PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF THE VOLUNTARY PUBLIC ACCESS AND HABITAT INCENTIVE PROGRAM AGREEMENT FOR PENNSYLVANIA

FINAL

THE PENNSYLVANIA GAME COMMISSION

In Partnership With

U.S. Department of Agriculture
Farm Service Agency

May 2011

Finding of No Significant Impact Voluntary
Public Access and Habitat Incentive Program
Commonwealth of Pennsylvania

May 2011

Introduction

The United States Department of Agriculture Farm Service Agency proposes to implement a new program authorized by the Food, Conservation, and Energy Act of 2008 (the 2008 Farm Bill) in the Commonwealth of Pennsylvania (Pennsylvania). The Voluntary Public Access and Habitat Incentive Program (VPA-HIP) provides grants to State and tribal governments to encourage owners and operators of privately-held farm, ranch, and forest land to voluntarily make that land available for access by the public for wildlife-dependent recreation, including hunting, fishing, and other compatible recreation and to improve fish and wildlife habitat on their land. The VPA-HIP is administered by the State or tribal government that receives the grant funds.

Pennsylvania, through the Pennsylvania Game Commission (PGC), proposes to use VPA-HIP grant funds to expand its existing public access programs to provide the public with more opportunities to hunt, fish, watch wildlife, enjoy other recreation, and to improve wildlife habitat on private lands. The PGC works closely with thousands of landowners who voluntarily participate in its existing private land access program. This program provides financial incentives and the opportunity to work with State employed biologists for private landowners to allow public access to their lands as well as improve wildlife habitat. These programs have historically opened more than three million acres of private land to the public in Pennsylvania. This successful program continues to increase public awareness about the availability of private lands to individuals who hunt, fish, and enjoy wildlife-related recreation and motivate landowners to conserve wildlife species and habitats.

Preferred Alternative

The Preferred Alternative is the Proposed Action which is the implementation of Pennsylvania's VPA-HIP agreement. The elements of this agreement are: 1.) Enrollment of 1,000,000 additional acres of eligible private lands in Pennsylvania statewide into the PGC's Public Access Program over the next three years; 2.) Over 100,000 acres of wildlife habitat improvement will occur; 3.) Pennsylvania hunters will be provided access to enhanced mapping of private lands open to public hunting.

Reasons for Finding of No Significant Impact

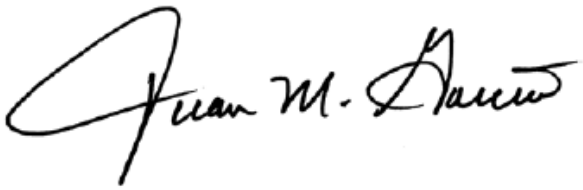
In consideration of the analysis documented in the Programmatic Environmental Assessment (EA) and in accordance with Council on Environmental Quality regulations 1508.27, the preferred alternative would not constitute a major State or Federal action affecting the human and natural environment.

Therefore, this Finding of No Significant Impact (FONSI) has been prepared and an Environmental Impact Statement will not be prepared. This determination is based on the following:

1. Long-term beneficial impacts and short-term localized impacts would occur with the preferred alternative. Neither of these impacts would be considered significant.
2. The preferred alternative would not affect public health or safety.
3. Unique characteristics of the geographic area (cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, and ecologically critical areas) would be preserved with implementation of the preferred alternative.
4. The potential impacts on the quality of the human environment are not considered highly controversial.
5. The potential impacts on the human environment as described in the Programmatic EA are not uncertain nor do they involve unique or unknown risks.
6. The preferred alternative would not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration.
7. Cumulative impacts of the preferred alternative in combination with other recent, ongoing, or foreseeable future actions are not expected to be significant.
8. The preferred alternative would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places.
9. The preferred alternative would have long-term beneficial impacts to wildlife and their habitats, including endangered and threatened species under the Endangered Species Act of 1973.
10. The preferred alternative does not threaten a violation of Federal, State, or local law imposed for the protection of the environment.

Determination

On the basis of the analysis and information contained in the Programmatic EA and FONSI, it is my determination that adoption of the preferred alternative does not constitute a major Federal action affecting the quality of the human and natural environment. Barring any new data identified during the public and agency review of the Final Programmatic EA that would dramatically change the analysis presented in the EA or identification of a significant controversial issue, the Programmatic EA and this FONSI are considered Final 30 days after date of approval signature.



Approving Signature

May 17, 2011
Date

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EXECUTIVE SUMMARY

This Programmatic Environmental Assessment (PEA) describes the potential environmental consequences resulting from the proposed implementation of Pennsylvania's Voluntary Public Access Habitat Incentive Program (VPA-HIP) agreement. The environmental analysis process is designed: to ensure the public is involved in the process and informed about the potential environmental effects of the proposed action; and to help decision makers take environmental factors into consideration when making decisions related to the proposed action.
This PEA has been prepared by the Pennsylvania Game Commission in accordance with the requirements of the United States Department of Agriculture, Farm Service Agency (FSA) and the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and 7CFR 799 Environmental quality and Related Environmental Concerns – Compliance with the National Environmental Policy Act.

Purpose and Need for the Proposed Action

The purpose of the proposed action is to implement Pennsylvania's VPA-HIP agreement. Under the agreement, eligible private lands in Pennsylvania will be enrolled in the Pennsylvania Game Commission's existing Public Access Cooperator Program and an enhanced mapping system of these properties will be developed for the hunting public to locate and utilize these Public Access properties. The Game Commission will provide incentives for new cooperator enrollment such as increased availability of antlerless deer tags for deer control, a Pennsylvania Game News subscription, payments to public access cooperators that provide grassland habitat for upland birds, and free services including property-specific wildlife habitat plans, habitat improvements, bird and mammal nesting boxes and pheasant stocking.

The Pennsylvania Game Commission VPA-HIP agreement is needed to meet the following goals:

- Provide 25% more new hunting and trapping opportunities to hunters and trappers for pheasants, rabbits, woodcock, ducks, quail, mink and muskrats.
- Increase our current 3 million acre, 13,822 public access participant program by 1 million acres and 6,065 private landowner cooperators with 5-year contracts within 3 years.
- Increase habitat quality on at least 100,000 acres on participating properties to increase the quality of the recreational experience of the users and increase the likelihood that recreational users will visit CREP and other access properties for recreation.
- Achieve the above objectives by enhancing existing program elements and instituting new program elements to improve habitat and increase program participation by landowners and availability and use by hunters and trappers.

Proposed Action and Alternatives

The proposed action would implement Pennsylvania's VPA-HIP agreement. Under this agreement, 1,000,000 additional acres of eligible private lands in Pennsylvania statewide would be enrolled in the Pennsylvania Game Commission's Public Access Program over the next three years. Wildlife habitats would be improved and Pennsylvania hunters will be provided access to enhanced mapping of private lands open to public hunting.

The Pennsylvania Game Commission (PGC) will expand its existing successful public access program to provide the public with new opportunities for hunting, trapping, and wildlife-watching. The proposed program enhancements include increased mapping, signing, outreach, cooperator incentives and habitat improvements and will be focused in the 59 county-area currently eligible to enroll land in the existing two CREPs and any of the remaining 8 counties that may be included in a proposed CREP during the grant period.

The PGC will enhance existing program elements and institute new program elements to improve habitat and increase program participation by landowners and availability and use by hunters and trappers. Landowner participation will be encouraged in the public access program by offering new or enhanced incentives, which either have proven to be successful in our programs in the past, or based on the results of our Responsive Management survey of public access cooperators, are expected to meet with widespread acceptance among landowners. Program elements including funding and other details to meet these objectives follow:

- 1. Public Access Mapping – location data will be collected using GPS units for every cooperator property, locations will be verified, GIS based maps will be created that are available on the PA Game Commission website, and will be updated quarterly. Maps will be printed quarterly and made available to the public at all PGC offices, county Agricultural Service Centers and mailed upon request.
- 2. A Public Access Field Coordinator position will be contracted to Pheasants Forever (PF) to ensure that public access signs that are embossed with all partner insignias, including FSA, are posted at all access points on public access cooperator properties, habitat evaluations are conducted on all properties to ensure adequate wildlife habitat is present to justify habitat and incentive payments to landowners, provide outreach on CREP mid-contract management participation and implementation, and supervise Public Access Habitat Specialists. Public Access Habitat Specialists contracted to PF will solicit enrollments from landowners on a targeted basis, provide outreach on CREP mid-contract management participation and implementation, and provide general access program outreach materials and presentations.
- 3. NEW Cooperator Partnership Incentive Program – provide NGO and Local Agency partners with financial incentives standardized at $100/cooperator to enroll their personnel-contacted landowners into our program as a 5-year public access contract enrollment.
- 4. Landowners Incentives Program – provide a multi-faceted menu of appropriate incentives to encourage private landowners to enroll in public access programs,

specifically targeting CREP participants for many of the facets. Some activities and programs provided are not funded with this grant, but are provided as extra incentives. All enrolled landowners will get liability protection under state law by participating in our program, additional PGC law enforcement, and eligibility for all of the other applicable program enhancements listed below.

