

For further information about the Center and any of the  
projects or programs listed in this report write or call:  
The Center for Rural Pennsylvania  
212 Locust Street, Suite 604  
Harrisburg, PA 17101  
Telephone (717) 787-9555

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# PENNSYLVANIA ECOTOURISM



*untapped  
potential*

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*untapped potential*



THE CENTER FOR RURAL PENNSYLVANIA  
MARCH 1995



# THE CENTER FOR



## RURAL PENNSYLVANIA

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This report is drawn in part from PENNSYLVANIA ECOTOURISM: A CASE STUDY, the final report submitted to the Center for Rural Pennsylvania by Dr. J. Christopher Haney and Dr. Charles P. Schadt, The Pennsylvania State University—DuBois Campus. Mr. Lawrence J. Lentz, Center for Rural Pennsylvania, also contributed to the sections on ecotourism. The full report is available from the Center for Rural Pennsylvania.





## FOREWORD

Rural communities and small towns need effective strategies for retaining their quality of life while ensuring a viable economy. Our rural communities have natural resources that many Americans and international visitors want to see and experience. Tourism, one of the fastest growing areas of our economy, can be an effective part of an overall community development strategy. Using natural resources in ways that don't compromise their future use, to attract visitors, is what ecotourism is all about. It is development that can be sustained.

However, only if this element is combined within a larger community vision and overall strategy can rural areas and small towns take best advantage of its potential. Inventorying natural, scenic, historic, cultural and recreational resources can be an effective way for a community to start working together toward a shared picture of its future. In this way, ecotourism can be an important part of the rapidly growing heritage tourism movement. In this approach, citizens from diverse backgrounds join with businesses, nonprofit organizations, and across municipal boundaries to use an area's natural and cultural resources to tell the story of its people, their landscape, and the way they interact. Every community has unique qualities, but only by combining and linking them in a coherent way do we provide a visitor with a reason to come, to stay, and to return again. Heritage tourism and ecotourism celebrate those things that make your community special and help to boost civic pride and enthusiasm for its future.

This Guide will provide you with a variety of resources and ideas you can put to work in your own area. Use it to enhance your economy while identifying, teaching, sharing, and preserving those unique natural areas that make your place special. The Center for Rural Pennsylvania's Board of Directors and staff wish you well and support your efforts. I invite you to share your concerns, your achievements and your vision with us, and together we can work toward a bright future for rural communities and small towns everywhere.

Jeffrey L. Soule, AICP  
Director



## INTRODUCTION

Ecotourism. The term conjures up images of yuppies donning pith helmets and traveling to Antarctica to pose with penguins. The reality is that over 40% of the U.S. population participate in some form of ecotourism. It is the fastest growing segment in the travel industry. The challenge to rural Pennsylvanians is how to tap into this market while maintaining their quality of life and preserving the environment.

The results of this project clearly indicate that ecotourism has potential as an economic development tool in Pennsylvania. We have many unique ecosystems and cultural attractions that have the potential to be ecotourist destinations. This report is in four parts:

*Part One*—Provides an overview of ecotourism and its economic potential.

*Part Two*—Examines ecotourism programs in areas with existing infrastructure such as Bucks County and the Poconos. It also details how a rural community with relatively little infrastructure or tourist tradition was able to harness its resources in a sustainable manner to generate jobs.

*Part Three*—Explores two potential resources which could be used to develop sustainable ecotourism in rural areas: old-growth forests and migratory forest songbirds. Threats to these resources are also analyzed.

*Part Four*—Presents Conclusions and Recommendations.

**SUSTAINABLE IS DEFINED AS USING RESOURCES IN A PRACTICAL, PROFITABLE, AND ENVIRONMENTALLY SENSITIVE MANNER, SO THAT THE RESOURCES CAN BE UTILIZED WITH LITTLE OR NO DEGRADATION. GROWTH IS DIRECTED TOWARDS AREAS WHERE INFRASTRUCTURE ALREADY EXISTS.**





## PART ONE

### ECOTOURISM OVERVIEW

Ecotourism is a virtually untapped source of economic development for rural Pennsylvania. Increasing numbers of Americans are taking to the woods, marshes, and fields to observe birds and other wildlife. In 1990, over 40 percent of the U.S. population age 16 and older—76 million people, participated in ecotourism or nonconsumptive uses of wildlife resources. Over \$18.1 billion were spent in this activity with Pennsylvanians contributing \$1.1 billion towards the national total. Nineteen percent of Pennsylvanians were true "ecotourists," traveling at least one mile to participate in an ecological experience, according to the U.S. Department of the Interior. The four million Pennsylvanians (43 percent) who engaged in a nonconsumptive activity within their residential area (less than one mile from home) are a huge potential market for ecotourism.<sup>1</sup> Figure 1 illustrates the potential economic impact of ecotourism.

**ECOTOURISM IS DEFINED AS RESPONSIBLE TRAVEL TO NATURAL AREAS WHICH CONSERVES THE ENVIRONMENT AND IMPROVES THE WELFARE OF LOCAL PEOPLE.<sup>2</sup> THE DEFINITION HAS BEEN EXPANDED TO INCLUDE HISTORICAL AND CULTURAL ACTIVITIES IN A NATURAL SETTING.**  
**NONCONSUMPTIVE USE OF WILDLIFE RESOURCES IS DEFINED AS OBSERVING, FEEDING, AND PHOTOGRAPHING WILDLIFE.<sup>3</sup>**

However, ecotourism has not been fully developed as an economic resource for rural Pennsylvania. Communities and agencies are sometimes unaware of the existence of local unique ecological resources or their economic potential. Many communities fear that tourism, especially environmental tourism, could lead to the disruption of traditional industries such as timber.

### ECOTOURISM POTENTIAL

Located within easy driving distance of a large part of the U.S. population, Pennsylvania is uniquely endowed to utilize the potential of sustainable ecotourism. Many organizations now offer similar or

FIGURE 1. ECONOMIC IMPACT OF NONCONSUMPTIVE OR ECOTOURISM IN SELECTED PA LOCATIONS<sup>4</sup>

Activity	Number of Visitors	Expenditures per visitor per day <sup>a</sup>	Annual Total Expenditures <sup>b</sup>	NET Economic Value Per Visitor Day <sup>c</sup>	Annual Total Resource Value <sup>d</sup>
Fisherman's Paradise (Catch and Release Trout Fly Fishing)	1,648	\$16.56	\$35,597	\$53.40	\$84,634 per stream mile
Spring Creek (Catch and Release Trout Fishing)	2,894	\$5.19	\$15,002	\$19.32	\$16,691 per stream mile
Hawk Mountain (Watching Birds of Prey)	48,100	\$7.00	\$322,515	\$15.04	\$693,344
Middle Creek Wildlife Management Area (Observing Waterfowl)	73,900	\$2.73	\$207,662	\$4.28	\$324,852
Elk State Park and Adjacent Game Lands (Viewing Elk)	7,300	\$14.22	\$102,384	\$24.51	\$176,472
Showers Creek (Environmental Education)	45,000	\$1.92	\$86,575	\$4.44	\$199,800

A. Average amount spent per day by a typical visitor.  
 B. Total amount spent by a visitor in the activity.  
 C. The additional amount a typical visitor would have been willing to pay per day in order to observe his actual expenditures.  
 D. Total number of visitor days multiplied by NET economic value per day for that activity. (Column 2 x Column 3 = Column 4)

related experiences that could be combined into an ecotourism marketing strategy. Ecotourism offers the potential for small business start-up and expansion in the rural areas of the state.

Ecotourism has the potential to spur growth in related businesses. Campgrounds, outdoor equipment shops, restaurants, farm vacations, bed and breakfasts, service stations, and local stores and markets would all profit from an influx of visitors. An ecotourist strategy which combines viewing wildlife with cultural events, river rafting, and visiting historic sites such as the Oil Region Heritage Park would further boost the overall economy. To illustrate the potential, over 90,000 tourists visit Cape May, New Jersey, each year to view migratory and resident birds. These visitors spend over \$10 million in the community.<sup>5</sup>

**TOURISM, PENNSYLVANIA'S SECOND LARGEST INDUSTRY, GENERATED OVER 16.2 BILLION DOLLARS IN REVENUE AND SUPPORTED APPROXIMATELY 290,000 JOBS IN 1990.<sup>6</sup>**

Ecotourism opportunities in Pennsylvania abound on public and private lands throughout the Commonwealth.





