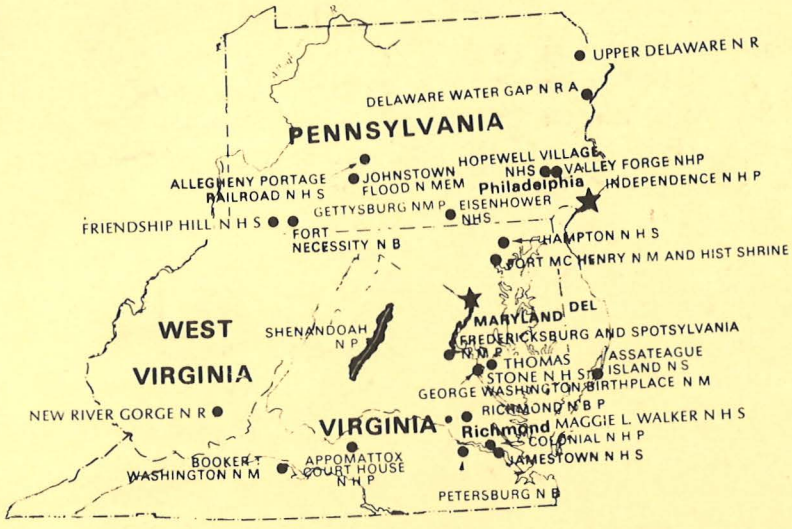


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MID-ATLANTIC REGION

RESEARCH/RESOURCES MANAGEMENT REPORT

SUMMARY OF RESEARCH OBJECTIVES, ACCOMPLISHMENTS, AND FUTURE NEEDS FOR THE STUDY OF APPROPRIATE RIVER RECREATION USE ON THE

- Delaware Water Gap National Recreation Area
- New River Gorge National River
- Upper Delaware Scenic and Recreational River


U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE



MID-ATLANTIC REGIONAL OFFICE
143 SOUTH THIRD STREET
PHILADELPHIA, PENNSYLVANIA 19106

The Mid-Atlantic Region (MAR) of the National Park Service is the central administrative office for 28 park units in five states: Maryland, New Jersey, Pennsylvania, Virginia, and West Virginia. The diversity of parks and their resources is reflected in their designations as national parks, national seashores, national historic parks, national recreational areas, national military parks, and national rivers.

The MAR Branch of Resource Protection administers scientific consultation, research, and monitoring efforts in these parks, involving a wide range of biological, physical, and social sciences. The Research/Resources Management Series was established as a medium for distributing current scientific information obtained from studies designed to improve the management, protection and interpretation of park resources. Information contained in this Series is potentially useful to other Park Service areas outside the MAR and also benefits independent researchers working in the parks and elsewhere. The Series provides for the retention of research information and makes possible more complete in-house evaluation of internal research, technical, and consultant reports.



The Series includes:

1. Research reports which directly address resource management problems in the parks.
2. Literature reviews and bibliographies of existing information relative to park resources or resource management problems.
3. Presentations of basic resource inventory data.
4. Other applicable reports relating to the research and resource management programs of the Mid-Atlantic Region.

Research/Resources Management Reports are produced in limited quantities and, as long as the supply lasts, copies may be obtained from the Branch of Resource Protection, Mid-Atlantic Region.

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Recreational River

Submitted to:
USDI National Park Service
Mid-Atlantic Region
Philadelphia, PA

Coordinated by:
David W. Lime
Department of Forest Resources
College of Natural Resources
University of Minnesota
St. Paul, MN 55108

January 18, 1989

PREFACE

In 1984, the Mid-Atlantic Region of the National Park Service entered into a cooperative agreement with the U.S. Forest Service's North Central Forest Experiment Station to investigate appropriate river recreation use on three rivers--the Upper Delaware Scenic and Recreational River, the Delaware Water Gap National Recreation Area, and the New River Gorge National River. A comprehensive, in-depth research plan was designed with a strategy that focused on providing information to help in the development of management objectives for recreational use of the study rivers. Topics dealt with the most important persons or groups involved in influencing management directions for the river (the managers, the users, the commercial sector, and inhabitants of the region, including interest groups and riparian landowners), the legal and administrative directives that guide actual decision-making, and the impacts of recreational uses on the environment being managed.

The research plan emphasized the human component of the resource. While there are many concerns with the ecological impacts of recreational use, most of the issues raised with regard to management of the study rivers involve concerns over the human element, including use-related problems and conflict. Thus, a major part of the research effort intended to identify the elements of the human community involved with the study rivers, and how those elements interact with respect to the rivers.

Through a process of reviewing past research and management information as well as brainstorming and numerous meetings with research administrators, researchers and other knowledgeable persons, a comprehensive list of information needed and potential research topics was generated. From this list, 13 separate studies were funded during the past five years involving both National Park Service and university scientists nationwide. Several studies have been completed; others are in progress. This "report" summarizes those research activities associated with the study of appropriate river recreation use. For each of the 13 studies, study investigators, period of study, research objectives, progress to date and expected products (published papers, reports, presentations), and future needs for further activities are identified. The research is grouped into four major subject components targeted toward those areas most important to understanding management of appropriate recreational use. They involve:

- 1) the environment and impacts resulting from recreation use,
- 2) the nature of the users and their recreational experiences,
- 3) the social and economic aspects of the region impacted by recreational use of the rivers, and
- 4) the management system that is involved to oversee and protect the resource.

The four research components are briefly described below. At the conclusion of these descriptions is a table which identifies the 13 studies associated with the research. For each study the investigator(s) is identified as well as the starting and completion

date for the research. An appendix identifies the current mailing address and phone number for each investigator.

Ecological Component

Research focuses on five issues: (1) analysis of site impacts--characterize vegetation and soil related impacts occurring on recreation sites and the relations of such impacts to visitor types and use levels and environmental conditions, (2) monitoring of resource impacts--develop objective methods to monitor resource impacts on recreation sites over time, (3) evaluation of site management strategies--characterize recovery rates and rehabilitation effectiveness of sites closed to recreational use, (4) analysis of trespass--characterize the amount of trespass by river floaters on private land and the nature of resource impact caused by such activity, and (5) fish and wildlife impacts--characterize the types of fish and wildlife impacts potentially caused by river recreation activity.

