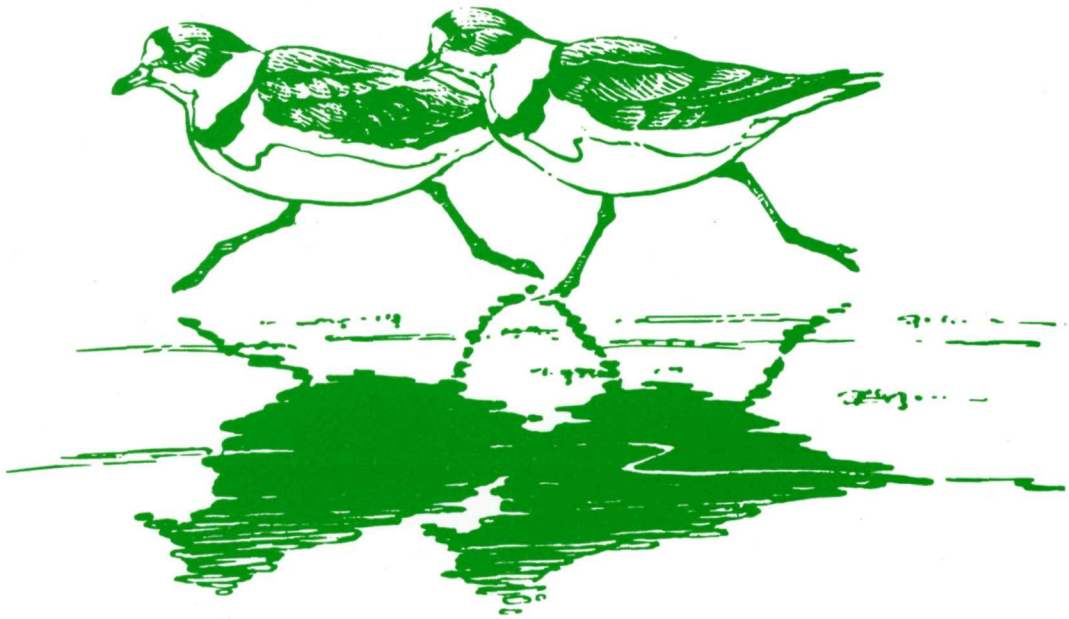
Annual Science Report 1986



Midwest Region
National Park Service

Cover: Piping Plover (*Charadrius melodus*).
(Illustration courtesy U.S. Fish and Wildlife Service)

MIDWEST REGION

ANNUAL SCIENCE REPORT

1986

Compiled by:

Gary D. Willson
Michael Van Stappen

Research and Science Division
National Park Service, Midwest Region
Omaha, Nebraska 68102

TABLE OF CONTENTS

INTRODUCTION

This report provides a listing of natural and social science research and monitoring projects that were in progress in the Midwest Region of the National Park System during 1986. It also includes information on research projects completed during 1986 and a list of issues that face the Region in the next 5 years. A current listing of Regional science and resource management personnel is presented. You may obtain copies of this report or information about any of its contents by contacting:

Dr. Michael A. Ruggiero
Regional Chief Scientist
National Park Service, Midwest Region
Omaha, Nebraska 68102
402-221-3438 (commercial)
8-864-3438 (FTS)

MIDWEST REGION SCIENCE PROJECTS

Information in this section was compiled from 1986 Investigators' Annual Reports. Projects are listed in general subject categories by park (alphabetically). The following legend explains data field codes, abbreviations, and symbols used in this section:

ACCESS NO. - park code + fiscal year + number assigned to data entry

AUTHOR OR INVESTIGATOR - person(s) responsible for conducting project

TITLE - title of project

PERIOD OF RESEARCH - beginning and ending dates of project indicated by month and year or season and year, where P=spring, S=summer, F=fall, and W=winter

% COMPLETE - percentage of project completed
con. = continuing project
R.A. = report available

SPONSOR - funding source for project

-- - no data

AIR QUALITY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8704	Karnosky, D. Berrang, P.	A genecological evaluation of cloned quaking aspen for air pollution sensitivity.	7/86-8/88	20%	NPS
CUVA8703	McClenahen, J.R. Brown, J.	Air pollutant effects on growth of white pine in the Cuyahoga Valley National River area.	9/84-11/86	98%	NPS
CUVA8704	McClenahen, J.R. Vimmerstedt, J.P.	Acidic deposition histories using multi-elemental tree-ring analysis.	9/85-1/89	20%	U.S. Dept. of Agriculture Competitive Grant
CUVA8707	Karnosky, D. Berrang, D.	A genecological evaluation of cloned quaking aspen for sensitivity to air pollution.	7/86-8/88	20%	NPS
CUVA8708	Karnosky, D. Berrang, D.	A genecological evaluation of air pollution tolerances in hardwood trees in eastern forest parks.	9/83-12/86	100%	NPS
GWCA8713	Belk, C.	Effects of acid rain on microarthropods.	3/86-5/86	100% R.A.	Missouri Southern State College
INDU8708	Brunansky, L.	Sulfur dioxide levels at Indiana Dunes National Lakeshore.	--/79- --	con.	NPS
INDU8709	Brunansky, L.	Particulate levels at Indiana Dunes National Lakeshore.	--/79- --	con.	NPS
INDU8720	Brunansky, L.	Acid precipitation monitoring at Indiana Dunes National Lakeshore.	10/80- --	con.	NPS
INDU8731	Karnosky, D. Berrang, P.	A genecological evaluation of air pollution tolerances in hardwood trees in eastern forest parks.	9/86-12/86	80%	NPS
INDU8736	Cole, K.	A history of heavy metal accumulation in Cowles Bog, Indiana Dunes National Lakeshore.	1/85-7/88	70%	NPS
INDU8758	Karnosky, D. Berrang, P.	A genecological evaluation of cloned quaking aspen for air pollution sensitivity.	7/86-9/88	20%	NPS

AIR QUALITY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
INDU8760	Sanchini, P.	Survey of white pine in Indiana Dunes National Lakeshore for evaluation of ozone injury.	4/86-4/87	75%	NPS
ISRO8701	Rutkowski, D. Stottlemyer, J.R.	Assessing anthropogenic atmospheric deposition effects in national parks of the Great Lakes Basin.	6/83-4/87	90%	NPS
ISRO8702	Rutkowski, D. Toczydlowski, D. Stottlemyer, J.R.	Effects of atmospheric acid deposition on watershed/lake ecosystems of Isle Royal and Michigan's Upper Peninsula.	6/82-1/92	50%	N.A.P.A.P.
ISRO8705	Glime, J.M.	Baseline bryological studies.	S/82-7/87	95%	Michigan Tech. University
ISRO8706	Karnosky, D.F. Berrang, P.	A genecological evaluation of air pollution tolerances in hardwood trees in eastern forest parks.	9/86-12/86	80%	NPS
LIBO8703	Stolte, K.W. Bennett, J.P.	Evaluating ozone air pollution injury on common milkweed in the eastern United States.	7/86- --	con.	NPS
PIPE8702	Stocks, D.	Common milkweed (Asclepias syriaca) as a biomonitor.	4/86- --	--	NPS
SLBE8710	Karnosky, D. Berrang, P.	A genecological evaluation of cloned quaking aspen for air pollution sensitivity.	7/86-4/88	20%	NPS
VOYA8702	Teng, P.S. Kromroy, K.W.	A biological system for indexing air quality and assessing vegetation effects (Minnesota bioindicator study).	P/82-1/93	40%	Minnesota Environmental Quality Board
VOYA8710	Albrecht, N. Wetmore, C.	Monitoring air quality with lichens.	6/85-7/87	80%	University of Minnesota
VOYA8714	Karnosky, D.F. Berrang, P.	A genecological evaluation of air pollution tolerances in hardwood trees in eastern hardwood forest parks.	9/86-12/86	80%	NPS
VOYA8715	Karnosky, D.F. Berrang, P.	A genecological evaluation of cloned quaking aspen for air pollution sensitivity.	7/86-9/88	20%	NPS

AIR QUALITY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
VOYA8716	State of Minn. Div. of Air Quality	Minnesota acid deposition program.	4/84-1/92	35%	Minnesota State Legislature
VOYA8717	Brezonik, P.L. Webster, K.E.	Cluster Lakes monitoring for acid precipitation effects in the upper Great Lakes region.	3/84-1/88	--	U.S. Environmental Protection Agency
VOYA8720	Glass, G.	Atmospheric pollution.	-/78- --	con.	NPS

ANIMALS

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
SCBL8701	Franklin, W.L. Cox, M.K.	Faunal survey of birds, mammals, and reptiles in the Scotts Bluff National Monument.	1/86-7/89	25%	Iowa State Univ., Iowa State Univ. Cooperative Wildlife Unit

AQUATIC ECOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
GWCA8715	Dailey, D.A.	Energy budget of the crayfish.	2/86-5/86	100% R.A.	Missouri Southern Foundation
GWCA8717	Ferguson, A.	A pioneer study on the bioenergetics of Orconectes neglectus.	2/86-5/86	100% R.A.	Missouri Southern Foundation
GWCA8720	Ruggiero, M.A. Beeson, D. Baxter, S.	Benthic macroinvertebrate study at George Washington Carver National Monument.	4/86-7/87	50%	NPS
INDU8701	Willey, R.L.	Aquatic biology of interdunal ponds.	1968-1997	30%	NPS
INDU8706	Wilcox, D.A.	Characterization of the waters of interdunal ponds.	5/74-11/86	100% R.A.	NPS
INDU8742	Poulson, T.L. Rovelstad, S.	Structuring of pond communities by predation.	6/86-1/92	10%	NPS
OZAR8706	Poulton, B.C.	The stoneflies (plecoptera) of the Ozark and Ouachita Mountains.	S/84-10/88	65%	National Science Foundation
OZAR8718	Gosset, M. Rabeni, C.F.	Secondary production in an Ozark stream.	6/85-10/87	75%	Missouri Cooperative Fish & Wildlife Research Un
PIRO8702	Mroz, G. Reed, D. Stottlemyer, R. Jurgensen, M. Loope, W. Veneburg, B.	An evaluation of standard timber harvest practices on stream dynamics in the Pictured Rocks National Lakeshore buffer zone.	9/85-10/88	50%	NPS
PIRO8703	Szczytko, S.W.	Limnological survey of four lakes in the Pictured Rocks National Lakeshore, MI (Miners, Chapel, Beaver, and Grand Sable).	7/83-3/87	96%	NPS
SACN8701	Wilcox, D.A.	Aquatic macrophyte communities of the Phipps and Pacawong flowages.	5/86-4/88	40%	NPS
SACN8702	Wetzel, M.J.	Collection of aquatic invertebrates in the Namekagon and St. Croix rivers, Douglas and Washburn counties, Wisconsin.	8/86- --	--	personal funds