## PART TWO

### WHERE INFRASTRUCTURE EXISTS

#### *Eco-Adventures in Bucks County*

The Bucks County Tourist Commission, Inc. announced its Eco-Adventure program on May 1, 1994. It was one of the first in the country to package its environmental and cultural resources toward the ecotourism market. It was patterned after American Express' principles for ecotourism, which were developed in coordination with the National Trust for Historic Preservation. There was a growing realization that to preserve the heritage and environment in the County, tourism must be sustainable. Instead of luring busloads of tourists to already strained facilities, the focus changed to sharing sustainable experiences on a wider variety of locations. In Bucks County, sharing equals preservation.

Michael J. Krajsa, Executive Director of the Commission, stated that Bucks County entered the ecotourism arena because it is the fastest growing segment of the tourist industry. In his view, Bucks County was a "green oasis" between Boston and Washington, uniquely positioned to take advantage of the ecotraveler. It also offered an abundance of "soft" eco-adventures. The majority of ecotourists are not interested in mountain climbing or white water rafting. They want hiking, environmental experiences such as visiting a wetlands, and cultural heritage experiences. Bucks County's assets are primarily of the "soft" variety, attractive to the majority of ecotourists.

Bucks County Tourist Commission publicized the program through a publication entitled *Eco-Adventures*. It was designed to blend ecotourism, nature travel, adventure travel heritage and cultural tourism, environmental tourism, living history and environmental education into a family vacation. The list of state parks, bike trails, and fishing areas was not new. What was new was the emphasis throughout the document on preserving and protecting the environment through responsible travel. Bucks County was also able to utilize its designation by American Express as a "Great American Destination," which produced considerable free publicity.



*Hanover Covered Bridge, Bucks County, Courtesy of Pennsylvania Office of Travel Marketing*

The Tourist Commission also added potential destinations that would not appear in normal tourist publications, such as:

- Rodale Institute Research Center—A leading organic research farm
- Waste Management Facility
- Locations of Endangered/Threatened Plants
- Archeological Dig Sites
- Wetlands
- List and Habitats of Threatened Bird Species

They also changed how attractions were presented. Instead of leading off with the history of Washington's Crossing State Park, they led with the Bowman's Hill Wildflower Preserve, then Washington's Crossing. Another example is Pennsbury Manor, William Penn's Pennsylvania Estate. The initial marketing focus is now on the collection of herbs and animals which inhabited the ecosystem in early Pennsylvania, and then transitions into the cultural history of the era.

By combining the traditional ingredients of tourism and adding an ecotourism spice, the Commission was able to repackage their community's assets to appeal to a wider audience.

It is too early to gauge the economic impact of the Eco-Adventure



approach. There is no quick return. Building awareness both of the program and its goals takes time. One important factor to note is that the Eco-Adventure program has apparently generated no new businesses. However, the perception exists that businesses and attractions have "spruced up" and are operating at a fuller capacity. More information can be obtained by calling 1-800-836-BUCKS.

#### Poconos

The Pocono Mountains Vacation Bureau (PMVB) independently began to institute its ecotourism program in 1993. While it shares some common features with the Bucks County program, there are also significant differences which highlight how communities can use varying aspects of ecotourism to reach a common goal.

According to Mathilda Harrison, Deputy Director of the PMVB, the interest in ecotourism was based upon a recognition of what people have always come to the Poconos for: the magnificence of the natural environment. Without developing sustainable ecotourism, there was a fear that the natural wealth of the Poconos might eventually be destroyed. To Ms. Harrison, *"Sustaining our environment equals sustaining our tourism industry."*

Similar to what occurred in Bucks County, organizations in the Poconos repackaged and modified some of their traditional marketing to attract the ecotourist. For example, a white water rafting company stressed the natural beauty of a trip in the Lehigh River Gorge instead of the adventure aspect. Lodging establishments advertised nature trails and tours. A theme common to both organizations was environmental education as a key component of the overall vacation experience.

A significant difference is the separation of eco or nature tourism from cultural or heritage tourism. In Bucks County, both were integrated into the overall marketing scheme. The PMVB made a conscious decision to focus its marketing efforts on nature tourism, and to separately promote the heritage market niche.

The PMVB also devoted considerable efforts to making its membership "green." A survey was conducted to determine the extent of recycling among tourist industries and to determine how to improve the industry's record. At the same time, an ecotourism conference was held to make the membership aware of the economic potential inherent in ecotourism and "green" operations. PMVB plans addition-



*Delaware Water Gap, Pocono Mountains, Courtesy of Pennsylvania Office of Travel Marketing*

al workshops to help its membership transition to a more environmentally friendly posture. PMVB's goal is to have a lodging directory which highlights those operations which are environmentally friendly, and thus more attractive to the fast growing ecotourist market.

Capitalizing upon the Nature Conservancy's declaration of the region as one of the top 40 "Last Great Places In the U.S.," the PMVB conducted a marketing campaign designed to attract the ecotourist with brochures that highlighted individual destinations. The showpiece of their 1995 campaign will be the *Poconos Nature Guide* which lists all nonprofit eco destinations in the region. Although the current emphasis is on organized experiences, Ms. Harrison hopes to provide information on species and habitats which could attract the individual or family ecotourist in the future. The overall goal is to be as inclusive as possible, to include those people who participate in ecotourism experiences but don't necessarily consider themselves "ecotourists."

The PMVB has not evaluated the economic benefits resulting from its ecotourism campaign. As in Bucks County, there is a feeling that destinations are receiving more people with an environmental interest. There are also some efforts in the Poconos region to help nascent entrepreneurs who want to find a niche in the tourist industry.



However, it will be difficult to evaluate their success or potential until the PMVB completes its 1995 Ecotourism campaign.

**BUCKS COUNTY AND THE POCONOS ARE EXAMPLES OF AREAS WHERE INFRA-STRUCTURE AND A TOURISM INDUSTRY ALREADY CO-EXISTED. BOTH REGIONS ANALYZED THEIR RESOURCES AND ADJUSTED THEIR MARKETING STRATEGY TO ATTRACT THE ECOTOURIST MARKET.**

**IN BOTH AREAS, DEVELOPING SUSTAINABLE, ENVIRONMENTALLY-FRIENDLY TOURISM WAS SEEN AS A MEANS TO PRESERVE THE TRADITIONAL TOURIST INDUSTRY AND DEVELOP A NEW NICHE MARKET.**

## BUILDING YOUR OWN INFRASTRUCTURE

### *The Arkansas Experiment*

Newton County Arkansas is rich in natural resources, but suffers from endemic poverty caused by a lack of employment opportunities. Its main industry is timbering and that activity faces an uncertain future. Most young people are compelled to leave home in search of jobs elsewhere. This county ranks as the poorest in Arkansas. Community leaders wanted to develop tourism, but were determined not to become commercialized like nearby Branson, Missouri. As a result, they formed the Newton County Resource Council (NCRC) to explore other tourism options. They decided to develop ecotourism as best-suited to bring employment while retaining the character of their community.

The NCRC defined ecotourism as, "responsible travel that protects the environment and sustains the well-being of local residents." As applied to Newton County, that meant small-scale travel, on a year-round schedule, that allowed visitors to share the natural resources and cultural heritage of that part of the Ozark Mountains.

Local people were encouraged to act as tour guides and provide support services, because they have first-hand knowledge of the subjects featured on the *Ecotours*. They are also keenly aware of local sensibilities and that mass tourism, driven by out-of-town commercial interests, can degrade a community and its natural environment.

The NCRC is developing an ecotourism microentrepreneur program similar to the Center for Rural Pennsylvania's Grameen Bank initiative in Bloomsburg. The intent is to offer young people a chance to find employment at home and start a small business of their own. In this way, ecotourism offers residents a financial incentive for protecting the environment they cherish so deeply.

The following extract from the NCRC Ecotourism 1994 Program Schedule clearly shows the wide variety of activities which can be marketed as ecotourism:

### **MARCH 27**

"Treading a New Trail." There's a new pathway that follows the Buffalo River as it threads its way through historic Boxley Valley. Experienced guide Lolly Tindol will pause often for observations on social, archeological and historic perspectives of this picturesque area where elk, beaver and numberless flora thrive. Cost \$50 includes a delicious outdoor lunch and printed background materials.

### **MAY 7-8**

"Mother's Day Ecotour." Here's a different way to commemorate the importance of motherhood by spending the weekend in company with Mother Nature. Guide Tara Keltner will lead family-oriented activities in the forest and along the river that include stories, songs, creative art forms and a campfire. The cost, including meals and motel lodging is \$135 for adults, \$70 for children 12 years and younger.

### **MAY 13-15**

Birding Ecotours in connection with National Migratory Bird Count. Newton County is home to nearly 200 species of birds and Saturday, May 14, is when it joins all the other counties in the nation in a 24-hour count. We'll coordinate the event with extra forays into woods and along streams where our avian residents and visitors hang out.