- CP2 Incentive Program – the PGC will pay any CREP participant that is enrolled or agrees to enroll in the public access program and selects CP2 (Native Grass Establishment) in their CREP contract, a one-time payment equal to the standard rental rate on all acres of CP2 planted for CREP up to $3,000 per landowner.
- Annual and 3-year Grassland Set-aside Program – highly targeted to new and existing public access cooperators in 6 pre-designated Wild Pheasant Restoration Areas and Quail Focus Areas to improve grassland bird nesting and brood rearing habitat in areas that PGC has invested in recovering wild populations of pheasants and quail.
- Cooperator Habitat Improvement Projects – contracted habitat improvements on private lands to create and improve native grassland and early successional habitats. The most targeted component of this program, designed to create up to 30 ten-acre minimum sized habitat projects on public access cooperators lands on a voluntary basis with priority given to landowners enrolled in CREP to create or improve additional habitat areas for sensitive species on acres not eligible for CREP.
- NEW Cooperative Invasive Weed Control Program –provide 3,000 public access cooperators with one 2 ½ gallon container of surfactant-free Glyphosate to treat a non-noxious, but invasive weed control issue related to habitat improvements, provide Aqua-Neat or similar surfactant-free glyphosate product to public access cooperators, including CREP cooperators to control weeds.
- Pennsylvania Game News subscription, a monthly magazine, will be provided free to all public access cooperators. The magazine will have a regular Public Access feature article, including one of the first that will highlight the VPA-HIP program.
- Bird boxes, Kestrel boxes, Barn owl boxes, Squirrel boxes, Bat boxes and others will be provided to cooperators at their request from their responses to our annual seedling and wood products solicitation each fall. Public Access cooperators participating in CREP will receive priority in box requests other than bluebird boxes.
- Stocking pen-raised upland game birds on CREP participant lands enrolled in PGC Public Access programs when not located in Wild Pheasant Restoration Areas (WPRA) or Quail Focus Areas (QFA). The results of our responsive management survey of public access cooperators indicated that landowners would like us to stock pen-raised pheasants and/or quail on their farms. We will stock at least 20 pheasants/quail on each CREP participant that is enrolled in public access that has at least 10 acres of adequate habitat as evaluated by our field staff or contract personnel.

This PEA documents the analysis of the proposed action and the No Action Alternative. Under the No Action Alternative, no additional lands would be enrolled in public access program by these incentives. None of the conservation practices or rental payments described above would be

implemented. No additional new hunting and trapping opportunities for hunters and trappers for pheasants, rabbits, woodcock, ducks, quail, mink and muskrats would be provided.
No substantial increase in the PGC's current 3 million acre, 13,822 public access participant programs would occur. No increase of habitat quality would occur on at least 100,000 additional acres of participating properties to increase the quality of the recreational experience of the users and increase the likelihood that recreational users will visit CREP and other access properties for recreation.

Summary of Environmental Consequences

It is expected that there would be both positive and minor negative impacts associated with implementation of the proposed action. A summary of the potential impacts is given in Table EC-1 below.

Resource	Proposed Action	No Action Alternative
Biological Resources	The proposed action is expected to contribute to vegetation and wildlife diversity. Positive impacts to threatened and endangered species, species of concern, and their habitats are expected.	Continued degradation of terrestrial and aquatic habitats and potential for occurrence of invasive species.
Cultural and Tribal Resources	There is slight potential for encountering archaeological resources as agricultural practices are implemented. Site specific archaeological and historic architectural surveys and coordination with SHPO are recommended prior to the installation of conservation practices. Consultation with several tribes that have traditional ties to Pennsylvania may be required once sites are selected.	No major impacts are expected though negative impacts to cultural resources could result from changes in existing farming practices which disturb previously undisturbed land.
Water Resources	Significant long term positive impacts to surface and ground water quality are expected. Temporary minor impacts to existing wetlands and localized surface water quality may result from runoff during activities associated with the installation of the proposed conservation practices.	Continued degradation of surface and ground water and wetlands is expected to result if the proposed action is not implemented.
Soils	Positive impacts to localized topography and soils are expected to result from implementation of the proposed action	Continued erosion is expected to result if the proposed action is not implemented.

Table EC-1

(Table EC-1 Continued)

Resource	Proposed Action	No Action Alternative
Air Quality	No impacts to attainment status or violations of State Implementation Plan standards would result from the proposed action. However, localized temporary minor impacts to air quality may result from ground disturbing activities and the use of agricultural equipment during the installation of conservation practices.	No change from current conditions is expected.
Recreational Resources	Positive long term effects on recreational resources are expected. The proposed conservation practices are expected to increase habitat for game and non-game species. Water quality improvements would result in better recreational fishing and other water-related recreation.	No change from current land-based recreational opportunities is expected; however, continued water quality degradation may negatively affect game fish and aquatic species or other water related recreation.
Socioeconomics	Increased land values and a minimal loss of farm labor jobs and expenditures are expected to result from the proposed action implementation.	No change in current trends in socioeconomic conditions are expected.
Environmental Justice	Because the project areas are not considered areas of concentrated poverty or minority population, there are no environmental justice issues.	No change in current trends in environmental justice issues are expected

Table EC-1

TABLE OF CONTENTS

CHAPTER 1 - PURPOSE AND NEED

1.0 INTRODUCTION

The United States Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the Voluntary Public Access and Habitat Incentives Program agreement for the state of Pennsylvania. This Programmatic Environmental Assessment (PEA) has been prepared to analyze the potential environmental consequences associated with the Proposed Action and No Action Alternative in accordance with the requirements of the National Environmental Policy Act (NEPA); the Council on Environmental Quality (CEQ) regulations; and 7 CFR 799 Environmental Quality and Related Environmental Concerns – Compliance with the National Environmental Policy Act.

1.1 BACKGROUND

The Farm Service Agency and Voluntary Public Access -Habitat Incentive Program

FSA was established during the reorganization of USDA in 1994. The mission of FSA is to "ensure the well being of American agriculture, the environment and the American public through efficient and equitable administration of farm commodity programs; farm ownership, operating and emergency loans; conservation and environmental programs; emergency and disaster assistance; domestic and international food assistance and international export credit programs. The FSA's Conservation Reserve Program (CRP) is the Federal government's largest private land environmental improvement program. CRP is a voluntary program that supports the implementation of long term conservation measures designed to improve the quality of ground and surface waters, control soil erosion, and enhance wildlife habitat on environmentally sensitive agricultural land. Building on the success of the CREP program, FSA initiated the Voluntary Public Access and Habitat Incentive Program.

The Voluntary Public Access and Habitat Incentive Program (VPA-HIP) is a competitive grants program authorized under Section 1240R of the Food Security Act of 1985, as amended, and is only available for states and tribal governments. Up to $50 million is available through fiscal year (FY) 2012. The primary objective of the VPA-HIP is to encourage owners and operators of privately-held farm, ranch, and forest land to voluntarily make that land available for access by the public for wildlife-dependent recreation, including hunting or fishing, under programs implemented by state or tribal governments.

Pennsylvania has a public access program for hunting and other wildlife related recreational activities. This program provides habitat-based incentives, such as technical or conservation services to landowners who allow the public to hunt or otherwise appropriately recreate on their land. The Pennsylvania Game Commission's program has limited scope and budget; the program has endured programmatic cuts in incentives provided to landowners over the past 6 years. The goal of the existing program includes providing access for wildlife-associated recreation, wildlife management, and encouraging conservation.

The Pennsylvania Game Commission's grant application and VPA-HIP proposal will maximize participation by landowners, ensure that land enrolled in the program has appropriate wildlife habitat, provide incentives to strengthen wildlife habitat improvement efforts on Conservation Reserve Enhancement Program (CREP) land, supplement funding and services from other federal

and state government or NGO and private resources that is provided in the form of cash or in-kind services; and provide information to the public about the location of public access land.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to implement Pennsylvania's VPA-HIP agreement. Under the agreement, eligible private lands in Pennsylvania will be enrolled in the Pennsylvania Game Commission's existing Public Access Cooperator Program and an enhanced mapping system of these properties will be developed for the hunting public to locate and utilize these Public Access properties. The Game Commission will provide incentives for new cooperator enrollment such as increased availability of antlerless deer tags for deer control, a Pennsylvania Game News subscription, payments to public access cooperators that provide grassland habitat for upland birds, and free services including property-specific wildlife habitat plans, habitat improvements, bird and mammal nesting boxes and pheasant stocking. Some of these program incentives have been reduced in the recent past due to budgeting issues. As a result of significant program overhauls and refinements, a reduction in numbers of public access program cooperators and available identifiable private hunting lands for the general hunting public has occurred. The proposed VPA-HIP agreement actions presented by Pennsylvania will address this issue.

1.3 OBJECTIVES OF THE PROPOSED PROGRAM

The Pennsylvania Game Commission VPA-HIP agreement is needed to meet the following goals:

- Provide 25% more new hunting and trapping opportunities to hunters and trappers for pheasants, rabbits, woodcock, ducks, quail, mink and muskrats.
- Increase our current 3 million acre, 13,822 public access participant program by 1 million acres and 6,065 private landowner cooperators with 5-year contracts within 3 years.
- Increase habitat quality on at least 100,000 acres on participating properties to increase the quality of the recreational experience of the users and increase the likelihood that recreational users will visit CREP and other access properties for recreation.
- Achieve the above objectives by enhancing existing program elements and instituting new program elements to improve habitat and increase program participation by landowners and availability and use by hunters and trappers.
- Enhance Public Access Mapping – location data will be collected using GPS units for every cooperator property, locations will be verified, GIS based maps will be created that are available on the PA Game Commission website, and will be updated quarterly. Maps will be printed quarterly and made available to the public at all PGC offices, county Agricultural Service Centers and mailed upon request.