AQUATIC ECOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
SACN8703	Boyle, T.P.	Ecological characterization /biological assessment of the Packawong & Phipps flowages on the Namekagon River, St. Croix National Scenic River.	5/86-6/87	70%	NPS
SACN8705	Havlik, M.E.	A survey of naiad mollusks living in the lower St. Croix River, Wisconsin/ Minnesota.	8/86-1/90	1%	NPS
VOYA8703	Naiman, R.J. Johnston, C.A. Kelley, J.C.	Hydrologic control of nutrient cycling processes: animal influences on the aquatic landscape.	2/86-2/88	46%	National Science Foundation
VOYA8707	Kraft, K.J.	Effects of abnormal water level fluctuations on benthic macroinvertebrates in Voyageurs National Park.	7/83- --	96%	NPS
VOYA8721	Kepner, R. Stottlemyer, J.R.	Comprehensive determination of physical and chemical factors affecting primary production in the Voyageurs National Park lake system.	4/85-6/87	80%	NPS

BIRDS

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
INDU8713	Taylor, T.	Great blue heron management study.	2/81-11/86	100% R.A.	NPS
INDU8748	Wobbenhorst, J.A.	Bird habitat study.	4/86-10/87	50%	Volunteer in the Par
INDU8755	O'Keefe, N.	Alder flycatcher study.	5/86-3/87	90%	NPS
SACN8704	Warner, D.W. Weisbrod, A.R.	Critical habitat definition.	5/84-1/89	50%	NPS
SLBE8706	Holden, M.W.	Waterfowl activities in Sleeping Bear Dunes National Lakeshore.	5/82-1/89	75%	NPS
SLBE8708	Scharf, W.C.	Monitoring bird migration at Lighthouse Point, South Manitou Island and the Village area of North Manitou Island.	5/65-2002	con.	Northwestern Michigan College, W.R. Angell Foundation
VOYA8704	Grim, L.H.	Breeding success of bald eagle, osprey, great blue heron, double crested cormorant and common tern in Voyageurs National Park.	--	--	NPS
VOYA8708	Reiser, M.H.	Investigation of the effects of regulated and natural water fluctuations on the distribution, abundance and reproductive success of marsh and aquatic nesting species in VOYA.	5/83-1/88	75%	NPS
VOYA8719	Cuthbert, F.J. Rothstein, A.	Factors influencing the distribution, abundance, and reproductive success of the osprey in VOYA.	6/85-6/87	75%	NPS

ENDANGERED AND RARE SPECIES

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8705	Anderson, R.K. Kozie, Karin	Breeding and feeding ecology of bald eagles.	4/84-12/86	100% R.A.	NPS
INDU8702	Resetar, A.	Faunal surveys and habitat requirements.	1977- --	con.	NPS
INDU8712	Weller, S.G.	Life history of the sand dune species Lithospermum caroliniese and Cirsium pitcheri.	1977-1992	60%	NPS
INDU8722	Mule',L.	The reproductive ecology of Liatris species.	5/83-11/87	80%	University of Illinois at Chicago
INDU8732	Iverson, C.	Distribution of the Franklin's groundsquirrel in Indiana.	5/86-12/86	100% R.A.	Indiana Dept. of Nat. Res., Nongame
INDU8747	Oviatt, G.	Effect of fire on Buchnera.	4/86-1/89	50%	NPS
INDU8753	Oviatt, G.	Blue heart habitat study.	4/86-1/89	40%	Indiana University-Northwest
OZAR8703	Morgan, S.W.	Rare plants of the Ozark National Scenic Riverway.	4/85- --	100% R.A.	NPS
OZAR8704	Cook, J.G. Anderson, S.A.	Surveys for rare raptors on National Park Service lands, Midwest Region.	4/85-12/86	100% R.A.	NPS
SLBE8701	Holden, M.W.	Piping plover population and nesting survey.	5/85-1/95	10%	NPS
SLBE8702	Holden, M.W.	Upland sandpiper population and nesting survey.	--/85-1/90	10%	NPS
SLBE8704	Pike, E.A. Wolinski, R.A.	Determination of habitat requirements, reproductive success and longevity of piping plover (Charadrius melodus) in Michigan.	5/83-1/89	65%	Michigan Department of Natural Resources
WICR8701	Morgan, S.W.	A study of a population of Lesquerella filiformis Rollins in Missouri.	4/83-12/86	100%	Missouri Department of Conservation

EXOTIC SPECIES

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8703	Henry, D.J. Meierotto, R.	Purple loosestrife (Lythrum sulicaria) and the Apostle Islands National Lakeshore.	6/86-12/86	96%	College of Saint Thomas
INDU8728	Wilcox, D.A. Seeling, M.	Control of purple loosestrife/ competition with cattails.	7/84- --	con.	NPS
INDU8751	Konz, L.	European alder eradication program.	9/86-1/92	25%	NPS
INDU8757	Patai, B.	Gypsy moth monitoring.	6/83- --	con.	NPS
LIBO8701	Onken, B.	Gypsy moth early detection program.	6/83- --	--	U.S.D.A. Forest Service
PIPE8707	Stocks, D.	Buckthorn research project.	4/86- --	--	NPS

FIRE ECOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
INDU8724	Cole, K.	Effects of prescribed burning on prairie and oak woodland communities of Indiana Dunes National Lakeshore.	1/83-7/94	40%	NPS
INDU8740	Werth, R.J.	Effect of fire on the amphibians and reptiles of Miller Woods.	5/86-1/88	50%	NPS
INDU8744	Kurth, L. Bogart, S.	Effects of spring wildfire on the vegetation of Inland Marsh at INDU.	--/86-5/87	80%	NPS
INDU8745	Oviatt, G.	Effects of fire on small mammals at Howes Prairie.	4/86- --	100%	NPS
INDU8746	Oviatt, G.	Effects of fire on soil microorganisms.	6/86- --	100% R.A.	NPS
INDU8749	Reeser, B. Cole, K.	Fire history in Beverly Shores.	4/86-7/87	85%	NPS

FISHES

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
OZAR8705	Legler, B. Mayer, D.	Current River gigging study.	9/86-5/87	50%	Missouri Department of Conservation
OZAR8709	Foster, D.I.	Ozark fishery investigations I: Fish Populations.	9/77- --	90%	NPS
OZAR8710	Foster, D.I.	Ozark fishery investigations IV: Fish reproduction studies.	8/78- --	100%	NPS
OZAR8711	Foster, D.I.	Ozark ecosystems studies: Icthyofauna.	5/78- --	95%	NPS
OZAR8712	Foster, D.I..	Water quality in the Ozark National Scenic Riverways.	7/73- --	90%	NPS
OZAR8716	Livingstone, A.C. Rabeni, C.F.	Food and habitat use by young-of-year centrarchids in the Jacks Fork River.	9/84-7/87	90%	Missouri Cooperative Fish & Wildlife Research Un
OZAR8717	Todd, B. Rabeni, C.F.	Movement patterns of smallmouth bass in the Ozark National Scenic Riverway.	6/85-6/87	70%	Missouri Cooperative Fish & Wildlife Research Un
VOYA8711	Kallemeyn, L.W.	Aquatic research - Voyageurs National Park.	10/83- --	--	NPS

GENERAL ECOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8709	Allison, T.D.	The influence of deer browsing on the reproductive biology of Canada yew.	5/82-12/86	100% R.A.	NPS
CUVA8701	Manner, B.	Environmental atlas of the Cuyahoga Valley National Recreation Area.	2/85-6/87	80%	NPS
GWCA8709	Hager, M.B.	The environmental impact of removal of woody stands at George Washington Carver National monument.	2/86-5/86	100% R.A.	Missouri Southern State College
GWCA8710	Dale, C.A.	A study of the decomposition rate and nutrient content of litter entering the detritus food web.	2/86-5/86	100% R.A.	Missouri Southern Foundation
INDU8725	Hiebert, R.D. Wilcox, D.A. Pavlovic, N.	An ecological study of pannes at the Indiana Dunes National Lakeshore.	5/83-11/86	100% R.A.	NPS
ISRO8708	Pastor, J. Naiman, R.J.	The effects of large mammal browsing on the dynamics of northern ecosystems.	9/86-1/89	5%	National Science Foundation
SLBE8703	Holden, M.W.	Dune impact studies.	--/84-1/89	70%	NPS

GEOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8701	Nuhk, E.B. Meller, H.W. Dalles, M.P. Weymouth, J.	Geological guidebook to Apostle Islands National Lakeshore.	6/86-11/86	100%	NPS
INDU8729	Wilcox, D.A.	The stratigraphy and development of Pinhook Bog.	6/83- --	con.	NPS

HERPETOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
GWCA8701	Ellis, R. Fuller, S.J. Szot, S.A.	Snake species survey of George Washington Carver National Monument prairie management unit number five.	9/86-12/86	100% R.A.	NPS
ISRO8712	Smith, D.C.	Population biology of the chorus frog, Pseudacris triseriata, on Isle Royale, Michigan.	2/86-7/89	30%	National Science Foundation

HYDROLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8707	Milfred, C.J.	Measurement of shoreline erosion along Presque Isle campground on Stockton Island and measurement of beach dimensions on sandspits and cuspate forelands of 12 islands in the Apostle Islands National Lakeshore.	8/86-4/87	75%	NPS
GWCA8702	Aley, T.J. Aley, C.L.	Groundwater tracings to delineate groundwater recharge areas for Carver and Williams springs and associated unamed springs which arise in Harkins and Carver branches.	4/86-3/87	20%	NPS
INDU8718	Shedlock, R.J. Cohen, D.A.	Hydrogeology of Indiana Dunes National Lakeshore.	10/81-7/87	90%	NPS
INDU8719	Shedlock, R.J. Cohen, D.A.	Investigation of the hydrology and water quality of the Cowles Bog wetland complex and surrounding area.	3/81-11/86	100% R.A.	NPS
INDU8726	Shedlock, R.J. Cohen, D.A. Thompson, T.A. Lolaceno, N.J.	Shallow ground-water flow and stream-aquifer relations in the Great Marsh wetland, Indiana Dunes National Lakeshore.	10/83-4/89	50%	NPS
INDU8743	Wood, W.	Shoreline situation report.	9/84-10/86	100% R.A.	NPS
OZAR8713	Thomas, J. Aley, C.L.	Groundwater study, Ozark National Scenic Riverways.	7/84-2/87	80%	NPS
OZAR8715	Alexander, T.W.	Delineation of flooding within Ozark National Scenic Riverway in southeastern Missouri.	10/84-10/87	80%	NPS
VOYA8709	Flug, M.	Simulation and modeling of regulated lake levels around Voyageurs National Park.	6/83-3/87	98%	NPS

INVERTEBRATES

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
HOME8701	Ruggiero, M.A.	Investigation of tick populations at Homestead National Monument.	5/86-12/86	100%	NPS
INDU8721	O'Brien, M.F.	Distribution and bionomics of sphecidae along Lake Michigan area.	5/82-10/86	100% R.A.	NPS
INDU8739	MacDonald, J.F.	Social wasps of the upper Midwest.	--/84- --	95%	NPS
ISRO8707	Nielsen, M.C. Herig, E.A. Herig, T.L. King, H.	Lepidoptera survey of Isle Royale National Park (& butterfly survey of Michigan).	6/82-2007	10%	private
SLBE8707	Linton, M.C.	Antlion larvae as sit-and-wait predators in a variable environment.	5/86-1/89	33%	personal funds

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8710	Anderson, R.K.	Black bear behavior and movements within the Apostle Islands National Lakeshore.	6/84-1/90	50%	U.W.-Stevens Point, Wis. Bear Hunters Assoc., Safari Club
GWCA8711	Fuller, S.J.	Energetics of the cotton rat (Sigmodon hispidus).	2/86-5/86	100% R.A.	Missouri Southern Foundation
GWCA8716	Womack, M. Szot, S.A.	Small mammal survey on prairie unit number five.	2/86-5/86	100% R.A.	Missouri Southern Foundation
INDU8714	Taylor, T.	White-tailed deer census and habitat study.	10/81-11/86	100%	NPS
INDU8752	Konz, L.	Raccoon monitoring.	9/86-1/88	35%	NPS
INDU8759	Taylor, T.	Roadkill survey.	10/81-1/88	70%	NPS
ISRO8703	Ackerman, T.N.	Summer activity patterns of moose as affected by heat.	5/85-6/87	80%	Michigan Tech. University
ISRO8709	Peterson, R.O. Risenhoover, K. Ackerman, T. Brandner, T. Page, R.	Ecological studies of wolves and moose on Isle Royale.	6/58- --	con.	Charles Ulrick and Josephine Bay Foundation
ISRO8710	Risenhoover, K.L.	Winter foraging and survival strategies of moose in boreal forest habitats on Isle Royal, Michigan.	5/84-1/89	75%	Michigan Tech. Univ. National Rifle Assoc National Wildlife Federation
ISRO8711	Shelton, P.C.	Ecological studies of beavers on Isle Royal National Park.	6/60- --	con.	NPS
OZAR8702	Cisneros, J.G. Fritzell, E.K.	Distribution and identification of white-tailed deer gastrointestinal parasites in Missouri.	11/84-5/87	80%	Univ. of Missouri, Missouri Agr. Exp. Sta., Missouri Dept. Conservation
SLBE8705	Holden, M.W.	North Manitou island white-tailed deer population and habitat study.	--/84-1/95	30%	NPS
SLBE8709	Scharf, W.C.	Small mammal studies - North and South Manitou Islands.	5/65-1/97	con.	W.R. Angell Foundation
VOYA8705	Cole, G.F.	Wildlife investigations.	1976-1986	100%	NPS
VOYA8706	Peterson, R.O. Thurber, J. Smith, D.	Effects of water drawdown on beaver/muskrat.	9/83-7/88	70%	NPS

MAMMALS

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
VOYA8718	Peterson, R.O. Route, W.	Effects of water drawdown on otters.	9/85-1/88	50%	NPS

METEOROLOGY

CCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
INDU8756	Konz, L.	Fire weather monitoring.	--/78- --	con.	NPS
PIPE8704	Stocks, D.	Fire weather monitoring station.	8/84- --	--	NPS

PALEONTOLOGY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
AGFO8701	Hunt, R.	Paleontological excavations at the Agate Quarries.	6/85-1/88	80%	University of Nebraska

PLANTS AND VEGETATION

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8708	Allison, T.D. Swain, A.	The influence of seed bed treatment and yew removal on the establishment of hemlock, white pine, and white cedar.	7/86-1/92	50%	NPS
CUVA8702	Balla, C. Vimmerstedt, J.P.	Leaf litter disappearance in oak and yellow-poplar stands in the Cuyahoga River valley.	6/85- --	100% R.A.	NPS
CUVA8705	Andreas, B.	Floristic survey of Cuyahoga Valley National Recreation Area.	6/85-2/87	90%	U.S. Fish and Wildlife Service
EFMO	Blewett, T.J.	A vegetation survey of grasslands and rare plants of Effigy Mounds National Monument.	6/85-12/86	100% R.A.	NPS
FOSC8701	Wollenhaupt, D.	Basal cover and species composition of the restored tallgrass prairie at Fort Scott NHS.	11/86-12/86	100% R.A.	NPS
FOSC8702	Jackson, J.R. Knoblauch, R.K.	Analysis of prairie area at Fort Scott National Historic Site.	F/85-3/87	85%	NPS
FOSC8703	Knoblauch, R.K.	A comparative vegetative analysis of the Fort Scott National Historic Site's restoration prairie and the Osage Prairie.	5/85-4/87	85%	NPS
GRPO8701	Loope, W.A. Ruggiero, M.A.	A baseline study of forest composition and structure along the Grand Portage Trail, Grand Portage National Monument, MN.	8/86-4/87	60%	NPS
GWCA8704	Jackson, J.R.	Prairie management study.	-/81-2/87	100% R.A.	NPS
GWCA8718	Johnston, M.E.	Invasion of prairie by woody plant (Rubus) at George Washington Carver National Monument.	1/86-5/86	100%	Missouri Southern Foundation, M. E. Johnston.
HEHO8701	Wilcox, W.T.	Prairie vegetation inventory.	9/86-11/87	5%	NPS
HOME8702	Patrick, K.	Prairie restoration.	4/86-12/86	100% R.A.	NPS
INDU8715	Hiebert, R.D.	Herbarium	6/81-1/89	70%	NPS

PLANTS AND VEGETATION

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
INDU8716	Wilcox, D.A.	Effects of water regime manipulations on the Cowles Bog wetland complex.	11/81- --	con.	NPS
INDU8730	Whitman, R.	Miller Woods inventory of aquatic and terrestrial flora and fauna at INDU.	7/83-11/86	100% R.A.	NPS
INDU8734	Dudash, M.	Reproductive strategies of Sabatia angularis.	5/83-11/87	85%	National Science Foundation, Sigma Xi Univ. of Illinois
INDU8735	Cole, K.	Tree-ring chronologies of white pine (Pinus strobus) and black oak (Quercus velutina) from Indiana Dunes National Lakeshore.	8/86-7/88	15%	NPS
INDU8737	Cole, K.	Paleoecology and pre-settlement vegetation of Indiana Dunes National Lakeshore.	5/85-1/90	20%	NPS
INDU8741	Brooks, R.	Patterns and levels of genetic variation.	12/84-7/88	40%	Sigma Xi
ISRO8704	Edwards, J.	Flowering, pollination and seed set in a boreal plant community.	S/86-1/89	80%	Williams College
LIBO8702	Pavlovic, N.B. Hiebert, R. Kurth, L.	Forest restoration at Lincoln Boyhood.	7/85-1/88	90%	NPS
PIRO8701	Loope, W.L.	Vegetation response to disturbance within Pictured Rocks National Lakeshore.	5/83-10/87	85%	NPS
SCBL8702	Gabel, M.	Tertiary flora of the Northern High Plains.	4/86-1/89	10%	Black Hills State College
SLBE8711	Hazlett, B.T.	The aquatic vegetation of Sleeping Bear Dunes National Lakeshore.	3/86-10/87	60%	NPS

REHABILITATION AND RESTORATION

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
INDU8717	Hiebert, R.D.	Revegetation of building removal sites.	7/81-1/88	90%	NPS
INDU8727	Wilcox, D.A.	The ecological and hydrological effects of restoring natural hydrologic conditions to Little Lake through ditch closure.	10/84- --	con.	NPS
PIPE8703	Stocks, D.	Prairie restoration.	4/86- --	con.	NPS
PIPE8708	Stocks, D.	Landscaping visitor's center with native plants.	4/86- --	con.	NPS
WICR8702	Gremaud, G.K. Kurz, D.R.	Wilson's Creek National Battlefield: A plan for the restoration of the historic vegetation.	5/85-12/86	100% R.A.	NPS