### **MAY 21**

River History Ecotour in connection with National River Cleanup Week. Besides the Buffalo River, Newton County has four other "wild and scenic" rivers. This is a great opportunity to help clean up the environment while enjoying a wilderness outing.





## PART THREE

### ECOTOURISM RESOURCES

#### *Old-Growth Forests and Migratory Forest Songbirds*

The old-growth forest ecosystem provides necessary habitat for many species of migratory forest songbirds. Without the old-growth forests, these birds would find it increasingly difficult to compete with other species. The decline of certain migratory songbirds throughout the United States may be related to the disappearance of much of their old-growth habitat. To develop old-growth forests and migratory forest songbirds as a sustainable ecotourism resource, it is first necessary to understand just what old-growth forests are, and to determine if sufficient forests and birds exist to support a sustainable ecotourism industry.

### OLD-GROWTH FORESTS

#### *Defining Old-Growth Forest*

What is an old-growth forest? What makes old-growth different from other forest types? There is no universally-accepted definition.

General ecological characteristics of old-growth include:

- vertical diversity as a result of different tree species and sizes that produce a multilayered canopy
- increasing size of trees
- large snags and large downed boles
- patchiness associated with small scale disturbances and death of individual dominant trees.<sup>7</sup>

This general definition is used for the purpose of this report.

Some of Pennsylvania's largest and best-studied old-growth sites are Cook Forest, Tionesta, and Hearts Content in northwestern Pennsylvania. The maximum ages recorded for individual trees in these or similar stands includes 360 years for a mixed oak stand (Hopewell Furnace National Historic Site); 450 years for white pines (Hearts Content); 300-500 years for eastern hemlocks (Alan Seeger Natural Area); and 200 years for red pines (Tiadaghton State Park).<sup>8</sup>

#### COMMON FEATURES OF OLD GROWTH FORESTS



SNAGS

DOWNED BOLES



MAST

UPTURNED ROOTS



MULTILAYERED CANOPY



# AN EXAMPLE OF SUCCESSIONAL DEVELOPMENT OF OLD-GROWTH FOREST



1749

Severe fire destroys a substantial portion of the beech-hemlock old-growth forest.

1750

The fire-devastated area is largely barren. Remains of the forest continue to decompose. Mosses and lichens appear.

1753

Herbs, grasses, and bushes have appeared. Few small trees are present.



1773

Young trees take over the area crowding out the brush and grasses.

1833

Deciduous hardwoods which cannot tolerate shade mature. Hemlock and white pine constitute a second story of growth.

1869

Both deciduous and coniferous species have matured.



1870

A severe windstorm causes widespread uprooting. White pine and hemlock expand to crowd out the shade-intolerant species in many areas.

1970

White pines and hemlocks now dominate the forest and perpetuate themselves by the slow growth of seedlings.

1994

The forest has developed old-growth characteristics. It is dominated by white pine and hemlock.

FIGURE 2. PENNSYLVANIA'S OLD GROWTH FORESTS



<b>EAST</b>		Ricketts Glen	14	Joyce Kilmer	27	Cook Forest	41
Chalfont Site	1	Wissahickon Valley	15	Laurel Run	28	Cruik's Island	42
Cowawing Islands	2	Wissler Run	16	Lebo Red Pine	29	Erie NWR	43
Courseshorn Run NA	3	Woodbourne Forest	17	Mount Logan	30	Hearts Content	44
Dingman Falls	4	<b>CENTRAL</b>		Pine Creek Gorge	31	Kennedy Mills	45
Farmkill	5	Alan Seeger	18	Snyder-Middlewarth	32	McCormick Mill	46
Friendship Hill NHS	6	Bark Cabin	19	Sweet Root	33	Silvermine Run	47
Hopewell Furnace NHS	7	Beor Run	20	Tall Timbers NA	34	Thompson's Island	48
Jakky Hollow	8	Boontown Woods	21	The Hemlocks	35	Tionesta Scenic and Research	49
Jennings Run Gorge	9	Crowford Hollow	22	<b>WEST</b>			
Jenkins Woods	10	Derwiler Run	23	Timber Trail	36	Natural Area	
Kelly Run NA	11	East Branch Swamp	24	White Mountain	37	Tryon-Water Woods	50
Lehigh Gorge	12	Forest H. Durlinger	25	Beer Run Nature Reserve	40		
Otter Creek	13	Johnson Run	26				



**JUST BECAUSE AN AREA HAS TREES WHICH ARE OLD, IT IS NOT NECESSARILY CONSIDERED OLD-GROWTH. A FEW OLD INDIVIDUALS OF ONE PLANT SPECIES DO NOT AN OLD-GROWTH FOREST MAKE. IT MUST HAVE THE ATTRIBUTES DISCUSSED PREVIOUSLY (SNAGS, BOLES, ETC.).**

## INVENTORY OF PENNSYLVANIA'S OLD-GROWTH FOREST

### *Geographic Distribution*

Old-growth forest in Pennsylvania is distributed among at least 36 counties (Annex A). In eastern Pennsylvania, old-growth occurs within 18 sites and totals almost 2,000 acres. Individual tracts of old-growth forest in eastern Pennsylvania are distinguished for being relatively small, usually less than 200 acres, and under either industrial (public utilities) or private ownership.

Central Pennsylvania possesses the largest number of old-growth sites (20), totaling a little more than 2,000 acres. Virtually all of the old growth in this region is under state ownership, either by the Pennsylvania Game Commission or the Department of Environmental Resource's Bureau of Forestry. Most individual sites in central Pennsylvania are small, but a few exceed 250 acres.

In western Pennsylvania, 13 old-growth sites have been identified to date, mostly in the northwestern counties totaling approximately 6,400 acres. More than half of the Commonwealth's old-growth occurs in this region. Western Pennsylvania has a combination of small tracts (less than 150 acres) to larger tracts such as Cook Forest State Park (494 acres) and Tionesta Scenic and Research Natural Areas (4,137 acres).

The geographic distribution of old-growth forest is dramatically linked to rural districts of Pennsylvania (Figure 2). Except for Wissahickon Valley, which may actually be very old second-growth instead of virgin old-growth, regions within about a 60-75 mile radius of urban areas near Pittsburgh and Philadelphia are virtually devoid of old-growth forest.<sup>9</sup> Thus, the Commonwealth's old-growth forest is primarily a rural resource.

### *Quantity*

Total land area of old-growth forest in the Commonwealth is estimat-

ed at more than 10,000 acres. In comparison to most nearby or bordering states, Pennsylvania's holdings are remarkably large. For example, only three sizable uncut or ungrazed areas of old-growth are known in New Jersey.<sup>10</sup> In Delaware, "old-growth" consists of only a few sites that have not been disturbed for the past 100-200 years. Today, no absolutely untouched forests remain in Kentucky.<sup>11</sup> Ohio also has no truly virgin forest.<sup>12</sup> In Maryland, a few sites with trees greater than 200 years of age have been identified, but most if not all of these sites were apparently logged at some time.<sup>13</sup> Finally, although West Virginia has more forest today than it has at any time since the turn of the century, it possesses only about 400 acres of old-growth, very little of it virgin.

Except for the Great Smoky Mountains National Park in Tennessee-North Carolina, the upper peninsula of Michigan, portions of New England, and New York, Pennsylvania probably contains the largest total land area and largest single contiguous tracts of old-growth forest remaining in the entire eastern United States.

## IMPORTANCE OF OLD-GROWTH

The term "old-growth" tends to generate polarization based on individual economic or environmental beliefs. Yet old-growth in Pennsylvania can serve two functions. From an economic standpoint it provides a benchmark to measure the activities of managed forests, and is a haven for birds and other animals which consume insects and mammals harmful to the entire forest and the timber industry. Old-growth also holds the potential to accommodate an ecotourism industry.

Environmentally, old-growth forests constitute a coherent, unique ecosystem which is a vital part of the Commonwealth's environmental health. Simply put, species survive in the old-growth that would disappear or decline if it were not there. The demise of these species would reduce the biodiversity of Penn's Woods and could have negative consequences for forest health. Additionally, old-growth forests are of tremendous aesthetic importance to individuals. Many find it a moving experience to wander amidst the immensity of the forest.