1.4 ORGANIZATION OF THE PEA

This PEA assesses the potential impacts of the proposed action and the No Action Alternative, on potentially affected environmental and economic resources. Chapter 1.0 provides background information relevant to the proposed action, and discusses its purpose, need and objectives. Chapter 2.0 describes the proposed action and alternatives. Chapter 3.0 describes the baseline conditions (i.e. the conditions against which potential impacts of the proposed action and alternatives are measured) for each of the resource areas while Chapter 4.0 describes potential environmental

impacts of the proposed action and alternatives on these resources including analysis of cumulative impacts. Chapter 5.0 is a list of the preparers of this document and lists persons and agencies contacted during the preparation of this document. Chapter 6.0 contains references and is followed by a listing of Appendices.

CHAPTER 2 - ALTERNATIVE ANALYSIS

2.0 PROPOSED ACTION

Through this grant, the Commonwealth of Pennsylvania will expand its existing successful public access program to provide the public with new opportunities for hunting, trapping, and wildlife-watching. The proposed program enhancements include increased mapping, signing, outreach, cooperator incentives and habitat improvements and will be focused in the 59 county area currently eligible to enroll land in existing two CREPs and any of the remaining 8 counties that may be included in a proposed CREP during the grant period. This gives the PGC the greatest opportunity to build on the currently successful CREP program that has over 175,000 acres enrolled in targeted Conservation Practices that provide habitat for a variety of wildlife of interest to hunters, trappers and wildlife watchers. Currently, 87% of Pennsylvania is privately owned, and the majority of hunting and trapping by the 927,655 licensed users occurs on private land.

Activities funded with this grant fall into 4 categories that ranked highest in two Responsive Management surveys of current public access cooperators and recreational users of those properties. These are described in detail in the Work Plan section below.

WORK PLAN

- The PGC does not endeavor to monetize public access without a direct habitat improvement in Pennsylvania, and this money will not be provided directly to landowners except for direct improved habitat benefits.

- PGC will enhance existing program elements and institute new program elements to improve habitat and increase program participation by landowners and availability and use by hunters and trappers. Landowner participation will be encouraged in the public access program by offering new or enhanced incentives, which either have proven to be successful in PGC programs in the past, or based upon the results of a Responsive Management survey of Pennsylvania public access cooperators, are expected to meet with widespread acceptance among landowners because they have expressed interest in having them, or have expressed sincere appreciation in the past when PGC made an effort to assist them with challenges they faced as a result of providing habitat on and hunting access to their lands. Program elements including funding and other details to meet these objectives follow:

    - 1. Public Access Mapping and Required PEA and RMS – location data will be collected using GPS units for every cooperator property, locations will be verified, GIS based maps will be created that are available on the PA Game Commission website, and will be updated quarterly. Maps will be printed quarterly and made available to the public at all PGC offices, county Agricultural Service Centers and mailed upon request. Names, addresses and phone numbers will NOT be provided, as they are protected by PA state law. This will be contracted with some GPS data collection done by agency employees independent of this grant, and some collection, all verification, and all mapping performed under contract with Pheasants Forever and a state GIS contractor, currently, GeoDecisions. These combined contract components will be for 3,120 hours/year, at a cost of $125,000/year. Landowners currently enrolled in CREP and CRP will be specifically targeted for enrollment, as they usually have existing habitat for wildlife.

Currently, about 10% of CREP participants are enrolled in the PGC public access program. The high rate of enrollment is due to the targeting of PGC public access cooperators by PGC's outreach program for CREP. The PA Game Commission previously employed a full time outreach coordinator for CREP enrollment, and the state Department of Environmental Protections previously provided funding of two NGOs $1 million each to do outreach for CREP enrollment in PA. This program element does not generate new contracts or acres, but makes those acres more available to the hunters and trappers. PGC will monitor numbers of website visits to the maps and the number of printed maps distributed.

- A responsive management survey (RMS) will be contracted with a human dimensions management consultant each year to evaluate the success of the program at achieving its objects and providing its benefits as well as determining the opinions of the cooperators and recreational users about the success of the program. Aspects of the survey will include landowner satisfaction, participant satisfaction, and agency satisfaction. The PGC will report on the number of cooperators enrolled, acres enrolled, retention rates, habitat created and improved, recreational opportunities created, and user days attributable to increased public access. Anticipated cost will be $20,000/year for a total of $60,000 over 3 years.

- 2. A Public Access Field Coordinator position will be contracted to Pheasants Forever (PF) for 2,080 hours/year at a cost of $65,000 to ensure that public access signs that are embossed with all partner insignias, including FSA, are posted at all access points on public access cooperator properties, habitat evaluations are conducted on all properties to ensure adequate wildlife habitat is present to justify habitat and incentive payments to landowners, provide outreach on CREP mid-contract management participation and implementation, and supervise Public Access Habitat Specialists. Public Access Habitat Specialists contracted to PF for 3,120 hours/year at a cost of $97,500 will be utilized to solicit enrollments from landowners on a targeted basis, provide outreach on CREP mid-contract management participation and implementation, and provide general access program outreach materials and presentations. This position does not account for contracts or acres in itself, but is critical to increasing the visibility of the program to recreational users in the field, and critical to the implementation of several of the program elements that do result in new contracts and acres being enrolled.

- 3. NEW Cooperator Partnership Incentive Program – provide NGO and local agency partners with financial incentives standardized at $100/cooperator to enroll their personal contacted landowners that are not enrolled in PGC public access programs as of July 1, 2010 into a 5 year public access contract. Partners that have expressed an interest in this at the time of grant application filing are Pheasants Forever, PA Federation of Sportsmen's Clubs, and the National Wild Turkey Federation. Additional groups that will be invited to participate include Ducks Unlimited, Farm Bureau, and County Conservation Districts. NWTF and PF represent over 100 local chapters in 67 counties, PFSC represents over 200,000 PA sportsmen. Based on current enrollment, the cost will be $0.12acre/yr. The cost will be $100,000 /year, for 1,000 new cooperators per year and 3,000 new cooperators over 3 years. This should result in an increase of 400,000 acres in 3 years. Landowners will get liability protection through the "Rural Use of

Land and Water Act" by participating in PGC's public access programs, additional PGC Wildlife Conservation Officer law enforcement, as well as eligibility for all of the other applicable program enhancements included in this work plan. These types of 3rd party incentive programs have been very successful in Pennsylvania, being utilized by the PA Farm Bureau that has over 38,000 farm family members (that's farms, not people) and the Pennsylvania State University, that has the second largest alumni membership (a large percentage are College of Ag alumni) in the country.

- 4. Landowners Incentives Program – provide a multi-faceted menu of appropriate incentives to encourage private landowners to enroll in public access programs, specifically targeting CREP participants for many of the facets.
    - A. Separately administered and funded, the Deer Management Assistance Program (DMAP) gives enrollment priority to landowners that are enrolled in our public access programs. There are a limited number of DMAP tags issues in the state, and access cooperators have first priority to apply for the tags. This was initiated this year, and is already increasing interest in the public access program.
    - B. Separately administered and funded, the Private Landowner Assistance Program (PLAP), provides private landowner wildlife habitat planning assistance by designing a property specific habitat plan for landowners. Public Access and CREP landowners are given priority for this program.
    - C. CP2 Incentive Program – the PGC will pay any CREP participant that is enrolled or agrees to enroll in the public access program and selects CP2 (Native Grass Establishment) in their CREP contract, a one-time payment equal to the standard rental rate on all acres of CP2 planted for CREP up to $3,000 per landowner. This is not currently budgeted, but based on the previous use of this program incentive, it will likely cost $30,000/year for 3 years, if PGC's CREP amendment is approved, and acres are increased by 25,000 in the lower Susquehanna River basin. This should result in 50-75 new public access cooperators/year for three years, increasing public access acres by 12,000 acres, additionally; those CREP cooperators will be in 15 year contracts rather than 5 year contracts, adding to their overall value. This component helps meet a portion of PGC's native grassland habitat needs identified as critical habitat for wildlife in Pennsylvania's State Wildlife Action Plan.
    - D. Annual and 3-year Grassland Set-aside Program – highly targeted to new and existing public access cooperators in 6 pre-designated Wild Pheasant Restoration Areas and Quail Focus Areas to improve grassland bird nesting and brood rearing habitat in areas that PGC and partners have invested resources in recovering wild populations of pheasants and quail. This also meets a high percentage of the PGC's Strategic Plan goals for sensitive species habitat protection as well as meeting a high percentage of grassland habitat goals identified in Pennsylvania's State Wildlife Action Plan. The PGC is targeting 15,000 acres/year for habitat set-asides at an annual cost of $750,000 in year one, and $877,500 in years 2 and 3 (depending on the mix of annual and 3-year participation). This should equate to 775 new cooperators per year, for about 358,500 new public access acres over a 3 year period. PGC has over 20 field personnel strategically distributed within the target area that currently coordinate with private landowners on private lands habitat issues, and they will be the staff

that will have the primary responsibility for delivering this program. A contract PF position will administer this program in cooperation with the Private Lands Section Chief, who has administered the technical service delivery component of the PGC's CREP Contribution Agreement with NRCS for FSA's CREP program and also administers all of the statewide public access programs.