SOCIAL SCIENCES

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8706	Heberlein, T.A.	Recreational boating and rural development: a comparative assessment of boaters across time (1975-1985) and location (Bayfield and Door Co.'s, Wis.).	9/84-4/87	90%	Sea Grant Institute, University of Wisconsin-Madison
INDU8723	Hiebert, R.D.	A study of human impacts on dunes.	6/83-1/87	50%	NPS
INDU8733	Wilcox, D.A.	Study of potential impacts of improving access to and visitor use of Little Calumet River by canoeists.	2/86- --	--	NPS
INDU8738	Hultsman, W.	Socio-economic study - examining visitor reaction to mitigation measures imposed at the Dunes.	5/86- --	90%	NPS
OZAR8707	Everson, A.R.	Cave recreation at Ozark National Scenic Riverway.	5/86-4/87	90%	University of Missouri
OZAR8708	Chilman, K.C. Everson, A.	Testing a recreation monitoring system for individual river zones.	5/86-3/87	90%	Southern Illinois University, Universi of Missouri
VOYA8701	Richner, J.J.	Archeological survey and testing at VOYA, 1986.	6/86-1/88	60%	NPS
VOYA8713	Cole, G.F.	Park-use, carrying-capacity.	-/83- --	100%	NPS

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
GWCA8705	Mason, J.	A soil survey of George Washington Carver National Monument, relating the location and composition of the basic soil types.	3/86-5/86	100% R.A.	Missouri Southern Research Foundation
GWCA8706	Hale, Becky	Chemical soil analysis of George Washington Carver.	1/86-5/86	100% R.A.	Missouri Southern Research Foundation
INDU8711	Esser, K.B.	Mineralogical and elemental distribution of chronosequence of soils in Indiana Dunes National Lakeshore.	6/80-5/87	90%	NPS
PIPE8705	Stocks, D.	Analyze soil nutrients.	4/86- --	--	NPS

WATER QUALITY

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
APIS8702	McCauley, D.J.	Water quality of the Apostle Islands National Lakeshore.	10/85-12/87	50%	NPS
CUVA8706	Beaumier, R.	Instream environmental impact assessment upstream and downstream from the Akron wastewater treatment plant.	S/84- --	--	U.S. Environmental Protection Agency, State of Ohio
GWCA8703	Boyt, Lorene	Water quality survey of Carver Branch and Hawkins Branch.	9/83-12/86	100% R.A.	NPS
GWCA8707	Ogle, P. Gibson, C.	The water quality of Williams Pond at George Washington Carver National Monument.	2/86-5/86	100% R.A.	Missouri Southern State College
GWCA8708	Ogle, P. Gibson, C.	Water quality of Williams Spring Pond at George Washington Carver National Monument.	2/86-5/86	100% R.A.	Missouri Southern State College
GWCA8712	Schmidly, S. Dozier, K.	Chemical analysis of water at George Washington Carver National Monument.	2/86-5/86	100% R.A.	Missouri Southern State College
INDU8703	Shedlock, R.J. Cohen, D.A.	Monitoring the water resources of Indiana Dunes National Lakeshore.	3/81- --	con.	NPS
INDU8704	Wilcox, D.A.	Salt intrusion at Pinhook Bog.	5/79- --	con.	NPS
INDU8705	Brunansky, L.	Bacterial contaminant monitors of the waters of Indiana Dunes National Lakeshore.	5/85- --	con.	NPS
INDU8707	Wilcox, D.A.	Impacts of U.S. Steel landfill on interdunal ponds in Miller Woods.	5/79- --	con.	NPS
INDU8750	Steffeck, D.W.	Contaminant testing of animals in INDU ponds.	9/86-2/87	90%	U.S. Environmental Protection Agency
INDU8754	Brunansky, L.	Little Calumet River water quality monitoring.	5/86- --	con.	NPS
OZAR8714	Davis, J.V.	Water quality monitoring, Ozark National Scenic Riverway.	9/76- --	con.	NPS
PIPE8701	Stocks, D.	Water quality study.	4/86- --	con.	NPS
VOYA8712	Payne, U.S.G.S.	Water quality monitoring	-/77- --	con.	NPS

WILDLIFE

ACCESS NUMBER	AUTHOR OR INVESTIGATOR	TITLE	PERIOD OF RESEARCH	PERCENT COMPLETE	SPONSOR
OZAR8701	Kurzejeski, E.W.	Restoration of ruffed grouse in the Ozark highlands.	8/79-1/97	50%	Missouri Dept. of Conservation

MAJOR NATURAL RESOURCE ISSUES

The following lists the major natural resource issues facing the Midwest Region in the next 5 years. Current research projects address many of these issues; additional research is planned or needed for the remainder. We welcome proposals on any of the topics. Issues are presented here by major resource category.

ANIMAL RESOURCES

1. Baseline information about animals. Current baseline information is lacking on many animal populations in Midwest parks. Information is particularly scant for terrestrial invertebrates, amphibians, and reptiles. While there is quantitative information for selected mammal, bird, and fish populations, such information for less conspicuous populations is lacking. A systematic approach for acquiring optimum baseline information on animal populations is needed. Without such an approach, information that is collected will be done haphazardly, limiting confidence in the data and restricting its usefulness for decision-making. Park staff should be involved in the collection of data as much as possible.

2. Rare animal species. Many state or federally listed rare, threatened, or endangered animal species reside in Midwest parks. We currently know what rare species occur, but on the whole, we lack specific information on their population dynamics and habitat use. This indepth information is needed to preserve the rare species' habitats and to prevent adverse effects from incompatible management activities.

3. Extirpated animal species. Several parks have identified extirpated animal species that once were residents. The technology to reintroduce some of these species is available and reintroductions are feasible with proper planning. Faithful representation of natural ecosystems will be impossible while component species are missing.

4. Disturbance to animals by human activities. Activities such as trail development and use, off-road vehicle use, construction projects, and overuse of resources by visitors adversely affects animal populations. Interaction between humans and animals is also a problem in some parks. Studies are needed to effectively plan the use of park resources by humans so that it is compatible with the preservation of animal populations. Lack of adequate planning will result in their loss or deterioration.

PLANT RESOURCES

5. Baseline information about plants. Information about plant resources is generally better than for animal resources. There is still a need, however, for repeatable quantitative studies of plant distributions. Such information will allow us to compare communities over time, analyze trends, and assess the effects of positive or adverse actions. Park staff should be involved in collection of baseline data.

6. Restoration of plant communities. The native plant communities of most Midwest parks have been drastically altered by humans over the past century.

Research is ongoing to describe how the communities should be restored and subsequently preserved. The initial survey phase for tallgrass prairie communities is nearly complete and restoration efforts are underway. In northern hardwood and boreal plant communities we are in the research phase. Previously landscaped or occupied areas are also being returned to native ecosystems. Several abandoned industrial sites need to be restored. Lack of action on this issue will result in further ecosystem change and make eventual restoration increasingly difficult.

7. Rare plant species. State and federally listed rare, threatened, and endangered plants exist in several Midwest parks. We have concluded a study to identify the presence of these species in parks. The next step is to develop quantitative data on their distribution and population biology. This information will enable us to give maximum protection to the species.

8. Exotic plant species. Non-native or exotic plant species pose a serious threat to native plant communities in parks. Exotic species may replace native species and hinder restoration efforts. Research, monitoring, and mitigation efforts are ongoing to control or remove exotic plants where possible. Inaction will allow certain exotic plants to further threaten native plant communities and make eventual restoration efforts more difficult.

GEOLOGIC FEATURES

9. Soil erosion. Many areas of parks in the Midwest Region are experiencing soil erosion. Shoreline manipulation along lakes, abandoned industrial sites, and recreation are major sources of erosion. We are currently identifying erosional sites and setting priorities for their restoration. Inaction will result in irretrievable soil loss and impacts on other resources.

WATER AND HYDROLOGIC FEATURES

10. Quality of surface waters. Threats to the quality of surface water exist in several parks. Contamination is from a variety of sources, including sewage treatment plants, industrial effluents, non-point runoff, and airborne deposition of pollutants. Quantitative baseline information is needed to determine current water quality and to provide a basis for mitigation efforts. Lack of mitigation may preclude the use of surface waters in some parks and result in degradation of aquatic biota.

11. Quality of ground-water. Baseline information is lacking for much of the ground-water resources in parks. Center-pivot irrigation and use of agricultural chemicals in those systems pose a threat to ground-water resources of parks in the Great Plains. The karst topography of the parks of southern Missouri is especially vulnerable to movement of contaminants into ground-water. Landfills and abandoned dumpsites in and around other parks also pose a threat to ground-water resources. We are currently conducting hydrological studies to identify spring recharge areas and pathways of potential contaminants. Mitigation cannot be achieved without sound cause and effect information. Decontamination of ground-water is a slow process.

12. Fluctuating water levels. Two major situations exist in the Midwest that are related to fluctuating water levels. One is the recent record high levels of the Great Lakes. This poses a severe threat to shorelines and cultural and developed resources on those shorelines. Actions taken by others to mitigate shoreline erosion directly affects park resources. The best approach for this issue is to understand the processes that are occurring and work cooperatively in Regional planning to protect park resources.

At Voyageurs, levels of the large lakes within the park are regulated by the International Joint Commission (IJC). Recent research by the National Park Service has demonstrated the negative impacts of unnatural lake level fluctuations on natural resources. The park is preparing to approach the IJC in an attempt to restore the lake level fluctuations to more natural conditions. Failure to restore natural conditions will continue to impact fish and wildlife populations.

AIR QUALITY

13. Biological effects of air pollutants. Certain parks in the Midwest Region are showing severe adverse effects of air pollutants. Effects of gaseous pollutants on plants and effects of acidic deposition on watersheds have been demonstrated. More intensive research is needed to build a strong, broadly based case for limiting the sources of contaminants.