**"OLD-GROWTH STANDS ARE RATED BY THE PUBLIC AS MOST ACCEPTABLE FOR THREE FOREST RECREATIONAL USES: SCENIC VIEWING, HIKING, AND CAMPING."**



## THREATS TO PENNSYLVANIA'S OLD-GROWTH FOREST



Courtesy of Pennsylvania Bureau of Forestry, Division of Forest Fire Protection

### *Natural and Biological Factors*

**Forest Aging.** Much of Pennsylvania's oldest old-growth forest is currently in decline due to the fact that some of the dominant tree species have surpassed their average life span. This is especially true for those stands containing very large eastern white pine such as Hearts Content and Cook Forest, where ages of individual trees may be 300+ years.<sup>18</sup> The average age at which white pine begins to suffer from serious decay is 160-170 years.<sup>19</sup> Large white pines in these old-growth stands are not replacing themselves, in part because this species normally is an early-successional colonist after severe, catastrophic disturbances such as fire. White pine only rarely forms contiguous stands of old-growth, so current sites may be something of an anomaly.

**Succession.** Eastern hemlock, the dominant tree species imparting character to Pennsylvania's old-growth forest, is not replacing itself in at least some of the Commonwealth's forests. When hemlocks die and fall, they are usually replaced by less shade-tolerant species.<sup>20</sup> In one of Pennsylvania's premiere old-growth sites, Tionesta Research Natural Area, hemlock has lost representation in the canopy to American beech, declining from 63% of the live canopy 60 years ago

to only 45% or less today.<sup>21</sup> In addition, browsing by white-tailed deer favors American beech, a less-palatable species.

**Fire, Weather, and Climatic Disturbance.** Many of the old-growth stands in Pennsylvania are so small that their integrity is jeopardized by micro-climatic change and such factors as lightning strikes, ice storms, small wind-throws, large tornadoes and thunderstorm downbursts. All of these factors have influenced at least some of the Commonwealth's old-growth.

**Disease.** Most of the dominant and co-dominant tree species comprising Pennsylvania's old-growth forest are subject to damage or death from specific pathogens. Several of these have already greatly altered the original condition of the virgin old-growth forests. By the late 1920's, some 65% of the chestnut in Hearts Content virgin forest had been killed by the chestnut blight. At one time, its abundance in some old-growth probably ranked third after white pine and eastern hemlock.<sup>22</sup>

**Insect Pest Outbreaks.** Two widespread and intense insect pests cause damage to the Commonwealth's old-growth. The gypsy moth primarily attacks oaks and has already precipitated considerable damage to the Commonwealth's oak forests. However, very little old-growth oak occurs in Pennsylvania. Oaks are usually infrequent and insignificant components in the hemlock-northern hardwood forests typical of Pennsylvania's old-growth.

Beginning in the summer of 1992 and continuing through at least the summer of 1994, parts of northern Pennsylvania suffered a severe outbreak of the elm spanworm, a native insect. Elm spanworms, which are "inchworms" or "loopers", feed on a variety of hardwoods, including oaks and American beech. Current outbreaks have been particularly severe in the Tionesta old-growth, whereas Cook Forest was virtually untouched in 1993. The widest outbreak ever experienced in North America occurred between 1954-1963, when over one million acres of hardwood forests were defoliated in the southern Appalachians. Repeated defoliation can cause growth loss, reduction in mast crops, and tree death.

**Mammal Browsing.** Field research indicates that porcupine girdling damaged up to 40% of the trees in the Tionesta old-growth forest.<sup>23</sup> Porcupines feed on bark, cambium, twigs, and leaves. Tree species affected included (in order of frequency) beech, hemlock, black cher-



ry, sugar maple, and yellow birch. Porcupine girdling may also kill the treetops of eastern hemlock.

Deer have also caused considerable alteration to the composition of Pennsylvania's old-growth forests. After protection from market hunting, deer populations increased rapidly. By the 1930's, deer had browsed and nearly eliminated eastern hemlock and hobblebush from the understory of Tionesta's old-growth forest.<sup>21</sup> White-tailed deer have a substantial influence on the ability of eastern hemlock to reproduce itself in forests where it is the dominant tree species.<sup>22</sup> Deer densities as low as 10 per square mile can prevent regeneration of eastern hemlock, thus posing significant external threats to mature and old-growth forest.<sup>23</sup>

## HUMAN IMPACT ON PENNSYLVANIA'S OLD-GROWTH

*Oil-gas Extraction.* Much of the Tionesta Research Natural Area is under some form of disturbance from oil and gas activities, including road and well construction, vehicular traffic, maintenance of wells and generators, and drilling operations. A 1984 study reported at least 11% of this natural area as disturbed with pipelines, pump houses, storage facilities, and service roads by the late 1970's.<sup>24</sup> More roads, wells, and access points have been constructed since his study. At the present time, it is not possible to attribute any harmful effects to these operations aside from localized tree removal and creation of artificial canopy gaps.

*Commercial Timber Harvesting.* Virtually all of the old-growth forest sites in Pennsylvania are protected under one or more public management agencies. The researchers are unaware of any large unprotected sites. Recently-encountered old-growth, such as on state forest lands, is usually protected from cutting soon after it is found.

*Removal of Wind-thrown and Diseased Trees.* From the 1950's through 1970's, it was prevalent in Cook Forest State Park to selectively remove large trees blown down during windstorms in order to "protect the remaining trees from disease and insects". There is absolutely no evidence that such salvaging operations prevent either disease or insect infestations. Furthermore, such practices erode biotic integrity of old-growth forest by removing snags, downed tree boles, and other wildlife habitat.

## MIGRATORY FOREST SONGBIRDS AND OTHER WILDLIFE



*Scarlet Tanager (A. & E. Morris/TREO)*

### *Residents of the Old-Growth Ecosystem*

Migratory forest songbirds were selected as the key species of the old-growth ecosystem for evaluation because of their role in consuming harmful insects, the awareness that various members of the group are declining, and their potential as a ecotourism resource. Deer and other species were also examined because of their potential economic impact on hunting in local communities.

It is important to remember to think of systems instead of individual or groups of species. The migratory forest songbirds depend on the old-growth habitat to survive. Conversely, the old-growth requires the migrants to defend it against insect depredation. The ecosystem is a mutually-dependent world.

## WHAT IS A MIGRATORY FOREST SONGBIRD

Birds that winter in tropical parts of Central and South America are known as neotropical migrants, because they annually migrate to the new-world (neo) tropical areas. The two primary reasons that migration occurs are food and to a lesser degree, climate.<sup>25</sup> Annex D lists



Pennsylvania's neotropical migrants. Throughout this report, neotropical migrant songbirds are referred to as migratory forest songbirds.

MIGRATORY FOREST SONGBIRDS ARE THE UNSUNG HEROES OF NORTHERN FORESTS, PROTECTING THEM FROM FOLIAGE-EATING MENACES. ADULT MIGRANTS MAY EAT A WIDE VARIETY OF INSECTS AND SPIDERS, BUT ALMOST ALL FEED THEIR YOUNG WITH CATERPILLARS THAT FEED VORACIOUSLY ON NEW LEAVES. THE AVERAGE PAIR OF WARBLER PARENTS REMOVE CATERPILLARS FROM MORE THAN A MILLION LEAVES IN THE TEN DAYS IT TAKES TO RAISE A NEST FULL OF BABIES TO FLEDGLINGS. IN A WORLD WITHOUT MIGRATORY FOREST SONGBIRDS, THE FOREST WOULD BE RAVISHED BY INSECTS, HELPLESS TO DEFEND ITSELF.<sup>26</sup>

## BIRD POPULATIONS AND COMMUNITIES IN OLD-GROWTH FOREST

The majority of migratory songbirds are not common backyard birds. Some species, such as the Northern Oriole, Indigo Bunting, Barn Swallow, and Eastern Kingbird, are common in fields and the edges of woodlands, but the majority of migratory songbirds are creatures of the forests. Except during migration, many of these species are difficult to see. The migratory explosion begins in March, with the majority of migrants being well-established on their breeding territories by May and June. Within three months or less, the birds finish nesting and begin their southern trek.<sup>27</sup> Figure 3-6 illustrates migration patterns.

The Commonwealth's migratory forest songbird community was analyzed to determine if sufficient numbers of birds existed to support an ecotourism industry. Seventeen old-growth study areas were identified in Northwestern Pennsylvania. These areas ranged from 12-45 acres in Cook Forest State Park, Allegheny National Forest, Erie National Wildlife Refuge, Tyron-Weber Woods, State Game Land 108, and private land. Evaluations were conducted during eight-week periods during the winters and early summers of 1992-1994.