User Behavior Component

The question of what constitutes an appropriate recreation experience is strictly a matter of personal taste. It is not a question science can answer. However, research can document what experiences are desired from the perspective of the recreationist. It also can specify the conditions which are necessary for these experiences to be generated. Having identified the necessary conditions, research can then help evaluate the effectiveness of various management strategies in creating or maintaining them.

The research strategy of this component is organized around three sequential goals: (1) specify appropriate recreation experiences which would be provided on the three study rivers through an improved understanding of the desired experiences of various clientele groups (recreationists, riparian landowners, etc.), (2) specify critical elements of the resource and social settings necessary to generate appropriate experiences, and (3) evaluate the effectiveness of alternate management strategies to generate appropriate experiences.

Socio-Economic Component

Research focuses on five issues: (1) community analysis--identify the members of the communities, including riparian landowners, who have an interest in the management of the rivers and how community members or groups relate to one another. Additional information was sought concerning the relationships of community members to the river resource and the National Park Service as the sole or cooperating management agency, (2) analysis of outfitting and outfitters--identify the nature and extent of outfitter operations, outfitters' perceptions of Park Service management directions, and the potential for developing additional cooperative relationships with them to manage the river for the maximum possible benefit, (3) regional economic impact--examine the contribution to the local and regional economy of recreation use of the

study rivers. Such information will help evaluate potential impacts to the region of expanding or limiting recreation opportunities in these settings, (4) regional supply and demand--identify other river resources in the region and the types of opportunities provided compared to the study rivers, and project demand for future types of regional recreation opportunities, particularly those provided by the study rivers, and (5) economic efficiency of management decisions--determine the net economic benefits produced from the implementation of potential management strategies.

Managerial Component

Managers are basically one component of a broader social system in each of the river settings under study. The interactions of managers with others, their perceptions of problems, and the ways in which they define and implement solutions are not fixed, but tend to vary across situations, environments and managers. The current management issues are as diverse as are the proposals from various interested parties to influence that management. This underscores the need to understand management's role in the overall picture and to attempt to make it as effective as possible in dealing with the concerns of these varied and divergent interests.

Research focuses on three issues: (1) legislative analysis--analyze the legislation and precedents to determine if there are indications in these sources to assist managers in adopting use-related objectives and techniques appropriate for these three rivers as well as to help guide specific research activities, (2) management system analysis--examine the current management processes on the three study rivers through in-depth interviews with managers to generate information concerning their strategies of management, problem definition, use of research, and communication with various publics, and (3) management technology--understand the ways in which managers use scientific information and translate it into managerial action as well as develop or apply technologies such as computer graphics to display the nature and consequences of potential management actions.

STUDY OF APPROPRIATE RIVER RECREATION USE
RESEARCH PROJECT SUMMARY

Title	Investigators	Start Date	Completion Date
A. ECOLOGICAL COMPONENT			
Recreational carrying capacity: An evaluation of experience and resource indicators	David W. Lime and Jeffrey L. Marion	July 1984	August 1985
Resource impact assessment and monitoring	Jeffrey L. Marion	June 1985	June 1989
A research reconnaissance for studies of resource impacts, site recovery and rehabilitation on the Delaware and New Rivers	Jeffrey L. Marion David N. Cole	June 1985	June 1986
Resource impacts at Upper Delaware Scenic and Recreational River, Delaware Water Gap National Recreation Area and New River Gorge National River: Evaluation of impacts, their causes, recovery rates and potential management	Jeffrey L. Marion David N. Cole	March 1986	July 1989
Identification and preliminary analysis of river recreation impacts on fish and wildlife	Joseph W. Roggenbuck, Michael Patterson and James D. Fraser	June 1985	October 1986
B. USER BEHAVIOR COMPONENT			
Visitor behavior in natural environments—defining the nature of the recreation experience	Richard Schreyer Richard C. Knopf	February 1986	February 1987
Initiation of field research on the definition of visitor experiences at the Upper Delaware Scenic and Recreational River and the Delaware Water Gap National Recreation Area	Alan R. Graefe, Richard C. Knopf and Fred Humphrey	June 1985	May 1987
User behavior, perceptions and expenditures as inputs to the determination of appropriate use in river recreation environments	Alan R. Graefe and Richard C. Knopf	May 1986	September 1987
C. SOCIO-ECONOMIC COMPONENT			
Recreation impact and value estimations on rivers: An economic study of the Delaware Water Gap, Upper Delaware and New Rivers	H. Ken Cordell	June 1986	June 1987
An analysis of the relationships between the federal presence and local communities in two National Park Service river areas	Ben W. Twight and Matthew S. Carroll	May 1985	July 1987
Exploring the potential partnership of river outfitters in managing public rivers	Joseph W. Roggenbuck and David W. Lime	December 1985	September 1988
D. MANAGERIAL COMPONENT			
Managerial perspectives on determining appropriate river use	J. Douglas Wellman	June 1985	January 1989
Analysis of legislative and legal foundations for establishing carrying capacity of three river resources	Leo McAvoyn and Steve Simpson	June 1985	September 1987

A. ECOLOGICAL COMPONENT

Title: Recreational carrying capacity: An evaluation of experience and resource indicators. FS-NC-4901 (84-06).

Investigators: David W. Lime and Jeffrey L. Marion

Starting Date: July 1984 Completion Date: August 1985

Objectives:

This study preceded the development of all other cooperative research studies and was designed to assemble information concerning potential carrying capacity planning frameworks, experience and resource impact indicators, and appropriate indicator inventory and monitoring methods.

1. Assess the potential applicability of the Limits of Acceptable Change recreation resource planning system.
2. Identify potential indicators of experience and resource impacts for the riparian environments of three USDI National Park Service units.
3. Develop processes to inventory the existing range of candidates for potential indicators.
4. Evaluate and recommend methods for monitoring selected indicators.

Accomplishments:

An in-depth review of the literature concerning the Limits of Acceptable Change planning framework was conducted. Managers and researchers who have implemented this framework were consulted and information gathered was presented to researchers and managers involved in the current studies. For each Park unit, lists of potential indicators of experience and resource impacts were compiled from previous research, management documents, and site visits. Procedures to inventory and monitor resource impact indicators on river recreation sites were developed. A comprehensive bibliography of recreation use estimation and measurement techniques was compiled from a review of the literature for the following methods: observation, surveys, photographic techniques, traffic counters, self registration, permits, and trail counters.