AESTHETICS

14. Adjacent land development. Uses of land surrounding parks in a manner that impairs their "naturalness" is commonplace in Midwest parks. Development occurring around parks is creating "insular" natural areas in a "sea of development." Early detection of proposed incompatible uses is needed.

OTHER

15. Genetic resources. Preservation of genetic diversity in parks is of utmost importance, particularly relating to species reintroductions, habitat fragmentation, pollutant effects, and rare species preservation. Studies are needed to elucidate basic theories and principles of conservation biology and management techniques need to be developed to preserve genetic diversity. Loss of genetic diversity will decrease the ability of species to adapt to changing environmental conditions.

16. Resource management planning. Resource management activities are driven by resource management planning. There is a general need to improve the quality of resource management plans. A possible solution is more involvement by professionals at the development stage. "Pulse teams" of specialists may be an effective way to get this involvement. Lack of quality resource management planning may result in major resource threats going unnoticed and major resource needs going unmet.

ABSTRACTS OR SUMMARIES OF RESEARCH REPORTS COMPLETED IN 1986

Abstracts or summaries of research funded by the Research and Science Division and completed in 1986 are included in this section.

Apostle Islands National Lakeshore

PROJECT: Feeding and Breeding Ecology of Bald Eagles in the Apostle Islands National Lakeshore

INVESTIGATORS: R. K. Anderson and K. D. Kozie, College of Natural Resources, University of Wisconsin, Stevens Point, Wisconsin

CONTRACT: IA-6000-4-8005

ABSTRACT/SUMMARY: Food habits and foraging areas, and chemical contaminants in eagle foods and carcasses were studied in bald eagles (Haliaeetus leucocephalus) nesting within the Apostle Islands National Lakeshore (APIS) during 1984 and 1985. Data on food habits collected during banding operations in 1983 and 1986 are also included. Productivity was monitored during 1984-1986. Food habits were determined by collecting prey remains from below nest and perch trees and by direct observation. Fish comprised 52.4 percent of prey remains and 97.0 percent of observations. Common species included longnose sucker (Catostomas catostomas), burbot (Lota lota), white sucker (Catostomus commersoni), and round whitefish (Prosopium cylindracem). Birds, primarily herring gulls (Larus argentatus), comprised 46.9 percent of prey remains and 1.5 percent of observations. Mammals comprised 0.7 percent of food remains and 1.5 percent of observations. Organochlorine and PCB residues were present at low levels (DDE: x = 0.07 ppm, PCB: x = 0.21 ppm) (wet weight) in fish. Adult and immature herring gulls contained higher concentrations (DDE: x = 5.4 ppm, PCB: x = 13.5 ppm) and appear to be the major source of elevated contaminant levels in the Apostle Island bald eagle population. The source of herring gull contamination is unknown. Migratory birds, wintering in areas where DDT is still in use, may add additional contaminants to the eagle food chain. Eagle feeding areas were located primarily along the shores near nest areas during the late incubation, brood-rearing and early post-fledging periods. An average of 0.9 young/occupied nest were produced in the Apostle Islands during 1984-1986 compared to an average of 1.3 young/occupied nest produced statewide in Wisconsin during those years. Nestling mortality was 27 percent among island nests (4 of 15 young). Contaminant levels in nestling bald eagle carcasses collected from Lake Superior nests were higher than those collected inland, suggesting local contamination. Replacement of adult females in two nests and the known death of an adult female at a third nest, indicates a high turnover among breeding adults in the APIS during 1985. Current production in the Apostle Islands may be due to a younger breeding cohort, with low contaminant levels, dispersing from the island population. Disturbance did not appear to be a factor affecting productivity or survival.

Fort Larned National Historic Site

PROJECT: Vegetation Survey and Prairie Management Plan for Fort Larned National Historic Site

INVESTIGATORS: Donald A. Becker, Ecosystem Management, Elkhorn, Nebraska; Thomas B. Bragg and David M. Sutherland, University of Nebraska-Omaha

CONTRACT: CX-6000-2-0076

ABSTRACT/SUMMARY: Native and partially restored prairie ecosystems at Fort Larned National Historic Site were analyzed from 1982-1985. The purpose of the study was to develop a management plan that highlights strategies for creating a vegetation scene resembling that of the 1860s.

A variety of resource survey and sampling techniques was used, including standard planning procedures. Among these were methods to inventory vegetation resources, assess resource management problems, and develop solutions.

Vegetation analysis indicated that weedy grasses and forbs dominate large areas of the park. Several areas colonized by noxious grasses and forbs were also identified. Native short grass cover has been nearly static for at least the last 5 years, but mid and tall grass cover has increased slightly and will continue into the future. However, the rate of cover increase is very low in many units and desired levels of cover and species composition are not being achieved. With no change in current management, it will take many decades on most plots before a condition resembling a climax can be achieved. With enhanced levels of management integrating a variety of reclamation and management approaches, this can be more readily achieved.

Riverine and wetland ecosystem degradation was identified as a long-term critical problem in the park. Its origin lies deep in several historical, economic, and cultural circumstances. Loss of this resource will continue far into the future unless methods to keep water in the Pawnee River can be developed.

Recommendations to resolve problems and to enhance existing park resources were developed for long- and short-term considerations. The plan emphasizes that downy brome must be controlled better through additional use of burning and chemical practices, and the more reclamation using native plant materials is needed. Regular monitoring of existing problems and management results was stressed in order to ensure that various practices are applied at the appropriate time.

George Washington Carver National Monument

PROJECT: Delineation of Recharge Areas for Springs in George Washington Carver National Monument

INVESTIGATOR: Tom Aley and Cathy Aley, Ozark Underground Laboratory, Protem, Missouri

CONTRACT: PX-6000-4-0797

ABSTRACT/SUMMARY: A hydrologic study was conducted to delineate recharge areas for springs in and adjacent to George Washington Carver National Monument. Groundwater tracing showed that Carver Spring is being pirated by a spring which we have called Lower Carver Spring. This explains why Carver Spring no longer has perennial flow.

Our groundwater tracing also demonstrated that the West Diamon Sewage Lagoon is a major source of contamination for Williams Spring, Carver Spring, and other springs in the channel of Carver Branch within George Washington Carver National Monument. Finally, the tracing showed that the East Diamond Sewage Lagoon lies outside of the recharge area for springs within George Washington Carver National Monument.

This investigation also included a mapping of hazard areas in the vicinity of the national monument. Hazard areas are sites that, because of their hydrogeologic characteristics and/or their associated land uses, pose particular threats to the quality of groundwater. This hazard area mapping included areas both inside and outside of recharge areas for springs within the national monument.

In addition, major groundwater contamination problems affect all springs within George Washington Carver National Monument. Actions to mitigate these problems are identified.

Multi-park

PROJECT: Visitor Impacts on Dunes at Indiana Dunes, Sleeping Bear Dunes, and Pictured Rocks National Lakeshores

INVESTIGATOR: ERM-North Central, Bloomington, Minnesota

CONTRACT: CX-6000-3-0134

ABSTRACT/SUMMARY: The 1984 study of visitor impact on dunes was conducted at Indiana Dunes, Sleeping Bear Dunes, and Pictured Rocks National Lakeshores. The investigation included four sites at Indiana Dunes, three at Sleeping Bear Dunes, and two at Pictured Rocks. Field methods included an onsite, personal interview survey and passive observations. Passive observations provide estimates of total use, distribution of users within each site, and the activity mix. The survey provided further information on the activity mix as well as the visitor profile, attitudes toward and knowledge of dune environments, attitudes toward facilities, and visitor origin.

Visitors to these nine areas can be placed into two groups based on observed and stated primary activities: (1) swimmers and sunbathers, and (2) dune users. Where lakes and beaches are available the dominant use is water oriented. Swimming, sunbathing, sitting/relaxing, and walking on the beach are most common. Deliberate use of the dunes typically accounts for less than five or six percent of all use. Walking in the dunes, sitting/relaxing, nature observation, and photography are common activities among the dune users. The primary difference between the groups lies in the reason they come to the recreation area: dune users come to see the dunes, swimmers are attracted by the beach and lake.

Mitigation impacts of visitors to these dune areas is most effective when measures are implemented with these two groups considered. Swimmers seek to pass directly through the dunes to the beach. Improved trail surfaces serving this group do not normally serve the dune user who desires access to the dunes and often seeks vistas for observation and photography.

Six steps are proposed in mitigating visitor impacts: (1) education, (2) direction, (3) improved trails, (4) exclusion, (5) prohibition, and (6) sanction. The appropriate level of mitigation needs to be determined based on activity characteristics, the nature of use at each site, and the management goals for each area.

Illinois-Michigan Canal National Heritage Corridor

PROJECT: Geology of the Illinois-Michigan Canal National Heritage Corridor

INVESTIGATORS: Lisa Smith, Charles Collinson, Ardith Hansel, Rod Norby, Dennis Kolata, Robert Krumm, Don Mikulic, Brian Trask, and Russ Jacobson, Illinois State Geological Survey

CONTRACT: CA-6000-5-8028

ABSTRACT/SUMMARY: The Illinois-Michigan Canal National Heritage Corridor is a new kind of national park which directs attention to geology, archeology, pre-history, history of settlement, and history of industrial development as well as economic revitalization. The I-M Corridor thus represents a zone of special federal interest for fostering restoration and recreation through open land preservation. For the first time, however, the Department of the Interior also includes economic development as one of the important reasons for park designation. In addition, the corridor represents a trend toward bringing national parks to the people, especially where natural, cultural, and recreational resources are in the midst of urbanized regions.

Nominated by the National Park Service as a historic landmark in 1963, the I-M Corridor was first seriously studied by the NPS in 1979 along with an Open Lands Project inventory. In 1980, after a series of articles in the Chicago Tribune, the Illinois congressional delegation sponsored a bill to make the canal a national park. The State of Illinois (1974) already had designated canal lands between Joliet and La Salle as the Illinois-Michigan Canal State Trail and had made substantial improvements in facilities there.