- E. Cooperator Habitat Improvement Projects – contracted habitat improvements on private lands to create and improve native grassland and early successional habitats. The most targeted component of this program, designed to create up to 30 ten-acre minimum sized habitat projects on public access cooperators lands on a voluntary basis with priority given to landowners enrolled in CREP to create or improve additional habitat areas for sensitive species on acres not eligible for CREP. $150,000/year to improve 600 acres/year. This should generate about 30 new cooperators/year, and 4,500 new acres of public access on extremely important habitat areas. This will assist with implementation of sensitive wildlife habitat goals within PGC's State Wildlife Action Plan.
- F. NEW Cooperative Invasive Weed Control Program – each of 3 years, provide 3,000 public access cooperators with one 2 ½ gallon container of surfactant-free Glyphosate (an unrestricted herbicide, not requiring a pesticide applicator's license in PA, and non-injurious to aquatic organisms). Following habitat evaluation by PGC personnel or contract personnel that indicates a non-noxious, but invasive weed control issue related to habitat improvements, provide Aqua-Neat or similar surfactant-free glyphosate product to public access cooperators, including CREP cooperators to control weeds. PGC will print stickers and label jugs with them that advertise CREP and PGC Public Access programs. PGC will provide printed materials on weed identification and control. Because this will be a spot treatment approach to weed control, the herbicide should be available for use over at least an entire growing season, increasing the number of times and number of individuals that will be exposed to the CREP, FSA and PGC Public Access label information, reminding the operator of the direct program benefits. This will be very well received by landowners who must control noxious weeds at their own cost, but receive no assistance for other invasive weeds in their wildlife habitats. Distribution of herbicide will be tracked via PGC's Habitat Evaluation/Implementation forms. This component helps meet goals identified in Pennsylvania's State Wildlife Action Plan regarding climate change impacts to native habitats from invasive species. Partners in this program will be the Rural and Community Development's weed management program, PA Department of Agriculture and Governor's Invasive Species Council in conjunction with their Cooperative Weed Management Area program. Annual cost for each of 3 years will be $300,000. This will be an important component of retaining existing cooperators, and may, in combination with other incentive components generate an additional 100 cooperators/year, for which this will be identified as the primary reason for joining. This should generate 50,000 new acres open to public hunting over the next 3 years.
- G. Pennsylvania Game News subscription, a monthly magazine, will be provided to all public access cooperators at an annual cost of $100,000. The Game News will have a feature article each year on the Public Access Program, and an aspect

of the CREP program in an effort to solicit additional participation from landowners in both programs. The first article will be a long feature on this new grant and the many opportunities it provides that augment the existing program, prominently featuring the important role that the Farm Service Agency will play in PGC's Public Access Programs. Additionally, articles of general habitat and wildlife interest to private landowners are regularly printed in the Game News. Articles of this nature are currently written, but very few landowners currently receive the magazine, so this will significantly increase the exposure of both programs to over 13,000 PA landowners. The PGC currently maintains a mailing list of all 13,822 public access cooperators, so ramping up this facet of the grant can be done quickly and easily. PGC also retains a list of cancelled cooperators (several thousand), which can be solicited to enroll by letter with a promise of all the benefits that would be provided by Pennsylvania's VPA-HIP. This is a highly sought after benefit of being a cooperator, and will be an important retention tool. In addition, it may generate about 200 new cooperators in years 1 and 2 and 100 new cooperators in year 3, generating 75,000 new acres open to public hunting and habitat improvements over 3 years.

- H. Bird boxes, Kestrel boxes, Barn owl boxes, Squirrel boxes, Bat boxes and others will be provided to landowners at their request from their responses to PGC's annual seedling and wood products solicitation each fall. Based on past requests and unmet demand, PGC program staff know this will be a very popular program, and provide easily installed, important habitat components to landowners so that they can enjoy wildlife within view of their homesteads. This increases their appreciation for wildlife and provides seasonally limited and important habitat for both game and sensitive wildlife species. PGC staff currently build the boxes at the PGC Howard Nursery, have known construction costs, and can increase production to meet demand. This will cost an additional $100,000 per year to provide additional boxes to meet the demand of existing and anticipated new public access cooperators. Public Access cooperators participating in CREP will receive priority in box requests other than bluebird boxes. This component may, in combination with other incentive components, generate an additional 100 cooperators/year, for which this will be identified as the primary reason for enrolling in the PGC Public Access Programs, totaling 50,000 new acres over 3 years.
- I. Stocking pen-raised upland game birds on CREP participant lands enrolled in PGC Public Access programs when not located in Wild Pheasant Restoration Areas (WPRA) or Quail Focus Areas (QFA). The results of PGC's Responsive Management survey of public access cooperators indicated that landowners would like us to stock pen-raised pheasants and/or quail on their farms. PGC will stock at least 20 pheasants/quail on each CREP participant that is enrolled in public access that has at least 10 acres of adequate habitat as evaluated by PGC field staff or contract staff. However, if the landowner is within a WPRA or QFA, PGC cannot stock birds, as it endangers the success of a wild bird restoration program. The good news is that if a landowner has CREP property located in a WPRA or QFA, they probably already have wild birds on their property. The PGC currently raises about 110,000 pheasants per year in its 3

pheasant farms. PGC has the capacity to raise up to 250,000 pheasants/year. PGC currently only stocks pheasants on public land. The PGC will raise additional birds to meet the demand of this program upon acquiring full FSA funding. PGC can react to this demand by retaining sufficient breeding stock before the last stocking in December. PGC will target 250 farms for stocking with 20 birds for an increased annual cost of $100,000. This will be an incentive for both enrolling at least 10 acres in CREP and enrolling in Public Access. This will be an important cooperator retention tool, and will likely generate 100 new cooperators per year for 3 years, totaling 50,000 new acres over 3 years.

- The PGC will continue to administer the existing components of the public access program and retain existing cooperators using existing staff resources and methodology. PGC currently utilizes over 200 employees and volunteers to implement its public access program and expends over $1 million per year on the program, utilizing federal Pitman-Robertson funds and Game funds derived from the sale of hunting and trapping licenses.

2.1 ALTERNATIVES

Alternative A – Preferred, The Action Alternative

Under Alternative A, the Pennsylvania VPA-HIP agreement would be fully implemented as described above. This would provide 25% more new hunting and trapping opportunities to hunters and trappers for pheasants, rabbits, woodcock, ducks, quail, mink and muskrats. It will increase participation in the PGC public access program by 1 million acres and 6,065 private landowner cooperators with 5-year contracts within 3 years. This will allow for an increase in habitat quality on at least 100,000 acres on participating properties to increase the quality of the recreational experience of the users and increase the likelihood that recreational users will visit CREP and other access properties for recreation. In achieving the above objectives by enhancing existing program elements and instituting new program elements to improve habitat and increase program participation by landowners and availability and use by hunters and trappers Pennsylvania will successfully implement another new FSA program at the state level.

Alternative B - The No-Action Alternative

Under the No Action Alternative, the state of Pennsylvania's VPA-HIP agreement would not be implemented. No additional lands would be enrolled in Public Access Programs and the goals of 1,000,000 new public access program acres would not be met. Though eligible lands could be enrolled in CRP or other conservation programs, the benefits of CREP and VPA-HIP – targeting lands across Pennsylvania for enrollment, providing financial incentives to landowners, using additional non-Federal financial resources on private lands – would not be realized. This alternative will be carried forward in the analysis to serve as a baseline against which to assess the impacts of the Preferred Alternative.

2.2 PUBLIC INVOLVEMENT (SCOPING)

This draft Environmental Assessment has been listed in the Pennsylvania Bulletin for public comment, advertised in a press release from the Agency, and posted on the PGC website for review It has been made available for public inspection at all six regional offices of the PGC and the

Agency headquarters office in Harrisburg. The comment period will be open for fifteen days following advertisement in the Pennsylvania Bulletin on or about February 12, 2011. All relevant comments received from the public will be listed and addressed in the Final Environmental Assessment and Finding of No Significant Impact. A copy of the notice of availability for review of the PEA is listed below.

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Pennsylvania Game Commission
Notice of Availability
"Voluntary Public Access-Habitat Incentives Program"

Draft Environmental Assessment

The Pennsylvania Game Commission in Partnership with the U.S. Department of Agriculture, Farm Service Agency (FSA) announces the availability of a Draft Environmental Assessment for the Voluntary Public Access-Habitat Incentives Program. The primary objective of the activity is to provide private landowners various incentives to open their land to public hunting and wildlife related recreation and to improve conditions for wildlife and their habitats.

The Pennsylvania Game Commission is accepting comments on the draft EA through February 28, 2011 The draft EA can be reviewed either online at www.pgc.state.pa.us and view the VPA-HIP link or in person at the Pennsylvania Game Commission Headquarters Office in Harrisburg and its six region offices located at:

Pennsylvania Game Commission
Headquarters Office
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

NORTHWEST REGION

1415 Pittsburgh Road
Franklin, PA 16323
(814) 432-3187

SOUTHWEST REGION

4820 Route 711
Bolivar, PA 15923
(724) 238-9523

NORTHCENTRAL REGION

1566 South Route 44 Highway, Post Office Box 5038
Jersey Shore, PA 17740-5038
(570) 398-4744

SOUTHCENTRAL REGION

8627 William Penn Highway
Huntingdon, PA 16652
(814) 643-1831

NORTHEAST REGION

Intersection of Routes 415 and 118, Post Office Box 220
Dallas, PA 18612-0220
(570) 675-1143

SOUTHEAST REGION

448 Snyder Road
Reading, PA 19605
(610) 926-3136

Comments should be submitted to Michael Pruss, Chief- Private Lands Section at the Harrisburg address above or by email to mpruss@state.pa.us.