Seventy-six bird species were observed using old-growth forest during the summer breeding or winter seasons. This represents approximately 20% of the state's known bird species.<sup>28</sup>

FIGURE 3. EASTERN BLUEBIRD MIGRATION PATTERNS

BREEDING RANGE WINTER RANGE





FIGURE 4. BLACK-THROATED BLUE WARBLER MIGRATION PATTERNS

BREEDING RANGE WINTER RANGE



FIGURE 5. ROSE-BREASTED GROSBEAK MIGRATION PATTERNS

BREEDING RANGE WINTER RANGE





FIGURE 6. RED-EYED VIREO MIGRATION PATTERNS

BREEDING RANGE WINTER RANGE



#### Summer

The six old-growth plots (30-45 acres) studied in Cook Forest State Park and the Allegheny National Forest averaged slightly more breeding bird species than did plots in younger forests (72 versus 69). Pennsylvania's old-growth also contained substantially more bird territories per 100 acres than younger forests in Berks, Luzerne, Huntingdon, and Washington counties among others (342 versus 247). Significantly more territories of migratory forest songbirds occurred in old-growth forest (252 versus 166).

Differences in abundance between forest types for several of the migratory forest songbirds were most dramatic. Consider the following old-growth to younger forest ratios: Blackburnian Warblers averaged 45 times more abundant; Black-throated Green Warblers averaged 3.5 times more abundant; Magnolia Warblers averaged 40 times more abundant; Solitary Vireos were nearly 8 times more abundant in old-growth; and Swainson's Thrush, the rarest and most local of the thrushes breeding in Pennsylvania, was more than 20 times more abundant in old-growth forest.<sup>28</sup>

Other species were also recorded in old-growth forest during the breeding season that are either rare, vulnerable, or local breeders in the Commonwealth, or are considered sensitive forest-interior species subject to declines from forest fragmentation. The Yellow-bellied Flycatcher, the state's rarest nesting species and rarest flycatcher, used mossy hogs in dense groves of old-growth eastern hemlock.<sup>29</sup> Olive-sided Flycatchers were also noted on snags around forest openings or in extensive blowdowns situated in unmanaged forest areas adjacent to old-growth. Small numbers of Pine Siskin, an erratic breeder in Pennsylvania, occurred in old-growth at both Cook Forest State Park and Allegheny National Forest.<sup>28</sup> Forest-interior species commonly found in Pennsylvania old-growth included Acadian Flycatchers, Wood Thrushes and Scarlet Tanager. During the 1994 breeding season, a singing male Bay-breasted Warbler defending a territory in old-growth forest at Tionesta Research Natural Area in Allegheny National Forest was recorded. There have been no previous breeding season records of this species from the Commonwealth.<sup>32</sup>

Finally, a number of raptors were common and conspicuous in old-growth. These included the Northern Goshawk, Sharp-shinned and Cooper's Hawks, Red-shouldered Hawk, Barred and Saw-whet Owls. The Barred Owl, which had declined during the turn-of-the-century logging era, occurred on or near virtually every study plot.<sup>33</sup>



## LIST OF SPECIES OBSERVED AT ONE STUDY TRACT IN SUMMER AND WINTER

### SPECIES OBSERVED AT HILLSIDE TRACT (SUMMER)

\* Indicates neotropical migrants

GREAT BLUE HERON  
MALLARD DUCK  
COMMON MERGANSER  
BROAD-WINGED HAWK  
MOURNING DOVE  
GREAT HORNED OWL  
BARRED OWL  
SAW-WHET OWL  
CHIMNEY SWIFT  
BELTED KINGFISHER  
DOWNY WOODPECKER  
HAIRY WOODPECKER  
NORTHERN FLICKER  
PILEATED WOODPECKER  
EASTERN WOOD-PEWEE\*  
**ACADIAN FLYCATCHER\***  
EASTERN PHOEBE  
BARN SWALLOW\*  
BLUE JAY  
AMERICAN CROW  
COMMON RAVEN  
BLACK-CAPPED CHICKADEE  
BROWN CREEPER  
WINTER WREN  
RED-BREASTED NUTHATCH  
WHITE-BREASTED NUTHATCH  
**BLACKBURNIAN WARBLER\***  
AMERICAN ROBIN  
**OVENBIRD\***  
VEERY\*  
SWAINSON'S THRUSH\*  
**RED-EYED VIREO\***  
HERMIT THRUSH  
WOOD THRUSH\*



Photo by [unreadable]



Photo by [unreadable]



Photo by [unreadable]



Photo by [unreadable]

CEDAR WAXWING  
SOLITARY VIREO\*

**MAGNOLIA WARBLER\***

PINE WARBLER

**BLACK-THROATED BLUE WARBLER\***

LOUISIANA WATERTHRUSH\*

COMMON GRACKLE

BROWN-HEADED COWBIRD

SCARLET Tanager\*

**ROSE-BREASTED GROSBEAK\***

CHIPPING SPARROW

PURPLE FINCH

PINE SISKIN

AMERICAN GOLDFINCH

DARK-EYED JUNCO



Photo by [unreadable]



Photo by [unreadable]



Photo by [unreadable]

### SPECIES OBSERVED AT HILLSIDE TRACT (WINTER)

COOPER'S HAWK  
WILD TURKEY  
GREAT HORNED OWL  
BELTED KINGFISHER  
DOWNY WOODPECKER  
HAIRY WOODPECKER  
PILEATED WOODPECKER  
BLUE JAY  
AMERICAN CROW  
NORTHERN RAVEN  
BLACK-CAPPED CHICKADEE  
RED-BREASTED NUTHATCH  
WHITE-BREASTED NUTHATCH  
WINTER WREN  
BROWN CREEPER  
GOLDEN CROWNED KINGLET  
CEDAR WAXWING  
PURPLE FINCH  
COMMON REDPOLL  
AMERICAN GOLDFINCH  
EVENING GROSBEAK



### Winter

A total of 25 bird species were recorded on old-growth plots during the first winter field season of 1992-1993. Species which eat insects from leaves and bark were the most commonly recorded. Woodpeckers, raptors, Wild Turkeys, Ravens, and northern finches tended to have more variable numbers within old-growth plots during this particular winter season. Wild Turkeys were frequently found sheltering in or near the more coniferous sections of the old-growth study plots this winter. Compared to forested regions from across northeastern North America, the old-growth forests studied averaged significantly higher in total numbers and diversity of its bird community.

Winter bird populations were generally similar in composition during the 1993-1994 winter field season in which 27 species were recorded. One notable occurrence this season was an invasion of northern finches across the region into the study plots. Species included Pine Grosbeak, Evening Grosbeak, White-winged Crossbill, and Common Redpoll. At least some of these species were preferentially attracted to old-growth sites, being far less common in Pennsylvania's second-growth, regenerating forest.<sup>21</sup>

## MIGRATORY FOREST SONGBIRDS IN TROUBLE

Although few species face imminent extinction, the numbers of migratory birds are steadily declining.

**THE NUMBER OF MIGRATORY FOREST SONGBIRDS IN EASTERN NORTH AMERICA DECLINES AT A RATE OF ONE TO THREE PERCENT A YEAR.<sup>22</sup>**

**THE VOLUME OF MIGRATORY FLIGHTS OVER THE GULF OF MEXICO DETECTED BY RADAR DURING THREE YEARS IN 1980 WAS HALF THAT OF THREE YEARS IN 1960.<sup>23</sup>**

## THREATS

### Natural and Biological Factors

*Predation.* The nests and young of migratory forest songbirds are threatened by predators and parasites. The open, woven-cup nests built by most migrants are more vulnerable to egg predators like raccoons, opossums, and squirrels than are the nests of many resident species. Small migratory songbirds cannot defend their nests from bird egg predators such as the Blue Jay, Common Grackle, and

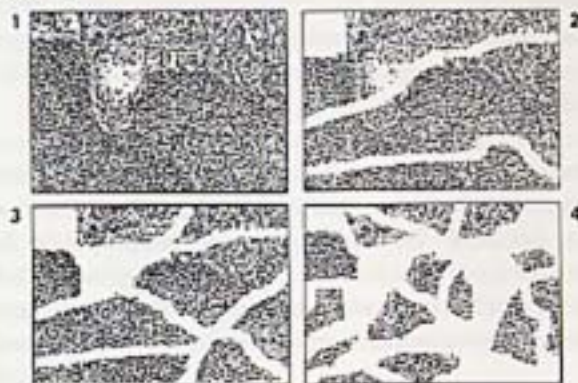
American Crow. Losses hit migrants particularly hard because their short breeding season rarely permits more than one brood per year.<sup>24</sup>

*Cowbirds.* Many nesting migrants are also threatened by the parasitic Brown-headed Cowbird. Female cowbirds seek out unattended nests to lay their eggs among those of the nest's owner, sometimes throwing the resident eggs out. Some species such as American Robins, Grey Catbirds, and Blue Jays, recognize the alien eggs and throw them out. However, many migratory forest songbirds cannot differentiate between the eggs, and incubate the eggs and raise the cowbirds with their own young. The young cowbirds mature more quickly than the songbirds and consequently demand more food. The end result is that many young songbirds are pushed out of the nest or starve.