Products:

1. Marion, J. L. 1984. Campsite impact assessment systems: Application, evaluation, and development. In: 1984 National River Recreation Symposium Proceedings, Oct. 31-Nov. 3. Baton Rouge, LA. Joseph S. Popadic and others (editors), School of Landscape Architecture, Louisiana State University, Baton Rouge, LA, pp. 551-573. Poster presentation also given at Conference.

2. Marion, J. L. 1984. Methods for estimating recreational use: A bibliography. Unpublished report prepared in response to research agreement between USDA Forest Service, North Central Forest Experiment Station and USDI National Park Service, Mid-Atlantic Region, 12 pp.

3. Marion, J. L., D. N. Cole and D. Reynolds. 1985. Limits of Acceptable Change: A framework for assessing carrying capacity. Park Science 6(1):9-11.

4. Marion, J. L. and D. W. Lime. 1986. Recreational resource impacts: Visitor perceptions and management responses. In: Wilderness and Natural Areas in the Eastern United States: A Management Challenge. David L. Kulhavy and Richard N. Conner (editors), School of Forestry, Stephen F. Austin State University, Nacogdoches, Texas. pp. 229-235. Paper presented at Conference.

Future Needs:

None. Components of this study have been continued and expanded under other study numbers.

Title: Resource impact assessment and monitoring. FS-NC-4901 (86-01).

Investigator: Jeffrey L. Marion

Starting Date: June 1985

Completion Date: June 1989

Objectives:

Growing river recreation use within the river corridors at Delaware Water Gap National Recreation Area and the New River Gorge National River is causing a variety of physical and biological changes to recreation resources. Managers are finding a need for objective and standardized methods to assess and monitor these resource impacts.

1. Complete development of impact assessment and monitoring systems at the Delaware Water Gap National Recreation Area.
2. Explore and document the potential of microcomputer data storage and retrieval for impact assessment and monitoring information.
3. Conduct a comprehensive inventory and impact assessment for recreation sites at the Upper Delaware Scenic and Recreational River.

Accomplishments:

Site visits and meetings with resource managers were conducted to select appropriate resource impact parameters, develop field measurement procedures, and to train field personnel. At Delaware Water Gap and New River Gorge, National Park Service seasonal staff completed all field measurements and forwarded the data to the investigator for analysis. Final reports and the development of microcomputer menu-driven dBASE III programming for future management input, analysis, and output of impact monitoring data is completed for Delaware Water Gap and underway for the New River Gorge. An inventory and impact assessment for recreation sites at the Upper Delaware has been completed along with preparation of a final report.

Products:

Publications:

1. Marion, J. L. 1987. Campsite impact monitoring systems: Application and development. In: North Atlantic Region Conference on Science and Resource Management in Northeast National Parks. University of Massachusetts, Amherst, MA, March 30-31, 1987. Paper presented at Conference.
2. Marion, J. L. 1988. Inventory and impact monitoring of river campsites within the Delaware Water Gap National Recreation Area. Final Report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 36, 94 pp.

3. Marion, J. L. 1988. An inventory and assessment of impacts for river accesses and trespass recreation sites at the Upper Delaware Scenic and Recreational River. Unpublished Mid-Atlantic Region Research Report, 25 pp.

4. Marion, J. L. and D. N. Cole. 1987. Recreational impact assessment and monitoring systems: Past, present and future. In: Conference on Science in the National Parks. Colorado State University, Fort Collins, CO, July 13-18, 1986. Paper and poster presented at Conference.

Publications to be completed:

1. Marion, J. L. 1989. Recreation site inventory, impact assessment and monitoring at the New River Gorge National River. Final Report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report.

Future Needs:

Recreation impact monitoring systems are designed to provide rapid, but reliable estimates of environmental changes resulting from recreational use. However, error is inherent to all measurement systems. When comparing measures for a given site over time, managers need to be able to distinguish between measurement error and a real change in site conditions. Therefore, the following topics are recommended for further study: 1) improvement of existing measurement procedures to minimize measurement error, 2) improvement of training and documentation to minimize measurement error, and 3) documentation of the magnitude of measurement error.

Title: A research reconnaissance for studies of resource impacts, site recovery and rehabilitation on the Delaware and New Rivers. FS-NC-4901 (85-08).

Investigators: Jeffrey L. Marion and David N. Cole

Starting Date: June 1985 Completion Date: June 1986

Objectives:

Growing recreational use within the river corridors at the three study rivers (both on public and private land) is causing a number of physical and biological changes to the recreation resources. Managers need to better understand the nature and severity of these environmental changes if they are to develop and implement appropriate impact minimization strategies.

1. View and discuss resource impact problems with managers and seek their input in the development of applied research studies.
2. Conduct a preliminary assessment of the type and range in severity of ecological impacts resulting from recreational use of the Delaware and New Rivers.
3. Assess the availability of and locate appropriate study areas for (a) recreation site impact studies, and (b) site recovery studies.
4. Develop methods for evaluating recreation site impacts on the Delaware and New Rivers.
5. Develop a research plan describing the types of studies to be initiated in 1986, their location, and the methods to be employed.

Accomplishments:

The principal investigators visited each park unit to become familiar with the types of recreation sites and resource impacts, to locate appropriate study areas, and to discuss the research with park managers. A comprehensive long-term research program which integrates a variety of research approaches was developed. A research plan describing the research program, methodology, stratification of study sites, and study areas was prepared.

Products:

1. Cole, D. N. and J. L. Marion. 1986. Resource impacts at Upper Delaware Scenic and Recreational River, Delaware Water Gap National Recreation Area and New River Gorge National River: Evaluation of Impact, Their Causes, Recovery Rates and Potential Management, Study Plan for cooperative research between the USDA Forest Service, North Central Forest Experiment Station, and USDI National Park Service, Mid-Atlantic Region. 46 pp.

Future Needs:

This study is being continued under Project Number FS-NC-4901 (86-06).