Because economic renewal is a main goal of the proposed plans, they are combined with inducements for furthering renovation in the hope that they will improve the image of the corridor and that local pride will encourage new enterprises. As plans for the corridor progressed in 1981 and the National Park Service completed its feasibility study, public meetings were held to discuss financial support. Open Lands Project sponsored a series of town forums funded by the Illinois Humanities Council, the Field Foundation, and the National Endowment for the Humanities. In addition, Open Lands suggested that Illinois Valley industry should assume a major role in guiding development. Consequently, in 1981, Chicago industrialists, led by Edmund Thornton, President of Ottawa Silica, and Thomas Flavin, General Manager of Inland Steel, founded the Upper Illinois Valley Association to promote the I-M Corridor. Mr. Gerald W. Adelmann was named Executive Secretary. In March, 1982, with the personal support of the Secretary of the Interior, James Watt, new federal legislation was introduced into Congress by the Illinois senatorial delegation and Congressman Tom Corcoran. The 98th Congress passed the Illinois and Michigan Canal National Heritage Corridor Act of 1984 in August.

In 1985, under that legislation, the National Park Service was provided with funds to produce a geological inventory of the corridor and, in that year, contracted with the Illinois State Geological Survey to do so.

Under the 1984 act, the geological studies conducted by the Illinois State Geological Survey derive from Section 112(1)(B), which states that the Secretary shall complete an "inventory of sites and resources of archeological or geological significance in the Corridor" and that he shall:

1. Develop a thematic structure for the interpretation of the heritage story of the corridor; and

2. Design and fabricate interpretative materials based on such thematic structure, including:

a. Trail guide brochures for exploring such heritage story via private auto, bus, bike, boat, or foot, including brochures for exploring such heritage story in towns along the canal;

b. visitor orientation displays (including video presentations) at eight locations which are fairly distributed along the corridor;

c. a curriculum element for local schools; and

d. an appropriate mobile display depicting such heritage story.

The Illinois State Geological Survey, with Gary Willson as National Park Service Coordinator and Charles Collinson as ISGS Coordinator, thereupon embarked upon a geological inventory of the corridor. In its inventory, the ISGS includes the entire I-M Corridor extending 100 miles from Lake Michigan, including the large triangle between the Chicago Sanitary and Ship Canal which extends to Navy Pier and the Cal-Sag Channel which extends to Calumet Harbor.

In addition to the immediate canal right-of-way, the geological inventory includes the river valleys as well as the adjacent uplands and important other nearby sites. Because of the great corridor length, only sites of special significance are considered. In later trail guides, lesser sites will be included.

The scope of work includes:

1. A geological bedrock map of the Illinois-Michigan Canal National Heritage Corridor.

2. A surficial geology map of the Illinois-Michigan Canal National Heritage Corridor.

3. Identification of geological sites of special significance for historical, tourist, scientific, or commercial interest.

4. Selection of attractive geological sites and descriptions related to the main interest.

5. Development of the quarrying industry in the Upper Illinois Valley.

6. Physiographic description and geologic history of the Illinois Valley.

7. The Quaternary history and geomorphology of the Lake Michigan outlet and the area between the canals.

8. Preparation of descriptions of significant sites which are accessible to the public.

9. Identification of subject material for trail guidebook development.

10. Development of guidebooks, display, and tourist maps.

11. Preparation of trail guides.

The present product is the first draft of an encyclopedic reference volume and represents a background document for development and planning in the corridor as well as for production of educational materials. We anticipate that it will be specially useful to high school, college and university groups as well as the popular rock and mineral clubs. Most importantly, we view the inventory as a first phase in the development of a brochure, folders, and field guides for the general public.

Isle Royale National Park

PROJECT: Wolf-moose Interactions in Isle Royale National Park

INVESTIGATORS: Rolf O. Peterson, Richard E. Page, and Kenneth L. Risenhoover, Department of Biological Sciences, Michigan Technological University, Houghton, Michigan

CONTRACT: CX-6000-3-0049

ABSTRACT/SUMMARY: Summarized here is a 27-year study of wolf and moose populations at Isle Royale National Park, undertaken in 1958 in order to clarify mechanisms of population regulation for this predator-prey system. Wolf numbers remained relatively static in the 1960s, but moose increased to a level where moose foraging adversely impacted their food supply. A series of severe winters beginning in 1969 accentuated the food problem for moose, leading to increased moose vulnerability to wolf predation. Wolves increased in the 1970s while moose declined from the direct effects of predation and malnutrition. Wolf numbers remained at a high level from 1976 to 1980, but the food level measured in winter steadily declined. When average food availability for some packs dropped to 3 kg/wolf/day, some wolves died of malnutrition and there was an increase in territorial trespassing. During 1980-82, more than 50 wolves died and the wolf population crashed to a low level of 14 individuals. The spatial and social organization of the population was completely re-structured and the wolf population then recovered to a level near the long-term average. As soon as wolf numbers were reduced, moose calf survival approximately doubled, leading to a sustained increase in the moose population during the first half of the 1980s. Food availability for wolves, estimated from their kills during a 50-day period in winter, provided an adequate basis for understanding wolf population fluctuations. Moose population size, in turn, was largely determined by wolf predation level, which was sufficient to hold moose for long periods below levels at which forage limitation was influential. Wolf predation, however, was not sufficient to maintain moose at a low, stable equilibrium; rather, moose slowly "escaped" to a higher population level where forage limitations brought about increased malnutrition and vulnerability to wolves. This scenario represents our most recent characterization of wolf-moose dynamics at Isle Royale, a long-term cycle lasting 30 years or more that can be attributed to interactions among wolves, moose, and vegetation. We think trophic interactions among all three levels must be integrated in order to adequately understand the Isle Royale system. Long-term study has proven essential to discovering critical aspects wolf-moose dynamics. By comparison, our understanding of moose-forage interaction is in its infancy. Management recommendations can be summarized as follows: (1) minimize human influence of wolf-moose dynamics (primarily distribution and mortality of both moose and wolves); (2) continue to allow all naturally-occurring fires to burn unimpeded; and (3) continue monitoring and research efforts.

Pictured Rocks National Lakeshore

PROJECT: Long Term Implications, From a Geomorphological Standpoint, of Maintaining H-58 in Its Present Location at Grand Sable Lake

INVESTIGATORS: John P. Farrell and John D. Hughes, Department of Geography, Earth Science, Conservation and Planning, Northern Michigan University, Marquette, Michigan

CONTRACT: PX-6000-4-0839

ABSTRACT/SUMMARY: A 9-month investigation of the long-range implications, from a geomorphological standpoint, of maintaining county road H-58 in its present location at Grand Sable Lake was completed in July of 1985. The eastern low plateau section of Grand Sable Dunes was investigated in order to provide an historical background to the present physiography. A detailed investigation of the problem sandhill (dune) just to the north of Grand Sable Lake was carried out to provide data for a long-term (50 years) prediction of sand behavior. Geologic history, sand composition, sand structure, and historical and present surface contours were used in this phase of investigation.

The data reveal an accelerating rate of loss of sand from the study area. This seems to correspond directly with the accelerating human use of the area. Increasing human use affects the physical system in several ways. The fragile vegetation on the upper surface of the dune is destroyed, exposing the surface to the wind. The human-induced mass wasting on the slip face of the sandhill is increasing each year. Human access to the dunes at this location, combined with the physical characteristics of this dune, will perpetuate the present problem of sand on H-58. Seven options for mitigating the problem are discussed and summarized on the basis of relative cost over a 50-year period, impact on the environment, and effectiveness in solving the sand problem. The use of a tunnel ranks highest using this array of factors.

Pipestone National Monument

PROJECT: Small mammal habitat use and some population parameters of *Microtus pennsylvanicus* and *Sorex cinereus* at Pipestone National Monument

INVESTIGATOR: Ellen Jane Snyder, Department of Animal Ecology, Iowa State University, Ames, Iowa

CONTRACT: IA-6000-4-8002

ABSTRACT/SUMMARY: Macro- and micro-habitat features were used to assess small mammal habitat use in a variety of macrohabitats ranging from dry, sloping grasslands to moist, low-lying shrubland at Pipestone National Monument, Minnesota. *Microtus pennsylvanicus* occupied the most moist sites, which included riparian shrubland, tallgrass prairie, and mesic grassland. *Peromyscus maniculatus* were most abundant in rock outcrop-grassland in 1984 and in disturbed tallgrass prairie in 1985. *P. leucopus* were restricted almost exclusively to oak-ash woodland. *Sorex cinereus*, the most ubiquitous species, occupied all macrohabitats. *M. pennsylvanicus* and both *Peromyscus* spp. were associated with different microhabitat features in the 2 years of the study. *S. cinereus* was positively associated with density of vegetation 50 cm above ground in both years. Microhabitat measurements did not differ between years, but considerably more rainfall fell during June 1984 than during June 1985. Year-to-year variation in small mammal distribution and habitat use patterns may be a result of changing microclimate conditions. Measurements of soil moisture, humidity, and similar microclimate features were not measured, but perhaps would have shown yearly differences.

Pipestone National Monument

PROJECT: Vegetation Survey and Prairie Management Plan for Pipestone National Monument

INVESTIGATORS: Donald A. Becker, Ecosystem Management, Elkhorn, Nebraska; Thomas B. Bragg and David M. Sutherland, University of Nebraska-Omaha

CONTRACT: CX-6000-2-0076

ABSTRACT/SUMMARY: Study objectives were to develop a park herbarium and a prairie management plan. The plan outlines actions needed for restoring a vegetation scene that resembles the historic period of the mid-1800s.

A variety of research and planning methods were used to identify and define the vegetation resource problems. Among these were ecological surveys that established a qualitative and quantitative data base. Analysis of past conditions and trends, and compilation of management response data for key or critical species was also conducted. This information was used to define probable future conditions of the flora and vegetation under present management practices.