### Human Impact

*Forest Fragmentation.* Concern in northern breeding areas is focused on the effects of forest fragmentation: the subdivision of large, continuous tracts of forest into smaller isolated tracts by such impacts as urban sprawl, highways, and powerlines. Approximately 10 species of migratory forest songbirds (known as area-sensitive, or forest-interior birds) require large blocks of habitat for breeding and are particularly sensitive to forest fragmentation. Fragmentation not only reduces the total area of breeding habitat, but also increases the "edge" effect. Increasing the amount of "edge" around a forest through fragmentation leads to increased rates of predation and parasitism. As more land is developed or harvested, the available habitat for migratory forest songbirds steadily decreases.

The illustration below depicts what happens when the forest is fragmented. Block 1 is a healthy unfragmented forest. Disturbance to the ecosystem is minimal. In Block 2, areas of the forest have disappeared through natural or manmade disturbances. The amount of "edge" is increased, making it easier for parasites and predators to attack the ecosystem. Block 3 shows the fragmentation continuing. In Block 4, the forest has become so fragmented that the ecosystem is disrupted and species transition occurs as these birds and animals, that require unfragmented forest to survive, depart or die out.





*Tropical Deforestation.* Throughout the Latin American wintering grounds of migratory birds, the natural landscape is undergoing massive changes at phenomenal rates. By conservative estimates, between one and four percent of their winter habitat is being converted to pasture and farms each year. Forest loss has been most severe in the most important migratory bird areas such as Mexico and Central America. The loss of tropical wintering grounds leaves no winter home for Pennsylvania's summer visitors.<sup>30</sup>

*Toxins:* Massive use of pesticides is a lurking, but still poorly-documented, threat to migratory forest songbirds, either through direct toxicity or by severely reducing the food supply. North American forests are commonly sprayed with pesticides which kill caterpillars and other juvenile insects. Dependent on caterpillars to feed their young, many species may suffer significantly-reduced nesting success as a result. Long-lived chemicals like DDT, no longer legally used in the United States, are still supplied by U.S. companies and multinational corporations to Latin American and Caribbean farmers. These pesticides accumulate in the fat of migratory birds, and thus enter the food chain that ultimately affects us all.<sup>31</sup>

## ANIMALS IN OLD-GROWTH FOREST

Pennsylvania's old-growth forests are heavily used by white-tailed deer during the severe winter months. Deer densities were calculated at 30 to 90 deer per square mile on study plots in Cook Forest State Park and in the Tionesta Scenic and Research Natural areas in Allegheny National Forest. Highest deer use tended to be in areas with relatively greater conifer cover, closer to water. Deer utilize conifer stands during winter because hemlock, one of their preferred foods, also tends to create a more closed canopy which intercepts snowfall and reduces wind speeds.<sup>32</sup> Cover provided by coniferous trees can be the most important factor for winter survival of deer in hemlock hardwood forest types.<sup>33</sup>

Several other animals also use old-growth forests. Populations of red and gray squirrels were particularly high in the Cook Forest study plots during the 1992-1993 winter, after exceptionally large hemlock and white pine cone and beech mast crops were produced during the prior fall. Other animals also use old-growth forests, including chipmunks, raccoons, minks, porcupines, bears, bobcats, and coyotes.



## PART FOUR CONCLUSIONS



*Alan Seeger Natural Area, courtesy of Pennsylvania Bureau of Forestry*

Both Bucks County and the Poconos have demonstrated that ecotourism has the potential to be a successful marketing strategy and also serves to sustain the economic and environmental quality of life in their communities. Other Pennsylvania communities should assess their environmental assets to determine if ecotourism is feasible to develop new markets and sustain existing opportunities.

Ecotourism potential exists throughout Pennsylvania's rural communities, but limited sites in rural parts of the state possess infrastructure for ecotourism development. Communities without infrastructure should consider adopting the Arkansas model which focuses on local employment, preserving communities, and sustaining the environment. Communities with infrastructure should modify the Arkansas model to encourage microentrepreneurial development to complement existing businesses.



It appears feasible to utilize old-growth forests and migratory forest songbirds as an ecotourism resource. It appears to be especially suited towards small-scale sustainable tourism in communities with limited infrastructure.

Old-growth forest ecosystems in Pennsylvania are a unique and precious environmental legacy to all citizens which can be marketed as ecotourism destinations. Few states can match Pennsylvania's old-growth forest resources. The Commonwealth's minimum 10,000 acres of old-growth exceeds by a factor of two or more the old-growth holdings of such states as Illinois, Indiana, Iowa, Kentucky, and Ohio.<sup>41</sup> Further, the most readily accessible sites are all close to major tourist markets. Finally, a large percentage of the U.S. population lives within a day's drive of Allegheny National Forest in northwestern Pennsylvania, and old-growth sites in the central and eastern part of the state are even more accessible to a substantial portion of the American public.

Better marketing of Pennsylvania's ecotourism assets, to include the relatively untapped potential of old-growth and surrounding forest ecosystems, is necessary both nationally and internationally. Not only will this serve to attract the largest possible user group, it will also better disperse economic benefits from ecotourism across rural Pennsylvania.

The Commonwealth's State Forests have an extensive system of roads, trails, wild areas, and natural areas that do not necessarily contain old-growth, but still have strong potential for ecotourism development (Annex B).

Pennsylvania's State Parks currently offer a wide variety of services and environmental experiences to its citizens. The nine Natural Areas within the State Park system might be possible sites for ecotourism development (Annex C).

Cook Forest State Park, with its existing infrastructure and its capability for expansion, exemplifies a potential economic model for other parts of the state near old-growth forest. Ricketts Glen State Park, located in eastern Pennsylvania, could be considered as an approximate cross-state equivalent to Cook Forest.

The old-growth forests in northwestern Pennsylvania support an abundance and diversity of bird species unique in the northeastern

United States. This population includes migratory forest songbirds threatened by loss of habitat elsewhere.

Extractive industries, such as timber, do not appear to currently have an adverse affect on the migratory forest songbird population in old-growth areas of the Commonwealth due to restrictions which prevent timbering activities.

Thus far, Pennsylvania, like virtually all of the eastern United States, has devoted little attention to old-growth forest as a valuable natural resource. Maturation of the state's forests following the logging era at the turn of the century, and the present tendency on the part of public agencies to cut less forest than is being replaced through regeneration, both provide an opportunity to begin creation or replacement of old-growth forest without jeopardizing the economic return from the Commonwealth's important timber industry. Whatever public policies are adopted, Pennsylvania should coordinate efforts to diligently avoid polarization over the existence, maintenance, use, and preservation of old-growth forest.

**ECOTOURISM IS NOT A PANACEA FOR COMMUNITIES SUFFERING FROM UNEMPLOYMENT. IT IS ONE TOOL THAT CAN HELP ECONOMIC REVITALIZATION AND SIMULTANEOUSLY PRESERVE OUR COMMON ENVIRONMENTAL HERITAGE.**

## RECOMMENDATIONS

Greater efforts must be made to market the state's existing ecotourism destinations. Many organizations are attempting to enter the ecotourism arena. However, lacking a major sponsor such as American Express for Bucks County, most groups lack the necessary funds and expertise. It is incumbent on the Commonwealth to develop and coordinate an ecotourism marketing strategy.

Communities must have a plan to protect their resources before they begin to utilize them. Sudden increased visitation, without a comprehensive plan which addresses sustainability and capacity, could result in the destruction of the very resources which attract people. Planning assistance is available from the Rural Center and other organizations.

The Arkansas model of ecotourism development which focuses on conserving the natural environment and sustaining the well-being of local residents is a model for rural Pennsylvania areas which lack



existing infrastructure. Small loans for ecotourism development should be made available to microentrepreneurs. This program could be modeled after the Center-sponsored project Entrepreneurial and Microentrepreneur Development in Rural Pennsylvania. Local Resource Conservation and Development Councils would appear to be ideal candidates to administer this program.

Natural resource agencies such as the Pennsylvania Game Commission, Bureau of Forestry, Allegheny National Forest, and private organizations must develop a comprehensive plan for the management of old-growth to ensure its preservation. These organizations should jointly develop and apply objective ecological criteria to evaluate the existence, quality, and quantity of the Commonwealth's old-growth forests. Such testing would be useful to identify and rank stands with advancing age which could be set aside as potential old-growth areas in the future.