Title: Resource impacts at Upper Delaware Scenic and Recreational River, Delaware Water Gap National Recreation Area and New River Gorge National River: Evaluation of impacts, their causes, recovery rates and potential management. FS-NC-4901 (86-06).

Investigators: Jeffrey L. Marion and David N. Cole

Starting Date: March 1986 Completion Date: July 1989

Objectives:

Growing recreational use within the river corridors at the three study rivers (both on public and private land) is causing a number of physical and biological changes to the recreation resources. Managers need to better understand the nature and severity of these environmental changes if they are to develop and implement appropriate impact minimization strategies.

1. Estimate how much change has occurred on a sample of well-established day-use or campsites in each study area.
2. Determine how much on-going change occurs over a 5-year, or longer, time span.
3. Evaluate how differences in clientele affect differences in type and amount of impact.
4. Evaluate how difference in amount of use affects difference in impact and recovery of existing sites and experimentally-trampled plots.
5. Evaluate the extent to which the nature and magnitude of site impact and recovery varies between environments.
6. Determine how rapidly impact occurs on a sample of newly-opened campsites.
7. Determine how rapidly recently closed campsites recover.

Accomplishments:

The following studies were initiated in 1986:

1. Assessment of biophysical impacts on a sample of 10 recreation sites at Upper Delaware Scenic and Recreational River, 29 recreation sites at the Delaware Water Gap National Recreation Area, and 16 sites at the New River Gorge National River.
2. Assessment of biophysical impacts on a sample of recreation sites at Delaware Water Gap that were just opened to use and on sites just closed to use.

3. Assessment of the relationship between amount of trampling and extent of biophysical impact on experimentally trampled plots in two vegetation types at Delaware Water Gap.

Results from the first study have been analyzed and reports have been written. This study may be replicated in 5 years. For both of the other studies, measurements have been taken twice each year for the years 1986-1988 and results are currently being analyzed. Results will be presented in journal articles to be completed in 1989.

Products:

1. Cole, D. N. and J. L. Marion. 1987. Ecological impacts on recreational sites at New River Gorge National River, West Virginia. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 30, 70 pp.

2. Cole, D. N. and J. L. Marion. 1987. Ecological impacts on recreational sites at the Delaware Water Gap National Recreation Area, Pennsylvania-New Jersey. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 29, 79 pp.

3. Cole, D. N. and J. L. Marion. 1987. Recreational impacts in some riparian forests of the eastern United States. Environmental Management 12(1):99-107.

4. Marion, J. L. and D. N. Cole. 1987. Ecological impacts on recreational sites at the Upper Delaware Scenic and Recreational River, Pennsylvania-New York. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 28, 77 pp.

5. Marion, J. L. and D. N. Cole. 1987. Resource impacts at New River Gorge National River: Evaluation of impacts, their causes, and potential management. In: New River Symposium, Appalachian State University, Boone, North Carolina, April 9-11, 1987. pp. 17-26.

6. Marion, J. L. and D. N. Cole. 1988. Evaluating recreational impacts: A multi-faceted research design. To be published in Park Science (Wtr. issue).

Future Needs:

The studies of recreation sites at the Delaware Water Gap and New River Gorge were designed to permit replication after 5 or more years. We recommend that this be done so that long-term changes in recreation impacts and their recovery may be documented and analyzed. The experimental trampling study and the studies of recently-opened and closed sites should also be continued at a reduced level of effort for an additional 3 years. This will provide more detailed information on impact/amount of use relationships and recovery rates over time.

Title: Identification and preliminary analysis of river recreation impacts on fish and wildlife. FS-NC-4901 (85-05).

Investigators: Joseph W. Roggenbuck, Michael Patterson, and James D. Fraser

Starting Date: June 1985

Completion Date: October 1986

Objectives:

The research had two broad goals: (1) to determine the existence and extent of recreation impacts on fish and wildlife in the Upper Delaware Scenic and Recreational River, the Delaware Water Gap National Recreation Area, and the New River Gorge National River; and (2) to suggest strategies that managers might use to lessen such impacts. More specific objectives are as follows:

1. To identify fish and wildlife on study rivers that appear to be currently impacted by river recreation. Particular attention will be given to sensitive, rare, and endangered species.
2. To estimate the kind, extent, and severity of current recreation impacts upon fish and wildlife.
3. To identify fish and wildlife that will likely be impacted if river recreation use continues to grow.
4. To identify critical fish and wildlife habitat that is or will likely be impacted by river recreation use.
5. To identify the river use or user characteristics that appear to cause the fish and wildlife impacts.
6. To suggest management programs to both reduce fish and wildlife impacts and maintain high quality river recreation experiences.
7. Where necessary, to suggest an indepth program of research to gain information to reduce critical impact problems.

Accomplishments:

Appropriate literature was reviewed to determine fish, birds, mammals, and other important wildlife occurring in the study areas and locate documentation of recreational impacts on these species. Local experts in these informational areas were identified and interviewed for their concept of impacts. Questionnaires were prepared and distributed to all experts. Follow-up contacts were conducted when necessary. The data from these questionnaires and contacts were summarized and analyzed. The following final reports were prepared and distributed.

Products:

1. Patterson, Michael, Joseph W. Roggenbuck, and James D. Fraser. 1988. Identification and Preliminary Analysis of River Recreation Impacts on Fish and Wildlife: The New River Gorge National River. Final report, School of Forestry and Wildlife, VPI&SU, Blacksburg, VA.

2. Patterson, Michael, Joseph W. Roggenbuck, and James D. Fraser. 1988. Identification and Preliminary Analysis of River Recreation Impacts on Fish and Wildlife: Delaware Water Gap National Recreation Area. Final report, School of Forestry and Wildlife, VPI&SU, Blacksburg, VA.

3. Patterson, Michael, Joseph W. Roggenbuck, and James D. Fraser. 1988. Identification and Preliminary Analysis of River Recreation Impacts on Fish and Wildlife: Upper Delaware Scenic and Recreational River. Final report, School of Forestry and Wildlife, VPI&SU, Blacksburg, VA.

Future Needs:

No future research is proposed.

B. USER BEHAVIOR COMPONENT

Title: Visitor behavior in natural environments--defining the nature of the recreation experience. FS-NC-4901 (86-03).