2.3 RESOURCES ELIMINATED FROM ANALYSIS

Noise Resource

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Human response to noise varies according to the type and characteristics of the noise source, the distance between source and receiver, receiver sensitivity, and time of day.

The responsible 'Lead Agency" for Noise Resource/Noise abatement and control is at the State and local township government levels. In Pennsylvania, that state agency is the Pennsylvania Department of Environmental Protection. Noise sound levels are controlled locally by township ordinances where applicable and are regulated in some circumstances for stationary noise generating equipment to decibel readings of no greater than 50db at night and 60db daytime, at the property boundary (Ordinance No. 447, Upper Providence Township, Delaware County, PA 2009). Farming and agricultural uses including farm machinery and heavy equipment operation utilized in implementation of conservation practices are generally exempt from noise limitations, although any such proposed activities will be planned to minimize local impacts to nearby residents in the community. No impacts are expected to result from individual farm participation. If there is any question about whether impacts to socioeconomic resources would result from program participation by individual landowners, the FSA National Office will be contacted for guidance.

Important Land Resources

Important land resources include prime farmland, unique farmland, prime forestland, and prime rangeland. Continued reduction in the nation's farmland base may threaten the ability of the U.S. to produce food and fiber to sustain domestic needs. The Farmland Protection Policy Act was established to minimize to the extent practicable the conversion of farmland to nonagricultural uses.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion.

Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods.

Prime forestland is land used for the production of wood. It is divided into 4 categories based on yield and use, as follows:
☐ prime timberland grows at least 85 cubic feet /year in natural stands.
☐ unique timberland grows less than 85 cubic feet/ year in sustained yields of high-value species.
☐ timberlands of statewide importance are additional forest stands of State importance.
☐ timberlands of local importance are additional forest stands of local importance.

Prime rangeland is land that has the highest quality or value for grazing animals, and the (potential) natural vegetation is palatable, nutritious, and available to the area's common herbivores.

The following action is an exemption and does not require consultation with NRCS:

FSA reviews NRCS soil surveys, soil lists, and maps of important land resources (only those authorized for use by NRCS); and determines that the action will not effect important farmlands, prime forestlands, or prime rangelands. The PGC's VPA-HIP will not include direct payments on acres of prime farmland, unique farmland, prime forestland, and prime rangeland, therefore no impacts are expected on this resource.

Wilderness Areas Resource

Wilderness Areas Resources are defined by the Wilderness Act as:
• lands designated for preservation and protection in their natural condition
• an area where the earth and its community of life are untrammeled by man
• an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvement or human habitation
• generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticed
• has outstanding opportunities for solitude or a primitive and unconfined type of recreation
• shall be devoted to the public purposes of recreation, scenic, scientific, educational, conservation, and historic use.

Potential impacts to a wilderness area would only occur if a person exists within or very near the activity area. Potential impacts could include impacts that would alter the characteristics of the wilderness defined by The Wilderness Act, such as:
• developing the land within or very close to the boundaries of the wilderness
• removing significant portions of vegetation or wildlife
• creating a disturbance or nuisance that was not there before, such as noise, odor, aesthetics, or unsightly facilities and manmade structures.

There are two federally recognized Wilderness Areas in Pennsylvania. These are The Allegheny Islands Wilderness and the Hickory Creek Wilderness Areas. Both of these areas are located near or within the boundaries of the Allegheny National Forest. The Hickory Creek Wilderness Area is located entirely within the confines of the Allegheny National Forest. It is an area encompassing 8663 acres. The Hickory Creek Wilderness is located on the Bradford Ranger District of Allegheny National Forest in Warren County, Pennsylvania. The gentle to moderate terrain is drained by East Hickory Creek and Middle Hickory Creek. Topography ranges from 1273 feet where East Hickory Creek exits the wilderness to 1900 feet on the plateau. There are no particularly steep slopes and much of the area is heavily forested (FS 2010).

The United States Congress designated the Allegheny Islands Wilderness in 1984 and it now has a total of 368 acres. All of the wilderness is located in Pennsylvania and is managed by the Forest Service. Between Buckaloons Recreation Area and the town of Tionesta, a distance of approximately 56 miles, seven islands in the Allegheny River have been designated Wilderness. Alluvial in origin, the islands were formed from deposits of sand, mud, and clay that the river carried down from the Allegheny Mountains. Old river-bottom trees--willow, sycamore, and silver maple--characterize these islands. Crull's, at 96 acres, is the largest, followed by Thompson's and Baker (both 67 acres), Courson (62 acres), King (36 acres), R. Thompson's (30 acres), and No-Name (10 acres). Approximately eighty-seven miles of the river have been designated as "recreational" under the Wild and Scenic Rivers Act. Development activities on private lands in the river corridor are regulated under the act. This "protected" area extends upstream and downstream

of the wilderness islands. Agricultural activities occur on private lands within the corridor and any activities proposed in VPA-HIP on those lands will be conforming to existing uses with no new areas developed. Enrollment in VPA-HIP activities under Pennsylvania's agreement does not negatively impact the wilderness resource as these private lands are not in close proximity to the boundaries of these wilderness areas. No impacts are expected to result from individual farm or woodlot/forestlands participation.

Coastal Barriers Resource

Coastal barriers are unique landforms that provide protection for diverse aquatic habitats and serve as the mainland's first line of defense against the impacts of coastal storms and erosion. CBRA was amended by the Coastal Barrier Improvement Act of 1990 and restricts Federal expenditures and financial assistance that may encourage development of coastal barriers. Areas within CBRS, established by CBRA that may support development, are ineligible for Federal assistance unless they conform to designated purposes for protection of the area. CBRS currently includes almost 1.3 million acres from Maine to Florida on the Atlantic Coast; from Florida to Texas along the Gulf Coast; in Puerto Rico and the Virgin Islands; and in Michigan, Minnesota, Ohio, and Wisconsin, on the Great Lakes.

There are no coastal barrier landforms within the Commonwealth of Pennsylvania, and therefore, no impacts will occur.

2.4 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

The only alternatives discussed in this environmental Assessment are the Action and No-Action alternatives. A third Alternative of a "Partial-Implementation Action Alternative" of some of the proposed activities discussed in the Action Alternative of this Environmental Assessment would negatively impact the success of the individual projects and the synergistic effort as a whole in Pennsylvania. Therefore, if Pennsylvania's plan was reduced to partial implementation and elimination of some of its proposed projects included in the VPA-HIP proposal, the PGC would likely choose not to implement the plan. Also, FSA has directed the VPA-HIP participants that they need only address the Action and No-Action alternatives.

2.5 ALTERNATIVES SELECTED FOR ANALYSIS

Two alternatives were selected for analysis in this PEA; these are the Action and No-Action Alternatives.

Proposed Action Alternative

The Action alternative is discussed in detail in Chapter 2.0, the Proposed Action section. Its implementation would result in increased amounts of land open to public hunting and wildlife recreational usage planned at an additional 1,000,000 acres as well as wildlife habitat improvements on at least 100,000 acres of private lands. These objectives would be accomplished over a three year period for expenditures of $4.5 million in total.

No-Action Alternative

The No-Action alternative is exactly that. No new programs and projects would be implemented as discussed in the Proposed Action alternative. The PGC would not spend an additional $4.5 million

on voluntary public access and habitat incentive programs and projects on private lands. An additional 100,000 acres of improved wildlife habitat on private lands would not occur. An additional 1,000,000 acres will not be made available for public access.