Information about the Commonwealth's old-growth forests and their ecosystems should be made available for wide distribution. Although most of the old-growth forest in Pennsylvania is in the public domain, several diverse public agencies act as custodians. One solution to this scattered information is to produce a single booklet or brochure under multiple sponsorship that compiles the locations, history, and ecology of the various old-growth sites statewide. Such a brochure would serve as a marketing and educational resource.

Further research should be initiated to inventory the biotic diversity in old-growth forests, including the degree of dependence of various wildlife on late-successional forest areas.

**ECOTOURISM IS REAL. IT IS THE FASTEST GROWING SEGMENT OF THE TRAVEL INDUSTRY. A STATE IN WHICH TOURISM IS THE SECOND LARGEST INDUSTRY CANNOT AFFORD TO LET THIS OPPORTUNITY SLIP BY. EVEN MORE IMPORTANTLY, WE MUST PRESERVE THOSE UNIQUE RESOURCES WHICH MAKE THE COMMONWEALTH A PRIME DESTINATION FOR ECOTOURISTS.**

**THE KEY IS PLANNING FOR ECONOMIC DEVELOPMENT WHICH COMPLEMENTS AND SUSTAINS OUR NATURAL TREASURES. IF WE DO NOT ACT TO PRESERVE OUR NATURAL AND CULTURAL HERITAGE, HOW WILL WE ANSWER OUR CHILDREN WHEN THEY ASK US "WHERE HAS OUR BIRTHRIGHT GONE?"**



LUTHER BURTON © QUINCY PHOTO

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ANNEX A. LOCATION AND DESCRIPTION OF OLD-GROWTH FOREST SITES IN PENNSYLVANIA.

SITE NAME	NUMBER (FIGURE 2)	OWNERSHIP	COUNTY	ACREAGE	DISCUSSION
<b>EASTERN PENNSYLVANIA</b>					
Chalkley Site	1	Private	Bucks	10-15	Restored old growth with white oak
Conowingo Marsh	2	Philadelphia Electric	York	94	Virgin stands of hemlock-hardwood and black chestnut oak
Countryside Run N.A.	3	PNEL	York	39	Virgin or very old second growth tulip tree and sugar maple
Diagnosis Falls	4	Delaware Water Gap MRA	Pike	Unknown	Inaccessible virgin hemlock-northern hardwood
Fennell	5	PNEL	Lancaster	64	Near virgin mixed hardwood-hemlock
Friendship Hill NHS	6	National Park Service	Berks	7-10	Remnant of pre-settlement white oak
Hopewell Furnace NHS	7	National Park Service	Berks	7-10	300-year old chestnut-oak on steep slope
Jakey Hollow	8	Wyoming State Forest	Colleton	57	Virgin white pine, eastern hemlock, and northern hardwood
Jones Run Gorge	9	PA Game Commission	Carbon	141	Old-growth northern cypress forest
Jonas Woods	10	Private	Morris	30	Eastern hemlock with rhododendron understory
Kelly Run N.A.	11	PNEL	Lancaster	64	Possibly virgin mixed hardwood-hemlock
Lehigh Gorge	12	Lehigh Gorge State Park	Carbon	900	Undisturbed virgin hemlock-hardwood on steep slopes
Lehigh Gorge	13	PNEL	Carbon	99-200	Virgin mixed hardwood-hemlock and chestnut oak
Otter Creek	14	Richman Glen State Park	York	30	May be an additional 2000 acres of partial old-growth
Unrecorded	15	Private	Sullivan-Lancaster	10-15	Northern hardwood-cedar forest
Wissahickon Valley	16	City of Philadelphia	Wayne	Unknown	Virgin mixed hardwood-hemlock
Wissahickon Valley	17	The Nature Conservancy	Philadelphia	49	Very old second-growth, possibly virgin mixed hardwood-hemlock
Woodbourne Forest	18	Richman State Forest	Susquehanna	200	Prime virgin hemlock-hardwood, largest virgin tract in northeastern PA
<b>CENTRAL PENNSYLVANIA</b>					
Allen Seeger	19	Frederick State Forest	Huntingdon	118	Very large hemlocks and virgin oak
Bark Cullen	20	Frederick State Forest	Lancaster	7	Very small grove of virgin hemlock
Bear Run	21	Bald Eagle State Forest	Centre	15	Eastern hemlock
Beaumont Woods	22	Michoud State Forest	Franklin	27	Northern hardwood forest
Crescent Hollow	23	Private	Cumberland	89	Old-growth eastern hemlock-white pine
Dorchester Run	24	Richman State Forest	Huntingdon	185	White pine, hemlock with rhododendron understory, old-growth oak
East Branch Swamp	25	Spring State Forest	Clinton	20	Virgin hemlock swamp forest
Forest Hill Outcrops	26	Susquehanna State Forest	Clinton	158	Rare hemlock stand with virgin hemlock-northern hardwood
Johnson Run	27	U.S. State Forest	Cameron	27	Virgin hemlock in narrow strip along stream
Jones River	28	Bald Eagle State Forest	Union	76	Old-growth hemlock inaccessible to logging, low flood density
Long Run		Treasure State Forest	Perry	Unknown	Lightly cut old-growth forest, virgin hemlock on slope



SITE NAME	NUMBER (FIGURE 2)	OWNERSHIP	COUNTY	ACREAGE 2	DESCRIPTION
Lake Red Pine	29	Tusquehanna State Forest	Lewisburg	20	200-year old red pine mixed with white birch and oaks
Mease Logans	30	Bald Eagle State Forest	Clarke	32-69	Virgin hemlock on poor current site (dry)
Pine Creek Gorge	31	Tioga State Forest	Tioga	40	National landmark with unimproved old-growth
Snyder-Middlebush	22	Bald Eagle State Forest	Snyder	249-499	Virgin white pine, hemlock, pitch pine and mixed oaks
Sweet Run	33	Natchez State Forest	Bedford	25-69	Isolated virgin hemlock and oak
Tall Timbers NA	34	Bald Eagle State Forest	Snyder	99	Old-growth hardwoods with pitch pine, selectively cut since 1900
The Horseshoe	35	Tusquehanna State Forest	Perry	20-124	Narrow stand of hemlock along steep-walled stream
Timber Trail	36	State Game Land Number 105	Columbia	30	Virgin hardwood woodland near Prince George's State Park
White Mountain	37	Bald Eagle State Forest	Union and Mifflin	346	North slope of mountain with virgin hemlock
<b>WESTERN PENNSYLVANIA</b>					
Anders Run	38	Companions State Forest	Warren	95	White pine, eastern hemlock, post disturbance disrupted (Dyck 1993)
Beaver Creek	39	Private	Westmoreland	Unknown	Mixed virgin woods of hemlock, yellow birch, and sugar maple
Blue Run Nature Reserve	40	Western Pennsylvania Conservancy	Fayette	35-181	Various old-growth canopy types within second-growth oak
Cook Forest	41	Cook Forest State Park	Clarke, Forest, and Jefferson	494.1	White pine, hemlock, and northern hardwoods
Curt's Island	42	Allegheny National Forest	Warren	61*	Virgin mature forest of sugar maple and spruce
Eric NWR	43	U.S. Fish & Wildlife Service	Crawford	12-20	Selectively cut hardwoods of sugar maple, beech, and black cherry
Harris Centre	44	Allegheny National Forest	Warren	121-150	White pine, hemlock, and northern hardwoods
Kennedy Mills	45	Private	Lawrence	48-50	Old growth or near-virgin north hardwood-hemlock
McCawalls Mill	46	Allegheny National Forest	Lawrence	197-1,200	Mixed hardwood-hemlock in gorge of Slippery Rock Creek
Shenandoah Run	47	Private	Westmoreland	Unknown	Virgin forest of hemlock, beech, and sugar maple in a deep valley
Thompson's Island	48	Allegheny National Forest	Warren	44	Virgin shrub forest of other maple and spruce
Tenmile Scenic and	49	Allegheny National Forest	Warren and McKean	4,137*	Largest tract of virgin timber between the Adirondacks and the Great Smoky Mountains National Park
Research Natural Area		Western Pennsylvania Conservancy	Crawford	16	Virgin hemlock
Tryon-Widder Woods	50	Western Pennsylvania Conservancy	Crawford		

1. Sources: Pennsylvania Wildlife, Vol. 12, No. 4, p. 6, Erdman and Wegman, 1974

Pennsylvania Forests, Feb 1993, pp. 9.

Dyck, 1993

2. This figure includes three well-documented virgin tracts as well as lesser known sites such as the ridge top east of Honey Run. A slide segment of the remaining 7,500 acres is very old second-growth near approaching original condition (Erdman and Wegman, 1974).