Investigators: Richard Schreyer and Richard C. Knopf

Starting Date: February 1986

Completion Date: February 1987

Objectives:

1. Conduct a comprehensive literature review of research pertinent to defining the nature of recreation experiences.
2. Define a model of recreation experiences which may be used to guide field research in the study areas.
3. Provide critical input into the design of research methods to identify the recreation experiences sought by recreationists in the study areas.

Accomplishments:

Between February and July, 1986, an exhaustive literature review was completed. Over 500 references on psychological, social psychological, sociological and philosophical lines of thought pertaining to the management of leisure services were identified. A review and synthesis of this literature was accomplished, to (a) identify major theoretical approaches to understanding recreation experience, and (b) evaluate the strengths and weaknesses of each.

During the same time period, in-depth personal interviews were accomplished with 17 nationally renowned experts in psychology, social psychology, sociology, philosophy and market research to gain a sense of cutting edge theory and technology which has relevance to research on recreation experience.

Drawing on the results of literature review, literature synthesis, and personal interviews, a holistic theoretical model of the forces shaping recreation experience was created. This model specified critical variables to be measured in the field, and was used to construct a methodology for gathering field data and for analyzing the data once it was secured. A personal interview format was developed, consisting of 16 questions to be posed to study river recreationists using qualitative research design. Also developed was a 19-item inventory for analyzing responses to the questions--which were captured on audio tape. Finally, the strategy for using the inventory by a panel of experts to produce a content analysis of the responses was specified.

A summary of the process and results of all this activity has been prepared and submitted to the mid-Atlantic region in a 206 page volume. This activity produced the steering mechanism for carrying out Study FS-NC-4901 (86-04): User Behavior, Perceptions, and Expenditures as Inputs to the Determination of Appropriate Use in River Recreation

Environments. Personnel from the two studies worked jointly in guiding field research on the study rivers during the 1986 use season (see project update for 86-04). In addition (and under the guidance of this study), the methodology was replicated in the west on the Colorado River in Canyonlands National Park, at no cost to the Mid-Atlantic Region. The 19-item inventory was tested and refined through pilot tests by trained students at three universities (San Diego State University, Utah State University, Pennsylvania State University) during September through October, 1986. The revised instrumentation was administered to data from the three study rivers and the Canyonlands sample from October through December, 1986. Results of the analyses are available in the form of reports from each of the three universities, but such analysis activity reaches beyond the objectives of this particular study.

Products:

1. Beck, Lawrence. 1987. The Phenomenology of Optimal Experiences Attained by Whitewater Recreationists in Canyonlands National Park. Doctoral dissertation, College of Education, University of Minnesota, Minneapolis, MN.
2. Berger, Joyce L. and Richard Schreyer. 1986. The Experiential Aspects of Recreation--A Review of Relevant Literature and Suggestions for Future Research. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 26, 203 pp.
3. Knopf, Richard C., Joyce L. Berger and Richard Schreyer. 1986. Psychological Experience Data as Input to Park Management and Planning. In Proceedings, Conference on Science in the National Parks, USDI National Park Service, July 13-18, 1986, Ft. Collins, CO. 34 pp. (also poster session).

Future Needs:

None. Objectives of the study are completed.

Title: Initiation of field research on the definition of visitor experiences at the Upper Delaware Scenic and Recreational River and the Delaware Water Gap National Recreation Area. FS-NC-4901 (85-09).

Investigators: Alan R. Graefe, Richard C. Knopf, and Fred Humphrey

Starting Date: June 1985 Completion Date: May 1987

Objectives:

1. To conduct field research at the Upper Delaware Scenic and Recreational River and the Delaware Water Gap National Recreation Area to generate data on visitor experiences in the two recreation areas.
2. To examine and pilot test various data collection methodologies including structured and unstructured interviewing and observation.
3. To develop a paper on the merits of qualitative research methodologies for collection of data regarding visitor experiences, drawing upon the field research as a case study.

Accomplishments:

Field research was conducted between June 25 and August 26, 1985, resulting in a detailed set of field notes. These field notes were instrumental to the design and implementation of the followup User Behavior component study conducted during the summer of 1986. Analyses of notes has focused on identifying the complete range of experience attributes sought by Delaware River visitors as well as the underlying themes related to these attributes.

Products:

1. Graefe, A., R. Knopf and K. Pawelko. 1986. Defining the Visitor Experience on the Delaware River: A Comparative Study. Poster Presentation, Conference on Science in the National Parks, July 13-18, 1986, Ft. Collins, CO.
2. Graefe, A., R. Knopf, and K. Pawelko. (In preparation). Measuring the River Recreation Experience: A Comparison of Qualitative and Quantitative Methods. To be submitted for publication in leisure-related journal.

Future Needs:

None. Although additional data analyses and corresponding publications are anticipated, they are beyond the scope of this study and require no further resources. This study has served its purpose as a pilot study and will be finished with the completion of the paper cited above.

Title: User behavior, perceptions and expenditures as inputs to the determination of appropriate use in river recreation environments. FS-NC-4901 (86-04).

Investigators: Alan R. Graefe and Richard C. Knopf

Starting Date: May 1986

Completion Date: September 1987

Objectives:

1. To design and implement a survey of visitor expenditure patterns, including travel costs, equipment purchases and contributions to local economies, during the 1986 use season on the three study rivers.

2. To design and pilot test a methodology for defining the visitor's recreational experience that incorporates salient dimensions suggested by a review of current conceptions of the nature of human experience.

3. To implement the methodology in order to measure the river recreation experience on the three study rivers during the summer 1986 use season.

4. To develop and carry out analytical procedures using the data collected, with emphasis on identifying ways in which study results can be used as inputs to selecting management objectives.

Accomplishments:

Objective 1 - Completion of PARVS interviews with 1,258 visitors in the 3 study areas between May and September 1986. Data forwarded to USFS Southeastern Forest Experiment Station, Athens, Georgia, for processing and analysis. Objective 2 - Development of user behavior study methodology completed by investigators in consultation with Richard Schreyer. Methodology pilot tested with 130 interviews of river users on the Delaware River during May and early June, 1986. Objective 3 - Final methodology implemented on 3 study rivers during June-August 1986, resulting in an additional 178 completed interviews (total data set includes both pilot test and summer interviews for a total of 308 tape recorded interviews). Objective 4 - Analyses of data have focused on two approaches: first, preparation of customized data tapes featuring selected interview questions related to particular themes (e.g., social experience, environment, etc.); second, pilot testing of a set of experiential rating scales designed to measure the overall experience based on the complete taped interviews. The first approach has resulted in 9 topical tapes for each river area. The second approach was completed using 7 raters and 35 completed interviews from the Delaware River data.