CHAPTER 3 - AFFECTED ENVIRONMENT

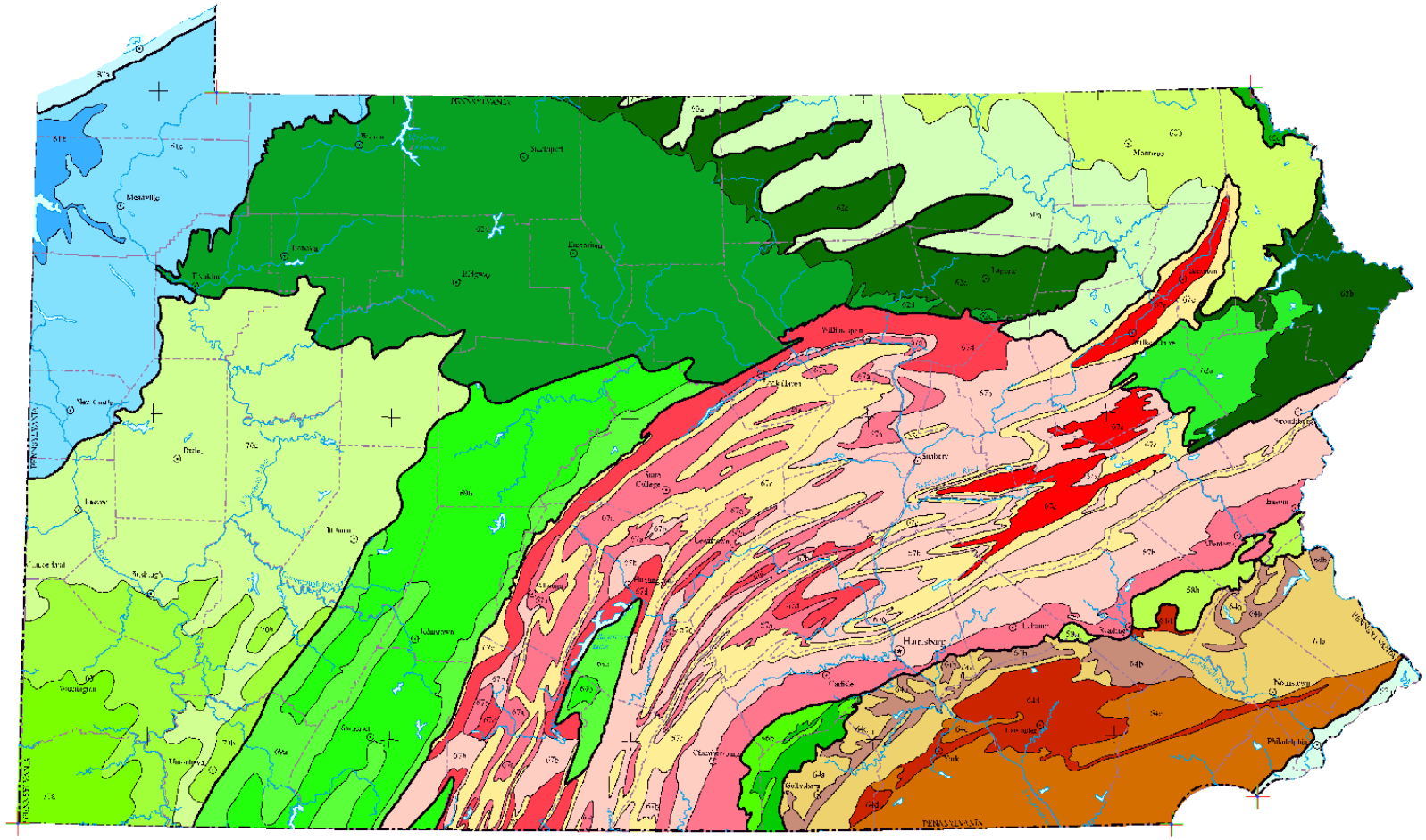
This Chapter describes relevant existing conditions for the resources potentially affected by the proposed action. In compliance with guidelines contained in NEPA and CEQ regulations, the description of the affected environment focuses on those aspects potentially subject to impacts.

Level III and IV Ecoregions of EPA Region 3 and Pennsylvania

All information included in this section of narrative was either directly copied or paraphrased from the EPA website at www.epa.gov/web/pages/ecoregions/reg3_eco.htm along with listed reference citations. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions are directly applicable to the immediate needs of state agencies, including the development of biological criteria and water quality standards and the establishment of management goals for nonpoint-source pollution. They are also relevant to integrated ecosystem management, an ultimate goal of most federal and state resource management agencies.

The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the spatial patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level. A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions (Commission for Environmental Cooperation Working Group 1997). At level III, the continental United States contains 104 regions (United States Environmental Protection Agency [USEPA], 1998). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995), Griffith and others (1994), and Gallant and others (1989). The Level IV ecoregions present in Pennsylvania are shown on the Map and listed below with their identifying characteristics.

Figure 3.1-0 EPA Level IV Ecoregions of Pennsylvania



58. Northeastern Highlands

The Northeastern Highlands comprise a relatively sparsely populated region characterized by nutrient poor soils blanketed by northern hardwood and spruce fir forests. Land-surface form in the region grades from low mountains in the southwest and central portions to open high hills in the northeast. Many of the numerous glacial lakes in this region have been acidified by sulfur depositions originating in industrialized areas upwind from the ecoregion to the west.

58h. Reading Prong

The Northeastern Highlands (58) extends from Canada through New England, New York, and New Jersey to Wernersville Ridge in northeastern Pennsylvania. On the ecoregion map (Figure 1), the Northeastern Highlands (58) contains one level IV ecoregion: the Reading Prong (58h).
The Reading Prong (58h) is contiguous with the Taconic Mountains and the New England Upland (Fenneman, 1938, p. 368). Its rounded summits typically range from 700 to 1,000 feet (213-305 m) and are about 200 to 550 feet (61-168 m) above the intervening valleys. Maximum elevation, about 1,400 feet (427 m), occurs on the Cambrian quartzite knobs of Wernersville Ridge. Elsewhere, Precambrian granitic gneiss, Precambrian hornblende gneiss, and fanglomerate are common (Berg and others, 1980). The metamorphic and igneous rocks are covered by slightly acidic, moderately fertile, residual soils which originally supported a native vegetation of Appalachian Oak Forest, dominated by white and red oaks (Cunningham and Ciolkosz, 1984; Cuff and others, 1989, p. 52). Today, we see a mosaic of rural residential development, woodland, and general farmland. Forest dominates only the more rugged, stony, or elevated locations, and overall it is less dense than that of the Diabase and Conglomerate Uplands (64b) or the higher Blue Ridge Mountains (66). Figure 1 shows the boundaries of Ecoregion 58h. Its dissected, rugged, crystalline hills are higher and both physiographically different and lithologically distinct from ecoregions 64a, 64d, and 67a.

60. Northern Appalachian Plateau and Uplands

Ecoregion 60, in northeastern Pennsylvania, is a plateau made up of horizontally bedded, nonresistant shales and siltstones and moderately resistant sandstones of Devonian age. It is often lower and less forested than the adjacent Glaciated Allegheny High Plateau (62c) and crestal elevations are typically 1,300 to 2,000 feet (396-610 m). Its rolling hills, open valleys, and low mountains are partly covered by Olean Till of Wisconsinan age and support a mosaic of cropland, pastureland, and woodland. Soils are derived from till and are mostly mesic Inceptisols (Cunningham and Ciolkosz, 1984). Stoniness and seasonal wetness are common limitations of these soils (Higbee, 1967). The natural vegetation was primarily Appalachian Oak Forest, dominated by white and red oaks. Some Northern Hardwoods occurred away from the Susquehanna River at higher elevations; dominant trees included sugar maple (Acer saccharum), yellow birch (Betula allegheniensis), beech (Fagus grandifolia), and hemlock (Tsuga canadensis) (Cuff and others, 1989, p. 52). The boundaries of the Northern Appalachian Plateau and Uplands (60) are shown on Figure 1. Its border with the North Central Appalachians (62), is based on topography, soils, and land use; The boundaries of the Northern Appalachian Plateau and Uplands (60) are shown on Figure 1. Its border with the North Central Appalachians (62), is based on topography, soils, and land use; Ecoregion 62 has greater forest density and is often more rugged and more elevated than the more fertile Northern Appalachian Plateau and Uplands (60). Its border with the folded and faulted, forested Ridge and Valley (67), follows the break in woodland density, physiography, and geologic structure.

On the ecoregion map (Figure 1), the Northern Appalachian Plateau and Uplands (60) is composed

of two level IV ecoregions: the Glaciated Low Plateau (60a) and the Northeastern Uplands (60b). Each is a mosaic of cropland, pastureland, and woodland on nearly horizontal shales and sandstones. Descriptions of the individual characteristics of these two ecoregions follow.

60a. Glaciated Low Plateau

The Glaciated Low Plateau (60a) is a mosaic of farmland, woodlots, and lakes upon low, rolling hills. The terrain has been glacially smoothed, stream gradients are low, and the valleys are open. Hilltop elevations are commonly 1,300-1,800 feet (395-550 m), and are often lower than those of adjacent ecoregions. Local relief is typically 300-500 feet (91-153 m). The growing season varies inversely with elevation, increasing from 100 days in the northwest to 160 days in the southeast. A corridor that is "favored from a climatic standpoint" (Murphy and Murphy, 1937, p. 371) bisects Ecoregion 60a along the entrenched Susquehanna River at elevations of less than about 820 feet (250 m).

The Catskill and Lock Haven (Chemung of New York) formations of Devonian age comprise the local bedrock (Berg and others, 1980). These rocks are less resistant than the Mississippian and Pennsylvanian strata of the higher Glaciated Allegheny High Plateau (62c) and are not deformed like those of the Sandstone Ridges (67c). Olean Till of Wisconsinan age partly covers the uplands and slopes and Quaternary glacial, lacustrine, and outwash deposits fill the valleys.
Mesic and frigid Inceptisols (Fragiaquepts, Fragiochrepts, Dystrochrepts) developed on the drift deposits (Cunningham and Ciolkosz, 1984). Leached and stony, they commonly have fragipans and poor drainage.

The topography, climate, and soil make Ecoregion 60a much more suitable for dairy farming and livestock raising than for general crops. The crops that are grown tend to be directly related to the dairy-livestock regime and include hay, corn for silage, and oats. Idle farms are increasing and woodland is common. The native vegetation was mostly Appalachian Oak Forest (dominated by white and red oaks), with some Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) occurring away from the Susquehanna River at higher elevations (Cuff and others, 1989, p. 52). Bogs and marshes are common throughout Ecoregion 60a.

The boundaries of the Glaciated Low Plateau (60a) are shown on Figure 1. Its eastern boundary with the Northeastern Uplands (60b) follows the break in elevation, relief, channel gradient, valley-side slope angle, forest density, and stream density that are shown on the Scranton 1:250,000-scale topographic map; all these are greater in Ecoregion 60b than in Ecoregion 60a. Its western border with the Glaciated Allegheny High Plateau (62c) is marked by a change in forest density and elevation; both are greater in Ecoregion 62c. Its southern border with the Northern Sandstone Ridges (67c) occurs at the break in forest density, elevation, and geological structure; there is less woodland density in Ecoregion 60a than in Ecoregion 67c which is folded and faulted and higher in elevation.