3. Old growth estimates based on no more than 1/3 of stands consisting of open areas (Erdman and Wegman, 1974).

4. Includes areas of natural disturbance and unmanaged regeneration (Approximately 563 acres of 120-200 year-old woodlands and 640 acres destroyed by a 1985 tornado).

Note: The table does not include several tracts of old-growth forest less than 7 acres in area.

## ANNEX B. SELECTED FACILITIES ON PENNSYLVANIA STATE FOREST LAND

STATE FOREST	COUNTIES	TOTAL ACRES	WILD AREA ACRES	NATURAL AREA ACRES	ROADS (MILES)	HIKING TRAILS (MILES)
Bald Eagle	Centre, Union & Snyder	195,624	2,925	7,020	249	36
Buchanan	Fulton, Franklin & Bedford	70,388	11,596	1,971	150	87
Companions	Forest	1,354	0	0	0	2
Delaware	Pike & Monroe	80,096	0	6,250	41	150
Elk	Greene & Elk	197,815	48,166*	19,932**	138	100
Fulton	Westmoreland, Somerset & Fayette	51,201	4,675***	3,671	76	69
Goshen	Indiana, Cambria, Bedford & Somerset	15,317	2,791	384	10	51
Hunting	Jefferson, Forest & Venango	13,299	0	0	13	47
Lackawanna	Lackawanna & Luzerne	8,816	0	0	14	23
Michaux	Franklin, Adams & Cumberland	84,633	0	1,391	126	65
Monkman	Centre & Clearfield	185,835	48,166*	917	188	244
Rathrock	Centre, Mifflin & Huntingdon	94,349	6,589	2,558	226	47
Spread	Centre & Clinton	270,271	7,129	16,859**	353	257
Susquehanna	Potter	251,754	30,875***	1,521	184	85
Tusquehanna	Lyon	214,973	19,072	5,144	235	200
Tioga	Tioga & Bradford	162,923	3,070	8,826	178	34
Troutman	Cumberland, Perry, Franklin, Huntingdon, & Mifflin & Juniata	91,025	5,363	1,411	121	49
Valley Forge	Chester	843	0	0	0	5
Warrior	Dauphin, Carbon, Schuylkill & Berks	19,361	0	0	65	9
Warming	Sullivan	42,820	0	871	77	90
<b>TOTAL</b>		<b>2,072,260</b>	<b>143,391</b>	<b>61,376</b>	<b>2,544</b>	<b>1,670</b>

\* The acreage for the Quakana Wild Area (18,186) is included for both the Elk and Monksman State Forests.

\*\* The acreage for the Buckhorn Wild Area (16,368) includes land in both Sprad and Elk State Forests.

\*\*\* Includes the Quakana Wild Area (Fishes State Forest) and the Huntingdon Wild Area (Susquehanna State Forest) which are managed as wild areas but have not been officially designated as such.

Source: DCR Bureau of Forestry Chart, Recreation Facilities on State Forest Land, Revised 6/91.



# ANNEX C. NATURAL AREAS WITHIN THE STATE PARK SYSTEM

NATURAL AREA	STATE PARK	COUNTIES	NATURAL AREA ACRES	DESCRIPTION
Black Marshman Bog	Black Marshman	Centre	1,992	Wetlands adjacent to the southwest arm of the lake comprise the forest reconnected bog in Pennsylvania. Includes many rare plants associated with sphagnum bogs.
Forest Cathedral	Cook Forest	Clinton & Forest	555	Old-growth stand of white pine and eastern hemlock.
Rocky Mountain Cliffs	Dolan's Gaud	Bucks	28	Cliffs rise nearly 300 feet above the Delaware River. Provides habitat for rare native plant species of concern.
New Swamp	French Creek	Berks	98	Acidic broadleaf swamp containing rare plant species.
Builder Field	Hickory Run	Carbon	16	A unique formation of glacial drift, limestone due to its fissures and large size.
Forest of Pennsylvania	Chippewa	Fayette	104	The area contains abundant wildflowers as well as old-growth hemlock and several oak forests and plant species of concern.
Gull Point Special Management Area	Pesque Isle	Erie	67	Large variety of habitats which are critical for migrating shore birds and waterfowl. Provides habitat for many rare plants and animals.
Rapid Run	R. B. Wines	Union	39	Old-growth forest of white pine and eastern hemlock containing areas of emergent wetlands, springs, and sphagnum bogs.
Glen Natural Area	Ricketts Glen	Lancaster	2,845	The branches of Kichew Creek and their stamk waterfalls flow through old-growth forests of eastern hemlock, white pine, and mixed oak.

Source: John Mide, Natural Areas in Parks, Pennsylvania State Parks, Vol. III, Number 4, Fall 1993, p. 11.

# ANNEX D. LAND BIRDS OCCURRING IN PENNSYLVANIA WHICH BREED IN NORTH AMERICA AND SPEND THEIR NONBREEDING PERIOD PRIMARILY SOUTH OF THE UNITED STATES (SPECIES NOT NESTING IN PENNSYLVANIA ARE INDICATED BY AN \*)

SPECIES	BREEDING HABITAT	SPECIES	BREEDING HABITAT	SPECIES	BREEDING HABITAT
Chimney	Wetlands	White-eyed Vireo	Scrub/Shrub	Northern Waterthrush	Forest Interior/Wetlands
Broad-winged Hawk	Forest Interior	Song Sparrow	Woodland	Louisiana Waterthrush	Forest Interior
Merula*	Woodland	Yellow-throated Vireo	Woodland	Kentucky Warbler	Forest Interior
Pied-billed Grebe	Forest Edge	Warbling Vireo	Woodland	Connecticut Warbler*	Scrub/Shrub
Upstart Screeper	Grassland	Philadelphia Vireo*	Forest Interior	Mourning Warbler	Scrub/Shrub
Black-bellied Cuckoo	Forest Interior	Red-eyed Vireo	Woodland	Common Yellowthroat	Scrub/Shrub
Yellow-bellied Cuckoo	Woodlands	Blue-winged Warbler	Scrub/Shrub	Hooded Warbler	Forest Interior
Carolina Nighthawk	Urban	Golden-winged Warbler	Woodlands	Wilson's Warbler*	Woodlands
Chickadee's widow	Woodlands	Tennessee Warbler*	Woodlands	Canada Warbler	Forest Interior
Chimney Swift	Urban	Orange-crowned Warbler*	Woodlands	Yellow-bellied Chat	Scrub/Shrub
Ruby-throated Hummingbird	Urban	Nashville Warbler	Forest Interior	Summer Tanager	Woodlands
Eastern Wood-Pewee	Woodlands	Northern Parula	Forest Interior	Scarlet Tanager	Woodlands
Yellow-bellied Flycatcher	Forest Interior/Wetlands	Yellow Warbler	Scrub/Shrub	Blue-headed Grosbeak	Woodlands
Acorn Flycatcher	Forest Interior	Chimney Swift	Scrub/Shrub	Blue Grosbeak	Forest Edge
Alder Flycatcher	Wetlands	Magpie Warbler	Woodlands	Indigo Buntings	Scrub/Shrub
Willow Flycatcher	Scrub/Shrub	Cape May Warbler*	Woodlands	Deckard	Grasslands
Least Flycatcher	Woodlands	Black-throated Blue Warbler	Forest Interior	Chipping Sparrow	Scrub/Shrub
Great Crested Flycatcher	Woodlands	Black-throated Green Warbler	Forest Interior	Lincoln's Sparrow*	Grasslands
Eastern Kingbird	Forest Edge	Blackburnian Warbler	Forest Interior	Bobolink	Grasslands
Purple Martin	Forest Edge	Yellow-throated Warbler	Woodlands	Yellow-headed Blackbird*	Forest Edge
Rough-winged Swallow	Forest Edge	Prothon Warbler	Scrub/Shrub	Ochard Oriole	Woodlands
Bank Swallow	Forest Edge	Palm Warbler*	Forest Interior	Northern Oriole	Woodlands
CHL Swallow	Forest Edge	Bay-breasted Warbler*	Forest Interior	Hooded Wren	Scrub/Shrub
Barn Swallow	Forest Edge	Blackpoll Warbler*	Forest Interior	Vireo	Forest Interior
Blue-gray Gnatcatcher	Forest Interior	Carolina Warbler	Forest Interior	Gray-cheeked Thrush*	Forest Interior
American Redstart	Woodlands	Black-and-white Warbler	Wetlands	Ovenbird	Forest Interior
Swainson's Thrush	Forest Interior	Prothon Warbler	Forest Interior	Gray Catbird	Scrub/Shrub
Wood Thrush	Forest Interior	Worm-eating Warbler	Forest Interior		
Swainson's Warbler	Forest Interior				

Source: FOWL, PIERCE. Updated with data obtained from this project.