Additional funding has been requested and received (Fall 1988) for more complete analysis and interpretation of the existing data set. The analysis of tape recorded, open-ended interviews is extremely time consuming and needs to be completed by multiple listeners. It will take

a full year for grad students and investigators to adequately analyze the very rich data set.

Knopf, Graefe and Schreyer have completed a comprehensive report on management preferences of visitors to the Water Gap and Upper Delaware based upon extensive tape-recorded interviews with visitors taken during the 1986 field season. It analyzes visitor feelings about facilities, availability of information, Park Service management, and desired recreation experiences. The general conclusion is that recreationists are quite satisfied with what they experienced, and--as a rule--would like to see few things changed.

Sharon Todd, Penn State, completed her master's degree research on conflict among canoers along the Upper Delaware and Water Gap. Among the findings: more experienced canoeists tended to perceive more conflicts than did less experienced canoeists.

Products:

1. Graefe, Alan R., Richard C. Knopf, and Richard Schreyer. 1988. Measuring the River Recreation Experience: A Pilot Test of Some New Experiential Scales. Report of the User Behavior Working Group, USDA Forest Service, N.C. Forest Exp. Station, in cooperation with USDI National Park Service, Mid-Atlantic Region.

2. Knopf, Richard C., Alan R. Graefe, and Richard Schreyer. 1988. Management of River Resources at Delaware Water Gap National Recreation Area and Upper Delaware Scenic and Recreational River--A Survey of Visitor Opinion. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 33.

3. Schreyer, Richard and B. L. Driver. 1987. The Benefits of Recreation Participation: What We Know and Where We Need To Go. Paper presented at Society of American Foresters National Convention, Minneapolis, MN.

4. Todd, Sharon Leidy. 1987. Level of Experience and Perception of Conflict Among Canoeists on the Delaware River. M.S. Thesis, Dept. of Recreation and Parks, Penn State University, University Park, PA.

5. Todd, Sharon Leidy and Alan R. Graefe. 1988. A New Look at Visitor Conflict on the Delaware River. Paper Presentation, Conference on Social Science in Resource Management, Champaign, IL.

6. Todd, Sharon Leidy and Alan R. Graefe. (in review). Sources of Conflict in the River Recreation Experience. Journal article.

7. Todd, Sharon Leidy and Alan R. Graefe. (in review). Conflict Among Delaware River Canoeists. Draft Report to USDI National Park Service, Dept. of Recreation and Parks, Penn State University, University Park, PA.

Future Needs:

None requested.

C. SOCIO-ECONOMIC COMPONENT

Title: Recreation impact and value estimations on rivers: An economic study of the Delaware Water Gap, Upper Delaware and New Rivers. FS-NC-4901 (86-05).

Investigator: H. Ken Cordell

Starting Date: June 1986

Completion Date: June 1987

Objectives:

1. Develop the data necessary to describe expenditure profiles of recreation users of the 3 study rivers using the Public Area Recreation Visitors Survey (PARVS) procedures.
2. Develop estimates of the economic impact of recreation visitor expenditures the economies of those counties physically "touching" each river segment and within the relevant market radius of each river segment.

Accomplishments:

The following numbers of interviews were conducted at each river segment using the PARVS procedures:

	<u>Number</u>
Delaware Water Gap	681
Upper Delaware	354
New River	254

Interviewing was conducted by Penn State University students under the supervision of Alan Graefe. The Southeastern Station provided training for the four Penn State students who were issued a full complement of forms and equipment to conduct the research. Several modifications of the PARVS forms were executed.

All data have been scanned and cleaned. A descriptive draft summary of tables and charts was provided on October 19, 1987. Economic impact analyses are still in progress and are promised before January 15, 1989. Following this, the investigator(s) will meet with Park Service managers to present results of the analyses and reports--planned for early in 1989; probably at the Delaware Water Gap.

Products:

1. PARVS Working Group. (in review). Standard Descriptive Report of the Public Area Recreation Visitor Survey (PARVS) for RIVER PARVS. Draft report, S.E. Forest Exp. Station, University of Georgia, Athens, GA.
2. Report on economic impacts of each river segment to be completed.
3. Data tape with documentation to be provided.

Future Needs:

Estimation of the economic impact of the three river segments represents only a portion of the possible analyses and reports using the PARVS data. In particular, development of travel cost models (for estimating values of river trips); in depth analyses to describe profiles of users, their river use in the context of their overall outdoor recreation participation; and interrelationships between behaviors, characteristics and origins; and modelling of river recreation visitation.

Title: An analysis of the relationships between the federal presence and local communities in two National Park Service river areas. FS-NC-4901 (85-03).

Investigators: Ben W. Twight and Matthew S. Carroll

Starting Date: May 1985

Completion Date: July 1987

Objectives:

This research is being carried out to analyze relationships between the NPS and local communities affected by the agency's presence in the Upper Delaware Scenic and Recreational River and the New River Gorge National River.

1. Present a chronology of the historical context and of events related to the federal presence in the two river areas.
2. Document and analyze the emergence of issues related to the federal presence in the local areas.
3. Identify and analyze the perceptions and actions taken by local residents particularly members of formal and informal local organizations and social groups around such issues.
4. Present recommendations for the future of NPS-community relations in the two areas.

Accomplishments:

In-depth interviews with managers and a cross-section of community residents in the two areas have been carried out. Secondary data concerning the history of the areas and the history of NPS presence has been gathered. Demographic information concerning the local communities has been compiled.

Products:

1. Carroll, M. S. 1986. A methodology for assessing local community response to federal land management agency presence. Paper presented at the Conference on Science in the National Parks, Fort Collins, Colorado, July 13-16, 1986.
2. Carroll, Matthew S. and Ben W. Twight. 1987. An analyses of community response to National Park Service presence in the New River Gorge. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 25.
3. Carroll, Matthew S., Ben W. Twight and Marsha McCabe. 1987. An analysis of community response to federal presence in the Upper Delaware River Valley. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 24.