60b. Northeastern Uplands

The Northeastern Uplands (60b) shares many environmental characteristics with the Glaciated Low Plateau (60a). However, these ecoregions can be distinguished by lake density, slope angle, elevation, channel gradient, and the ratio of woodland to farmland; all these are greater in Ecoregion 60b than in Ecoregion 60a.

Ecoregion 60b is a dissected and glaciated plateau characterized by low, rolling hills of moderate relief and slope. More than half of the area is woodland, and lakes and bogs are very common. Crestal elevations are commonly 1,400-2,000 feet (427-610 m), increasing to a maximum of approximately 2,700 feet (823 m) at Mt. Ararat. Elevations are great enough to insure a short growing season of 130-140 days. Near the bottoms of valleys, frost occurs late in the spring and early in the autumn. Local relief typically ranges from roughly 650 feet (198 m) down to about 130 feet (40 m), whereupon lakes and wetlands become particularly common. Associated flora and fauna are found here. Bird life includes mallards (*Anas platyrhynchos*), Canada geese (*Branta canadensis*), wood ducks (*Aix sponsa*), and the American bittern (*Botaurus lentiginosus*), which is threatened in Pennsylvania (Gill, 1985, p. 310).

The Inceptisols (Fragiaquepts, Fragiochrepts, and Dystrochrepts) of Ecoregion 60b are derived from Wisconsinan drift and often suffer from poor drainage and stoniness (Cunningham and Ciolkosz, 1984; Higbee, 1967). The soil, climate, and terrain of Ecoregion 60b support a larger percentage of woodland and a smaller percentage of dairy and livestock farms than do those of Ecoregion 60a. Furthermore, farming is of declining importance; between 1982 and 1987, the number of farms in Ecoregion 60b declined by about 13% and the number of acres in farms has lessened by more than 10% (Pennsylvania Crop Reporting Service, 1983, p. 81; Pennsylvania Agricultural Statistics Service, 1990-1991, p. 82). Vacation cabins are increasingly common, but they are not surrounded by extensive forest as they are in the Low Poconos (62b).

The soils have formed on Olean Till and Quaternary glacial outwash. These in turn overlie Devonian age sandstone, siltstone, and shale of the Catskill Formation (Berg and others, 1980). The proportion of resistant sandstone is greater in Ecoregion 60b than in Ecoregion 60a, which explains the difference in elevation between the two ecoregions. The strata of Ecoregion 60b is undeformed, unlike the rocks of the Northern Sandstone Ridges (67c); as a result, Ecoregion 67c also has more relief and forest density than Ecoregion 60b.

The natural vegetation was mostly Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), exemplified by the Woodbourne Forest and Wildlife Sanctuary near Montrose, Susquehanna County (Erdman and Wiegman, 1974, p. 49). Some Appalachian Oak Forest occurs near the Susquehanna River (Cuff and others, 1989, p. 52). Wetlands such as Madisonville and Mud Pond swamps are very common in areas of low relief, especially on the Morris-Wellsboro and Morris-Wellsboro-Oquaga soil associations.

Figure 1 shows the boundaries that divide the ecoregions. The western boundary between the Glaciated Low Plateau (60a) and Ecoregion 60b follows the break in elevation, relief, channel gradient, valley-side slope angle, forest density, and stream density; all these are greater in Ecoregion 60b than in Ecoregion 60a. The eastern boundary between Ecoregion 60b and the more dissected Low Catskills (62e) occurs at the forest density and topography break shown on the Scranton 1:250,000-scale topographic map; Ecoregion 62e is much more rugged and wooded than Ecoregion 60b. The southern boundary between ecoregions 60b and the Low Poconos (62b) occurs at the forest density break shown on the Scranton 1:250,000-scale topographic map; Ecoregion 62b is more wooded than Ecoregion 60b. In places, the border also follows the lithological break between coarser and finer members of the Catskill Formation and is near the potential natural vegetation line dividing Northern Hardwoods from Appalachian Oak Forest (Cuff and others, 1989, p. 52).

61. Erie/Ontario Hills and Lake Plain

Ecoregion 61, in northwestern Pennsylvania, is characterized by nearly level to rolling terrain. Deposits from successive Pleistocene ice sheets and lakes cover the horizontally bedded sedimentary rock. In places, beach ridges, hummocky stagnation moraines, kettles, and kames can be found. Many wetlands still occur in the west and a high percentage of the threatened or endangered species in Pennsylvania reside there. Local relief ranges from less than 50 feet (15 m) on the former lake plain to about 400 feet (122 m) on the till plain. Elevations range from about 570 feet (174 m) at Lake Erie to 2,000 feet (609 m) inland.

The most common soils are Alfisols and Inceptisols; they tend to be acidic and are derived mainly from till and lacustrine material. The lake plain and the wetter soils of the southwest originally supported a Beech-Maple Forest dominated by sugar maple (*Acer saccharum*) and beech (*Fagus grandifolia*); elsewhere, Northern Hardwoods occurred, with sugar maple (*Acer saccharum*), yellow birch (*Betula allegheniensis*), beech (*Fagus grandifolia*), and hemlock (*Tsuga canadensis*) as dominant trees (Cuff and others, 1989, p. 52).

The Erie/Ontario Hills and Lake Plain (61) is the most important agricultural area in the Allegheny Plateaus physiographic province (Cuff and others, 1989, p. 24). The lake plain produces specialty crops, including fruits, vegetables, and nursery stock. The inland till plains, with their much shorter growing season and wetter soils, are dominated by dairy farming. Associated erosion and stream pollution occur (Omernik and Gallant, 1988, p. 37).

The boundary of Ecoregion 61 with the North Central Appalachians (62) and the Western Allegheny Plateau (70) roughly corresponds to the Wisconsinan till limit. It also approximates the natural vegetation transition between Beech-Maple Forest and Northern Hardwoods in the west and Appalachian Oak Forest in the east (Cuff and others, 1989, p. 52).

On the ecoregion map (Figure 1), the Erie/Ontario Hills and Lake Plain (61) is composed of two level IV ecoregions: the Mosquito Creek-Pymatuning Lowlands (61b) and the Low Lime Drift Plain (61c). Each is dominated by agriculture and each has been glaciated in contrast to neighboring ecoregions. Descriptions of the individual characteristics of these three ecoregions follow.

61b. Mosquito Creek/Pymatuning Lowlands

The glaciated Mosquito Creek-Pymatuning Lowlands (61b) has nearly level to undulating terrain. It is characterized by poorly drained terrain caused by low relief, clayey substrate, and fragipans. The soils are mostly Alfisols (Fragiaqualfs, Fragiudalfs) and the substrate is primarily clayey Hiram till of late-Wisconsinan age with some glacial outwash, alluvial, and lacustrine deposits. Numerous wetlands and broad, flat-bottomed valleys occur on the silt and silty clayey loams. Low-gradient streams are common, have few riffles, and lack associated stream organisms. Crestal elevations vary from about 900 to 1,300 feet (274-396 m) and local relief is usually less than 150 feet (46 m).

The dairy industry is well suited to Ecoregion 61b's general soil, climate, and topography, and there are many pastures. However, on well-drained outwash soils, corn, potatoes, wheat, and oats are sometimes grown; very poorly drained sites contain trees, idle land, brush, or wetlands.

Natural vegetation was composed primarily of Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) on the better drained sites and Beech-Maple Forest was found elsewhere. Remnants of the Beech-Maple Forest are preserved at Tyron's Woods (southwest of

Conneaut Lake) (Brenner, 1985, p. 14; Erdman and Wiegman, 1974, p. 4). Marshes are common and contain many species, including cattails (*Typha* spp.), bullrushes **(***Cladium jamaicensis*), sedges (*Carex* spp.), and reed grasses (*Phragmites communis*) (Brenner, 1985, p. 11). Shrub swamps and swamp forests cover large areas of the Mosquito Creek-Pymatuning Lowlands (61b) and are more extensive than elsewhere in Pennsylvania (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995). The shrub swamps are composed of species such as buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), poison sumac (*Rhus vernix*), and silky dogwood (*Cornus ammomum*). Swamp forests contain species such as red maple (*Acer rubrum*), white pine (*Pinus strobus*), and larch (*Larix laricina*). State Game Lands 214 near Hartstown contains marshes, shrub swamps, and swamp forests and is the last remnant of the Pymatuning Swamp, once about 16 square miles (42 km2) in area (Erdman and Wiegman, 1974, p. 13).

The northern bald eagle (*Haliaeetus leucocephalus alascanus*) and the marsh-dwelling king rail (*Rallus elegans elegans*) (Gill, 1985, pp. 301-304), endangered in Pennsylvania, inhabit the Mosquito Creek-Pymatuning Lowlands (61b). Several species threatened in Pennsylvania are also found in the marshes and lakes of Ecoregion 61b, including the least bittern (*Ixobrychus exilis exilis*), the American bittern (*Botaurus lentiginosus*), and the black tern (*Chlidonias niger surinamensis*) (Gill, 1985, pp. 307-314).

Figure 1 shows the boundary between Ecoregion 61b and the Low Lime Drift Plain (61c). Very poorly drained areas that are flat and often underlain by clayey Hiram till are included in the Mosquito Creek-Pymatuning Lowlands (61b); adjacent marshes and former marshes as shown on 7.5 minute quadrangles are also included in Ecoregion 61b.