Communities in the park ranged from near pristine to severely degraded. Old field communities, dominated by exotics, were undergoing initial stages of native forb succession. Native grass establishment, however, was a very slow process because of the dominance of cool season, exotic grasses. A few old pasture areas had a diverse complement of native grasses and forbs. They are in good condition, although most have been extensively invaded with smooth brome or quackgrass. Both the old fields and pastures need considerable restoration work. The virgin prairie area is in generally good condition, but can be improved in low-lying areas by better management of fire and mulch for control of Kentucky blue grass. Many rock outcrops have been invaded by bluegrasses, shrubs, and trees. Buckthorn and honeysuckle are two exotics that need to be removed from these areas. Rock outcrop landscapes can be restored to near the historic condition if woody vegetation is controlled by fire and prairie vegetation is allowed to regenerate.

Stream and prairie wetland degradation was identified as the most critical resource problem in the park. Its origin lies deep in several historical, economic, and cultural circumstances--resolution of this problem involves cooperation of adjacent landowners and interests. Stream hydrology and water quality have been drastically changed since the late 1800s, and as a result about 20 species of wetland plants have become extirpated from the park, with another 10 species threatened.

Extirpation of native prairie plants is another serious problem. Eight species have disappeared since 1967, and about another dozen may no longer have biologically viable populations.

Opportunities to resolve the above problems and to enhance existing park resources are identified for long- and short-term considerations. Long-term

work requires assistance from the NPS Regional Office and cooperation from other governmental agencies and the resource consuming public. Short-term work can be done with existing staff resources. Plans for this work emphasize more frequent burning, additional mowing and chemical use, continuing tree and brush cutting, monitoring of plant communities and critical species, and native plant restoration. Long-term plans emphasize further research and studies to resolve some of the more complicated or poorly understood resource systems such as streams and wetlands.

Saint Croix National Scenic Riverway

PROJECT: Development and Use of the Index of Biotic Integrity to Monitor Fish Communities in the Saint Croix National Scenic Riverway

INVESTIGATOR: Kurt D. Fausch, Department of Fishery and Wildlife Biology, Colorado State University, Ft. Collins, Colorado

CONTRACT: PX-6000-6-0380

ABSTRACT/SUMMARY: The index of biotic integrity (IBI), developed to monitor water resource quality in midwestern U.S. streams, appears to be an ideal tool for resource managers to evaluate the quality of lotic ecosystems in national parks and national wild, scenic, and recreational riverways. This index, which is based on 12 attributes of stream fish communities, was modified for use in the Saint Croix National Scenic Riverway along the Wisconsin-Minnesota border. Changes in fish communities in a northward direction were incorporated into the index by changing several community attributes, so the index would be more sensitive to environmental perturbations. For instance, the "percent of individuals as green sunfish" would not have been a useful matrix in the St. Croix River basin because the sunfish taxon declines to the north, and green sunfish are only sporadically distributed there. Because the white sucker is a very tolerant ecological generalist that fulfills a similar ecological role, this attribute was changed to the "percent of individuals as white sucker." Using data collected by the Wisconsin Department of Natural Resources, I was able to calculate the IBI for 38 sites along the main St. Croix River channel and 18 sites along the Namekagon River, as well as for 6 samples collected at these sites during 1908-1928 by early investigators. Analysis was complicated by incomplete identification of some fish species, and incomplete counts for some abundant species. No federally-listed endangered or threatened species occur in the basin, but three species considered endangered by Wisconsin, and three state-listed threatened species occur there. Only one of the endangered species has been captured recently. The proximity of sites to larger rivers and lakes affects the number of species expected, so sites close to these sources of colonist species must be deleted from IBI calculations, or the inflation of species must be taken into account. The maximum species richness line for the St. Croix basin is similar to lines for other midwestern or "Woodland" streams. While certain individual taxa, like suckers (Catostomidae) are well represented in the basin, both darters (subfamily Etheostomatinae: family Percidae) and sunfish (Centrarchidae) are depauperate compared to basins to the south. However, all maximum species richness lines are useful for setting IBI scoring criteria for the basin. Most sites along the St. Croix Riverway downstream from the Namekagon River confluence scored in the Fair, Good, or Excellent classes of the IBI. Several sites near the confluence with the Mississippi River and one just downstream from the hydroelectric dam at St. Croix Falls appear to be affected by perturbations there, and several others deserve further sampling to determine whether a problem exists. All samples from 1908-1928 had lower IBI scores than later samples at the same sites. For most sites this was probably due to the relatively inefficient seining gear used. The IBI scores

for sites along the Namekagon River generally declined in an upstream direction, but the four dams along this reach do not appear to be the cause. More likely, inadequate sampling, inappropriate maximum species richness lines, natural refractory organic compounds in the water, or other forms of environmental degradation contribute to the cause, so this reach deserves further sampling and analysis. The decline in the number of large river fish species along the riverway also shows no indication that the upstream dams have a significant effect. Finally, recommendations are made about factors to consider when choosing sampling sites and methods for future biomonitoring to assess the biotic integrity of fish communities.

Voyageurs National Park

PROJECT: An Analysis of the Effects of Fluctuating Water Levels on Littoral Zone Macrophytes in the Namakan Reservoir/Rainy Lake System and The Flora of Voyageurs National Park

INVESTIGATOR: Paul H. Monson, Department of Biology and Olga Lakela Herbarium, University of Minnesota-Duluth, Duluth, Minnesota

CONTRACT: CX-6000-2-0039

ABSTRACT/SUMMARY: In the Rainy Lake/Namakan Reservoir System in Voyageurs National Park, Minnesota, annual water level fluctuations average 3.6 feet in Rainy Lake and 9.3 feet in Kabetogama, Namakan, and Sand Point Lakes. To study the effects of these fluctuations on littoral zone macrophytes, biomass samples were obtained from eleven selected sites during the summers of 1982 and 1983. The data available as the result of these field studies include site characteristics and above-substrate biomass for each species of plant in each of four 0.25-square meter quadrat samples of emergent, floating-leaf, and submerged zone macrophytes at each site. Data were examined in a comparison with previously published records of the effects of fluctuating water levels on aquatic macrophytes, by a standard analysis of variance, in an adaptation of Morisita's Index of Community Similarity, and by Detrended Correspondence Analysis. The picture that emerges includes a number of inconsistencies, but there is little to suggest that the aquatic macrophytes in these four lakes are responding differentially to the annual water level fluctuations. It is suggested that the inconsistencies which occur might be explained on the basis of inadequacies in the sampling effort and by the fact that there is no consistency in either the magnitude or timing of the annual water level fluctuations.

To supplement vouchers included in the Olga Lakela Herbarium, specimens of both aquatic and terrestrial plants were obtained during the 1982 and 1983 field seasons. On the basis of the presently available record, the VNP flora includes 602 species of vascular plants in 277 genera of 89 families. The 1982-83 collections added 45 species to the record assembled by Olga Lakela in 1949-55, including one species, Tillaea aquatica L., previously known in Minnesota only from the extreme southwest. The flora does not include any species federally designated as endangered or threatened. At the State of Minnesota level, however, two species in the VNP flora are listed as endangered (Littorella americana Fern. and Subularia aquatica L.) and one is listed as threatened (Carex sterilis Willd.). The appended checklists include family name, common name, collector, collection number, collection date, and collection location for each of the approximately 2,900 vouchers.

Sleeping Bear Dunes National Lakeshore

PROJECT: The Terrestrial Vegetation and Flora of the Mainland Portion of Sleeping Bear Dunes National Lakeshore, Benzie and Leelanau Counties, Michigan

INVESTIGATOR: Brian T. Hazlett, Department of Biology, The University of Michigan

CONTRACT: CX-6000-4-0072

ABSTRACT/SUMMARY: The vegetation and flora of the mainland portion of Sleeping Bear Dunes National Lakeshore was surveyed during the summers of 1984 and 1985 in scope similar to that of a previous study of the Manitou Islands. The vegetation associations were mapped and described, and a catalogue of 704 vascular plant species compiled. Ten permanent plots were established within the study area to observe any future vegetation changes at selected sites. The mainland distributions of nine native species listed as threatened or of special concern by the State of Michigan were noted and fragile habitats identified. An investigation of the habitat, frequency, and distribution of the Sleeping Bear Dunewort, a potentially new species of Botrichyum discovered on the area's perched dunes, was made. Recommendations concerning the resource management of the mainland were proposed.

MIDWEST REGION RESEARCH/RESOURCES MANAGEMENT REPORTS

The following reports were published by the Research and Science Division:

MWR-1 Willson, G. D. and Gary L. Larson. 1982. Abstracts of park research funded by the Midwest Regional Office, 123 p. National Park Service: 1975-1982.

MWR-2 Wilcox, D. A. 1982. The effects of deicing salts on water chemistry and vegetation in pinhook bog, Indiana Dunes National Lakeshore. 139 p.

MWR-3 Palmes, E. J. 1983. The flora and natural history of George Washington Carver National Monument. 39 p.

MWR-4 Morey, G. B. 1983. Evaluation of catlinite resources, Pipestone National Monument, Minnesota. 48 p.

MWR-5 Henderson, N. R. 1982. A comparison of stand dynamics and fire history in two black oak woodlands in northwestern Indiana. 52 p.

MWR-6 Pestana, Karen E. 1985. Problem exotic plants in selected parks of the Midwest Region and a bibliography on their management. 75 p.

MWR-7 Cook, John G., Roberta M. Tietge, and Stanley H. Anderson. In prep. Results of surveys and management recommendations for rare diurnal raptors on National Park Service lands, Midwest Region. 55 p.

PUBLICATIONS AND REPORTS

Listed below are technical publications and reports about Midwest Region parks or by Midwest Region personnel.