Title: Exploring the potential partnership of river outfitters in managing public rivers. FS-NC-4901 (86-02).

Investigators: Joseph W. Roggenbuck and David W. Lime

Starting Date: December 1985 Completion Date: September 1988

Objectives:

1. To identify outfitters' preferences for resource and experience values to be provided on the river, their perceptions on the adequacy of current river management, and their desires for future management directions; and, to compare these views with those of river managers.

2. To compare outfitters' and managers' perceptions of river problems, potential solutions to problems and views on how outfitters and managers might increasingly cooperate to implement solutions.

3. To characterize the operations of river outfitters on the study rivers (e.g., the nature and extent of their activities, type of trips provided, type of market area served, marketing strategies used, primary clientele groups served) and explore relationships between type of river outfitter and views on appropriate roles for river management.

Accomplishments:

Draft final reports for all three rivers have been prepared and technical reviews were sought from the park units in December, 1988 (New River and Delaware Water Gap) and January, 1989 (Upper Delaware).

In late October 1987 preliminary results of interviews with outfitters and managers on the Upper Delaware were reported at both COUP (Council of Upper Delaware Townships) and CAC (Citizens Advisory Council) meetings. In May 1988, presentations to area advisory groups also were made. Initial findings suggest many similar responses of managers and outfitters both to perceived problems in the river corridor and to possible solutions. There seems to be good evidence that further cooperation between outfitters and managers is desired and possible.

Products:

1. Lime, D. W., J. W. Roggenbuck, W. C. Norman, and J. L. Berger. (In review). Delaware Water Gap National Recreation Area: Exploring the potential partnership role of river outfitters in managing public rivers. Draft final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report.

2. Lime, D. W., J. W. Roggenbuck, W. C. Norman, and J. L. Berger. (In review). Upper Delaware Scenic and Recreational River: Exploring the potential partnership role of river outfitters in managing public rivers. Draft final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report.

3. Roggenbuck, J. W., D. W. Lime, W. C. Norman, and J. L. Berger. (In review). New River Gorge National River: Exploring the potential partnership role of river outfitters in managing public rivers. Draft final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report.

4. Manuscript(s) will be submitted to refereed, management-oriented journals in 1989.

Future Needs:

Results will likely show that there are potentially fruitful areas for future research to help evaluate ways in which outfitters and managers can cooperate to achieve mutual objectives. Possible issues to evaluate include information/education services, water safety activities, and litter clean-up. A cooperative research project between the investigators and the Park Service could begin in summer 1989.

A cooperative research project between David Lime and the Superior National Forest has been funded by the Forest Service's Intermountain Research Station to explore potential cooperation between outfitters and Forest Service managers. Joe Roggenbuck is a consultant to this project. The study may investigate how use problems associated with large, outfitted parties could be managed. While this research is not funded by the Park Service, a similar funded project on Park Service rivers would benefit from the Boundary Waters experience. Similar problems, cooperative efforts, and research procedures could be studied across a two-agency test case.

D. MANAGERIAL COMPONENT

Title: Managerial perspectives on determining appropriate river use.
FS-NC-4901 (85-06).

Investigator: J. Douglas Wellman

Starting Date: June 1985 Completion Date: January 1989

Objectives:

1. Improve understanding of how managers establish management objectives. Specific subtopics include:

- a. manager perception of policy framework
- b. manager definition of social conflict
- c. manager definition of larger river recreation system
- d. manager perception of scientific research as it pertains to river management
- e. manager's personal experiences

2. Improve understanding of how managers implement management plans. Specific subtopics include:

- a. manager perceptions of who should be involved in implementation
- b. manager beliefs and attitudes about management support technologies

Accomplishments:

An initial visit was made to each park during summer 1985 to meet the managers and develop an awareness of the resource and management issues. During the fall of 1986, in-depth interviews were conducted at the rivers and the regional office. At the rivers, interviews were with all staff identified by the superintendent as having a substantial role in setting and carrying out park management objectives. At the regional office, interviews were held with Regional Director Coleman, Assistant Director Supernaugh, Planner DiBello and Chief Scientist Karish.

In the time between the start of the project and the fall interviews, an intensive literature was initiated. This review, coupled with the interviews, led to a tentative decision to change the direction of the research. Further discussion and reading through the winter of 1986-87, combined with consultation with outside experts in public administration, led to submission of a revised study plan in April, 1987.

In essence, the revised project is to be a study of managerial perceptions of the Limits of Acceptable Change (LAC) system for determining appropriate river use. Second round interviews with managers have been completed at all three rivers. The interviews focused on manager perceptions of LAC and Transactive Planning for determining appropriate river use.

In the next stage of the project carried out between July and October, 1988, telephone interviews were conducted with river managers elsewhere in the U.S. These interviews were based on what we learned from managers at the three study rivers. The purpose of the telephone interviews was to broaden our understanding of river management planning by bringing together managerial experience in many different settings. In the final stage, we will share what we have learned from river managers elsewhere with managers on the study rivers, and examine the usefulness of others' experiences and ideas. This final stage will take place in October/November, 1988. We plan to submit our draft final report in December.

Ms. Elizabeth Belcher, a doctoral candidate, now has assumed a major role in this project. Liz has conducted the second round interviews with study area managers and telephone survey, and she will conduct the final discussions with study area managers concerning their perceptions of the telephone interview results. Liz is in the second year of a doctoral program concentrating on the application of public administration theory and methodology to public sector outdoor recreation management. She began work on her Ph.D. after six years in recreation with the USFS-Jefferson National Forest. Her masters research involved a survey of landowners along Virginia's existing and proposed state scenic rivers.

In the original study plan, three products--a final report, a refereed journal article, and a conference presentation--were promised. Given the stage of the research, none of these have yet been produced. However, there have been several publication efforts related to the project. A paper (Greenough and Wellman) on public park administration is in press in the George Wright Forum. A panel on management processes held at the conference on Scientific Research in the National Parks (Fort Collins, summer 1986), was held as a direct result of this project. Investigations carried out as part of this project have also contributed to a textbook (Wellman 1987), a paper presented at the American Political Science Association annual meeting (Wellman 1987), and a presentation to a regional Society of American Foresters meeting (Wellman 1987).

Products:

1. Greenough, R. and J. D. Wellman. In Press. The National Park Service in the Temporary Society: Creating a Learning Agency. George Wright Forum 5(4).
2. Wellman, J. D. 1987. Challenge to Professionals: Changes in Public Involvement. Paper presented at the Appalachian Society of American Foresters' Virginia Division Summer Meeting, Roanoke, VA, June 18-19.
3. Wellman, J. D. 1987. Wildland Recreation Policy: An Introduction. New York: John Wiley. 278 pp.

4. Wellman, J. D. 1987. Foresters' Core Values and Cognitive Styles: Issues for Wildland Recreation Management and Policy. Policy Studies Rev. 7(2):395-403.

Future Needs:

None.

Title: Analysis of legislative and legal foundations for establishing carrying capacity of three river resources. FS-NC-1901 (85-07).

Investigators: Leo McAvoy and Steve Simpson

Starting Date: June 1985

Completion Date: September 1987

Objectives:

1. Identify for each site (Upper Delaware, Middle Delaware, and the New River Gorge), all general management directives regarding carrying capacity suggested by the legislative histories of the laws designating each site and directives contained in pertinent legal materials.
2. Identify directives within the legislative histories specific to the carrying capacity issues in each river.
3. Identify additional support for general management directives found in applicable court cases and law review articles.
4. Identify for the Upper Delaware and the Middle Delaware, general management directives regarding carrying capacity suggested by the legislative histories of the Wild and Scenic Rivers Act and the Delaware Basin Compact.
5. For the New River Gorge, identify the management intentions of the people instrumental in the designation of the site.
6. For the New River Gorge, compile a complete legislative history of the area.

Accomplishments:

The data collection and analysis for all sections of this study are complete. The objectives of the study plan have all been achieved. The final reports have been completed. The management reports for the Upper Delaware and New River Gorge have been approved and distributed, and the Middle Delaware report is currently being revised. In addition, two papers have been presented at national research conferences: Leisure Research Symposium of the National Recreation and Park Association; and, the Conference on Science in the National Parks. Results indicate there are general and specific guidelines for establishing carrying capacity (and for management in general) in the legislative history materials. The amount of documentation for some of these guidelines varies and is, of course, open for interpretation in light of current administrative and political considerations. But, there are definite guides for management in the legislative historical materials.

Products:

1. Simpson, Steven. 1988. An Analysis of Legislative Histories and Legal Foundations: Recreation Management Directives for the New River Gorge National River. Doctoral Dissertation, College of Education, University of Minnesota, Minneapolis, MN.

2. Simpson, Steven and Leo McAvoy. 1987. New River Gorge National River, A Narrative History of Its Designation as Part of the National Park System. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 19.

3. Simpson, Steven and Leo McAvoy. 1987. Analysis of Legislative and Legal Foundations for Establishing Carrying Capacity at the New River Gorge National River. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 20.

4. Simpson, Steven and Leo McAvoy. 1987. New River Gorge National River: A Summary of Interviews with Six Persons Involved in the Designation as a National River. Final report, Division of Recreation, Park, and Leisure Studies, University of Minnesota, Minneapolis, MN.

5. Simpson, Steven and Leo McAvoy. 1987. Analysis of Legislative and Legal Foundations for Establishing Carrying Capacity: Summary report for the Upper Delaware Scenic and Recreational River. Final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report No. 37.

6. Simpson, Steven and Leo McAvoy. (in review). Analysis of Legislative and Legal Foundations for Establishing Carrying Capacity: Summary Report for the Delaware Water Gap National Recreation Area. Draft final report, USDI National Park Service, Mid-Atlantic Region Research/Resources Management Report.

Future Needs:

All the funding in the original cooperative agreement has been spent, and the investigators request travel to the three rivers in the spring of 1989 to confer with river managers regarding the results of the study and the implications these results might have for management.

APPENDIX
PROJECT INVESTIGATORS' ADDRESSES AND PHONE NUMBERS

Matthew S. Carroll
Forestry & Range Management
Washington State University
Pullman, Washington 99164-6410
(509) 335-6166

David N. Cole
USDA Forest Service
Intermountain Experiment Station
Forestry Sciences Lab
P.O. Box 8089
Missoula, MT 59807
(406) 721-5694

H. Ken Cordell
Forest Service
Forestry Sciences Lab
Carlton St.
Athens, GA 30602
(404) 546-2451

James D. Fraser
School of Forestry and Wildlife
Resources
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061
(703) 961-6064

Alan R. Graefe
Pennsylvania State University
School of Forest Resources
267 Recreation Building
University Park, PA 16802
(814) 865-1851

Fred Humphrey
University of Maryland
Department of Recreation
1109 Symons Halls
College Park, MD 20742
(301) 454-2190

Richard C. Knopf
Arizona State University
West Campus
2636 W. Montebello
Phoenix, AZ 85017
(602) 246-6916

David W. Lime
Department of Forest Resources
110 Green Hall
University of Minnesota
1530 N. Cleveland Ave.
St. Paul, MN 55108
(612) 624-2250

Jeffrey L. Marion
National Park Service
Star Route Box 38
Milford, PA 18337
(717) 296-9280

Leo H. McAvoy
Division of Recreation, Park and
Leisure Studies
University of Minnesota
209 Cooke Hall
Minneapolis, MN 55455
(612) 625-5887

Mike Patterson
School of Forestry and Wildlife
Resources
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061
(703) 961-7418

Joseph W. Roggenbuck
School of forestry and Wildlife
Resources
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061
(703) 961-7418

Richard M. Schreyer
Department of Forestry and
Outdoor Recreation
Utah State University
Logan, UT 84322
(801) 750-2487

Steven V. Simpson
Division of Leisure Studies
202 Beyer Hall
Iowa State University
Ames, Iowa 50011
(515) 294-9437 or 294-4443

Ben W. Twight
The School of Forest Resources
Pennsylvania State University
University Park, PA 16802
(814) 865-9062

J. Douglas Wellman
School of Forestry and Wildlife
Resources
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061
(703) 961-6663