Bailey, Merryll D., Susan M. Monk and Margaret D. Ludwig (eds.). 1985 Proceedings of the Seventh Annual Research Conference, Apostle Islands National Lakeshore, October 18, 1985. U.S. Department of the Interior, National Park Service, Research and Science Division, Midwest Regional Office, Omaha, Nebraska 68102. 18 pp.

Bennett, J. P. Berrang, D. F. Karnosky, and R. A. Mickley. 1986. Natural section for ozone tolerance in Populus tremuloides. Canada Journal of Forest Resources. 16:1214-1216.

Cole, K. L., A Two-creekan spruce forest at the south end of Lake Michigan, p. 35-37, In, Hansel, et al., Quaternary records from northeastern Illinois and northwestern Indiana, Field Guide for the ninth biennial meeting of the American Quaternary Association, Illinois State Geological Survey. 1986. (Field Guide Chapter).

Cole, K. L., Late Holocene dune formation, erosion, and vegetational development along the southern shore of Lake Michigan, p. 45-51, In, Hansel, et al., Quaternary records from northeastern Illinois and northwestern Indiana, Field Guide for the ninth biennial meeting of the American Quaternary Association, Illinois State Geological Survey. 1986. (Field Guide Chapter).

Hess, W., H. Bowles, R. Hiebert, and M. DeMauro. 1986. Rare plant inventory and monitoring program for the Indiana Dunes National Lakeshore. Natural Areas Journal. 6:18-26.

Hiebert, Ronald D., and Noel B. Pavlovic. 1986. Role of past land use on succession at the Indiana Dunes; implications for management Proceedings of First Indiana Dunes Research Conference (in press).

Hiebert, R. D., D. W. Wilcox, and N. B. Pavlovic. 1986. Vegetation patterns in an among pannes (calcareous intradunal ponds) at the Indiana Dunes National Lakeshore. Am. Midl. Natur. 116:276-284.

Peterson, Rolf O. 1986. Ecological studies of wolves on Isle Royale. Annual Report, 1985-1986. Michigan Technological University, Houghton, Michigan. 8 pp.

Resenhoover, K. L. and R. O. Peterson. 1986. Mineral licks as a sodium source for Isle Royale moose. Oecologia (Berlin).

Ruggiero, M. A. and H. C. Merchant. 1986. Estimated energy budget for a population of eastern tent caterpillars (Lepidoptera: Lasiocampidae) in Maryland. Environmental Entomology. 15(4):795-799.

Stottlemyer, R. 1986. Evaluation of anthropogenic atmospheric inputs on national park ecosystems. Env. Mgt. 11(1):91-97.

Wilcox, D. A. 1986. The effects of deicing salts on water chemistry in Pinhook Bog, Indiana. Water Resour. Bull. 22:57-65.

Wilcox, D. A. 1986. The effects of deicing salts on vegetation in Pinhook Bog, Indiana. Can. J. Bot. 64:865-874.

Wilcox, D. A., R. J. Shedlock, and W. H. Hendrickson. 1986. Hydrology, water chemistry, and ecological relations in the raised mound of Cowles Bog. J. Ecol. 74:1103-1117.

Willson, G. D. and T. W. Vinyard. 1986. Changes in the Lichen Flora of Pipestone National Monument, Minnesota. Prairie Nat. 18(1):9-14.

MIDWEST REGION SCIENCE AND RESOURCES MANAGEMENT PERSONNEL

This section lists Midwest Region Science and Resources Management personnel (full-time only). It provides their affiliation and special interests to aid communication and interaction among natural resources personnel in the National Park Service.

MIDWEST REGION SCIENCE PERSONNEL

Scientist	Position	Location/Phone	Research/Resource Management Interest
Bailey, Merryll	Ecologist	Apostle Islands (715) 779-3397	fisheries biology, endangered species management
Cole, Kenneth	Plant Ecologist	Indiana Dunes (219) 926-7561	fire ecology and history, plant ecology, quaternary geology and paleoecology
Gogan, Peter	Research Biologist	Voyageurs (218) 283-9821	ungulate biology, elk restoration
Foster, David	Biologist	Ozark (314) 323-4236	aquatic ecology
Hiebert, Ronald	Supervisory Plant Ecologist	Indiana Dunes (219) 926-7561	restoration ecology, plant community ecology, succession, plant population biology, dune ecology
Kallemeyn, Larry	Aquatic Research Biologist	Voyageurs (218) 283-9821	fisheries biology, limnology
Pavolvic, Noel	Statistician (Biology)	Indiana Dunes (219) 926-7561	plant ecology, biostatistics, plant identification, succession, tallgrass prairie ecology, deciduous forest ecology, seed identification, seed banks, entomology
Ruggiero, Michael	Regional Chief Scientist	Midwest Regional Office (402) 221-3438	aquatic ecology, insect ecology, population ecology, ecological energetics, integrated pest management
Stottlemyer, Robert	Ecologist	CPSU/Michigan Technological University (906) 487-2478	atmospheric deposition, materials cycling in ecosystem, limnology
Weisbrod, Richard	Research Biologist	Saint Croix (715) 483-3284	biogeography, ornithology, marine and non-game birds, vertebrate ecology, mammalogy

MIDWEST REGION SCIENCE PERSONNEL

Scientist	Position	Location/Phone	Research/Resource Management Interest
Wilcox, Doug	Aquatic Research Ecologist	Indiana Dunes (219) 926-7561	aquatic ecology, wetlands ecology, wetland hydrology and chemistry
Willson, Gary	Ecologist	Midwest Regional Office (402) 221-3438	ornithology, prairie ecology, fire ecology, resource management planning, rare and exotic species management, research administration

MIDWEST REGION RESOURCE MANAGEMENT PERSONNEL

Resource Manager	Position	Location/Phone	Research/Resource Management Interest
Baxter, Shirley	Park Ranger (Resource Management)	George Washington Carver (417) 325-4151	prairie restoration, water quality
Benedict, James	Biologist	Voyageurs (218) 283-9821	wilderness management, fire management, geographic information systems
Brunansky, Louis	Environmental Protection Specialist	Indiana Dunes (219) 926-7561	air quality monitoring
Elmore, George	Park Ranger (Resource Management)	Fort Larned (316) 285-6911	prairie restoration, prairie monitoring, prairie dog biology
Grant, Victoria	Resource Management Specialist	Saint Croix (715) 483-5284	fire management, vegetation management
Gulvin, Jack	Resource Management Specialist	Cuyahoga Valley (216) 526-5256	minerals management, soils
Harris, Richard	Resource Management Trainee	Indiana Dunes (219) 926-7561	recreational impacts on wildlands, revegetation racoon population ecology/parasitology
Holden, Max	Resource Management Specialist	Sleeping Bear Dunes (616) 334-4042	wildlife management, vegetation restoration
Holmes, Ben	Resource Management Specialist	Midwest Regional Office (402) 221-3475	forestry, fire management
Konz, Leon	Supervisory Park Technician	Indiana Dunes (219) 926-7561	fire management
Kopcak, Dave	Soil Conservationist	Cuyahoga Valley (216) 526-5256	site restoration, erosion control

MIDWEST REGION RESOURCE MANAGEMENT PERSONNEL

Resource Manager	Position	Location/Phone	Research/Resource Management Interest
Krumenaker, Robert	Resource Management Specialist	Isle Royale (906) 482-0986	computers in natural resources, geographic information systems water resource management
Loope, Walter	Resource Management Specialist	Pictured Rocks (906) 387-2607	plant community ecology, watershed dynamics
Meldrum, Janis	Resource Management Specialist	Apostle Islands (715) 779-3397	aquatic biology, soils
Oelfke, Jack	Resource Management Trainee	Wilson's Creek (417) 732-2662	geomorphology, endangered plants, water quality
Oviatt, George	Resource Management Specialist	Scotts Bluff (308) 436-4340	prairie restoration, resource management planning
Rovang, Rodney	Park Ranger (Resource Management)	Effigy Mounds (319) 873-2169	wildlife biology, environmental law enforcement, international resource management programs
Simpson, James	Resource Management Specialist	Ozark (314) 323-4236	wildlife management
Sullivan, Gary	Park Ranger (Resource Management)	Homestead (402) 223-3514	prairie restoration
Williamson, Garree	Resource Management Specialist	Cuyahoga Valley (216) 526-5256	vegetation management, water quality monitoring, minerals management
Wobbenhorst, Jan	Supervisory Park Ranger	Indiana Dunes (219) 926-7561	resource management planning

APPENDIX A

PARK CODE	PARK NAME	STATE
AGFO -	Agate Fossils Bed National Monument	Nebraska
APIS -	Apostle Islands National Lakeshore	Wisconsin
CUVA -	Cuyahoga Valley National Recreation Area	Ohio
EFMO -	Effigy Mounds National Monument	Iowa
FOLS -	Fort Larned National Historic Site	Kansas
FOSC -	Fort Scott National Historic Site	Kansas
GWCA -	George Washington Carver National Monument	Missouri
GRPO -	Grand Portage National Monument	Minnesota
HEHO -	Herbert Hoover National Historic Site	Iowa
HOME -	Homestead National Monument of America	Nebraska
INDU -	Indiana Dunes National Lakeshore	Indiana
ISRO -	Isle Royale National Park	Michigan
LIBO -	Lincoln Boyhood National Memorial	Indiana
MOCI -	Mound City Group National Monument	Ohio
OZAR -	Ozark National Scenic Riverways	Missouri
PIPE -	Pipestone National Monument	Minnesota
PIRO -	Pictured Rocks National Lakeshore	Michigan
SACN -	Saint Croix National Scenic Riverway	Wisconsin
SCBL -	Scotts Bluff National Monument	Nebraska
SLBE -	Sleeping Bear Dunes National Lakeshore	Michigan
VOYA -	Voyageurs National Park	Minnesota
WICR -	Wilson's Creek National Battlefield	Missouri

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environment and cultural value of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
SCIENCE PUBLICATIONS OFFICE
75 SPRING ST., S.W.
ATLANTA, GEORGIA 30303