61c. Low Lime Drift Plain

The glaciated Low Lime Drift Plain (61c) is characterized by ground moraines, rolling terrain, broad over-fit valleys, and numerous dairy farms. Terminal moraines, kettles, kames, and poorly drained depressions are present locally. Glacial drift, primarily Kent till of late-Wisconsinan age, overlies acidic, sedimentary rock of varying ages and types. Most soils have fragipans and are poorly drained; they are typically rocky at the surface, low in carbonate, and not especially fertile. The climate is continental and is not influenced by Lake Erie, except in northernmost locations. The soil attributes and the short growing season make Ecoregion 61c poorly suited for cropland. Most of Ecoregion 61c is best adapted to hay, oats, silage corn, and pasture. Many ridges and lowlands are wooded or idle. Hilltop elevations range from about 1,100 feet to 2,000 feet (335-610 m) and local relief is typically 250-400 feet (76-122m).

The natural vegetation of the till plains was composed primarily of Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) on the better drained sites and Beech-Maple Forest elsewhere. Near the Wisconsinan limit, the Appalachian Oak Forest (dominated by white and red oaks) began and extended eastward into the Unglaciated Allegheny High Plateau (62d) and the Pittsburgh Low Plateau (70c) (Cuff and others, 1989, p. 52). Marshes, swamps, and bogs occur in areas of poor drainage (Geyer and Bolles, 1979, pp. 36-38). Muddy Creek Research Natural Area in Crawford County contains virgin Northern Hardwoods and fine marshes (Erdman and Wiegman, 1974, p. 12). Columbus Bog-Tamarack Swamp in State Game Lands 197 in Warren County, one of the best examples of a northern (kettlehole) bog in western Pennsylvania, has a floating peat mat of sphagnum, sedges (*Carex* spp.), and sundew (*Drosera rotundifolia*), second

growth tamarack (*Larix laricina*), and hemlock (*Tsuga canadensis*) (Cuff and others, 1989, p. 55; Erdman and Wiegman, 1974, p. 9).

At least two plant species that are endangered in Pennsylvania inhabit Ecoregion 61c, the Kalm's lobelia (*Lobelia kalmii*) and the spreading globe flower (*Trollius laxus*). Both are found in alkaline wet meadows (Wiegman, 1985, pp. 59, 71). Also inhabiting Ecoregion 61c are several species that are threatened in Pennsylvania, including the eastern sand darter (*Ammocrypta pellucida*) and the northern brook lamprey (*Ichthyomyzon fossor*) (Cooper, 1985, pp. 179, 182).

Figure 1 shows the boundaries of the Low Lime Drift Plain (61c). To the east, Ecoregion 61c extends to the approximate Wisconsinan ice limit, whereupon the potential natural vegetation changes, dairy farming declines in importance, the terrain becomes more hilly, and the loamy Kent till ends; in the Unglaciated Allegheny High Plateau (62d), forest land predominates and in the Pittsburgh Low Plateau (70c) general farming is dominant. To the north, Ecoregion 61c abuts the Erie Lake Plain (83a); here lacustrine deposits begin, natural vegetation changes, and the climate moderates. To the northwest, Ecoregion 61c continues until the landscape becomes flatter and dominated by both wetlands and the clayey Hiram till of the Mosquito Creek-Pymatuning Lowlands (61b).

62. North Central Appalachians

Ecoregion 62, in northcentral and northeastern Pennsylvania, is part of a vast, elevated plateau composed of horizontally bedded sandstone, shale, siltstone, conglomerate, and coal. It is made up of plateau surfaces, high hills, and low mountains, and was only partly glaciated. Both the southwest and the glaciated east are low in comparison to the central section, which rises to a general elevation of about 2,300 feet (701 m) on erosion resistant sandstones. The climate can be characterized as continental, with cool summers and cold winters. Average annual precipitation is from 33 to 50 inches (84-127 cm) and there can be as few as 100 days without killing frost, the shortest period in Pennsylvania. Soils are often frigid and were derived from sandstone, shale, and till; they are low in nutrients, and support extensive forests. The original vegetation was primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), but scattered Appalachian Oak Forest (dominants: white and red oaks) and isolated highland pockets of spruce/fir forest also occurred. Land use activities are generally tied to forestry and recreation but some coal and gas extraction occurs in the west.

The boundary with the Erie/Ontario Hills and Lake Plain (61) is near the Wisconsinan till limit, which approximates land use and natural vegetation breaks; Ecoregion 62 is much more forested than Ecoregion 61 and it originally lacked the beech/maple component that once dominated the Erie/Ontario Hills and Lake Plain (61). The border with the Western Allegheny Plateau (70) and the Central Appalachians (69) approximates the land use and elevation breaks; Ecoregion 62 is more forested, cooler, and higher than the adjacent ecoregions. The boundary with the Ridge and Valley (67) occurs at the junction of folded and horizontal strata and also approximates the border between the Northern Hardwoods and the Appalachian Oak Forest. The border with the Northern Appalachian Plateau and Uplands (60) occurs at the limit of resistant strata, which causes elevation, climate, and forest density to change.

On the ecoregion map (Figure 1), the North Central Appalachians (62) is composed of five level IV ecoregions: the Pocono High Plateau (62a), the Low Poconos (62b), the Glaciated Allegheny High

Plateau (62c), the Unglaciated Allegheny High Plateau (62d), and the Low Catskills (62e). Each is forested and each is underlain by nearly horizontal rock, predominantly sandstone. Descriptions of the individual characteristics of these five ecoregions follow.

62a. Pocono High Plateau

The Pocono High Plateau (62a) is a forested highland of little relief. It is studded with lakes and wetlands and is underlain by undeformed, noncarbonate strata. Elevations are great enough to make Ecoregion 62a higher and cooler than the nearby lowlands. Glacial advances and retreats have smoothed the terrain, disrupted drainage, produced hummocky morainal topography, and carved many potholes. Numerous resort and suburban developments occur, especially around the glacial and artificial lakes. Local relief is limited and commonly ranges from 50 to 175 feet (20-53 m). Stream gradients thus are also low and there are few riffles or riffle inhabiting species.

Wisconsinan till, glacial outwash, recent alluvium, and, in the south, Illinoian till overlie gently dipping Devonian and Mississippian strata. The Duncannon and Poplar Gap-Packerton members of the Catskill Formation predominate and contain sandstone and conglomerate. These rocks are more resistant to erosion than the finer material of Ecoregion 62b. As a result, the crestal elevations of Ecoregion 62a, ranging from about 1,800 to 2,300 feet (549-701 m), are markedly higher than those of Ecoregion 62b, which range from about 1,300 to 1,500 feet (396-457 m). An escarpment over 300 feet (91 m) high marks the juncture between ecoregions 62a and 62b and their respective lithologies. High-gradient streams and a few waterfalls, such as Indian Ladder Falls, occur on the escarpment (Geyer and Bolles, 1979, p. 202).

The Pocono High Plateau (62a) is a famous year around resort region because of its pleasantly cool summers, abundant snowfall, persistent winter snow cover, numerous lakes, extensive woodland, public lands, tourist facilities, and proximity to urban centers. In recent years, Ecoregion 62a has also experienced substantial suburban growth, resulting in stress to environmental systems.

Soils derived from Wisconsinan drift are widespread and often very stony, acidic, low in fertility, and poorly drained; these Inceptisols are almost always better suited to trees, wildlife, and recreation than to other uses (Fisher and others, 1962, p. 2). The short growing season of 125-140 days reinforces this situation and, therefore, almost no commercially viable farming occurs in Ecoregion 62a. Limited areas are underlain by Illinoian till and have different soils than occur further north on the younger tills; these soils are mostly Ultisols (Hapludults, Fragiudults) and support the ecologically significant Pocono till barrens (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995).

The natural vegetation of the Pocono High Plateau (62a) was predominantly Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), with some Appalachian Oak Forest (dominants: white and red oaks) on the southern periphery. By 1870, almost all the original forest had been cut over or burnt (Murphy and Murphy, 1937, p. 364). Today, the mixed hardwood forest is mostly second or third growth. Mature Northern Hardwoods still can be found in Gouldsboro State Park and virgin northern hardwood forest/spruce still occurs in Hickory Run State Park (Brenner, 1985, p. 14; Erdman and Wiegman, 1974, p. 63). Wetlands are widespread and include marshes and swamps such as those in Gouldsboro State Park and along Two Mile Run. Numerous kettlehole bogs occur, including those at Pine Lake Natural Area and Bruce Lake; they are composed of floating peat mats that grade into mixed hardwood swamps (Erdman and Wiegman,

1974, pp. 62-65; Van Diver, 1990, p. 97). “Mesic to hydric Pocono till barrens presently cover some 6,000 acres near the southern rim of the Pocono Plateau, adjacent to xeric ridge top barrens overlying sandstone covering an additional 6,000 acres. The glacial till barrens are a mosaic of shrublands with scattered pitch pines variously dominated by scrub oak (*Quercus ilicifolia*), sheep-laurel (*Kalimia angustifolia*), and rhodora (*Rhododendron canadense*); a small proportion of the barrens consists of pitch pine woodlands. The Pocono till barrens and adjacent swamps comprise the largest concentration of globally rare communities and species in Pennsylvania; the area is The Nature Conservancy’s highest priority for biodiversity conservation in the state (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995).” These barrens have a high diversity of moth and butterfly species (Cuff and others, 1989, p. 56).

The border between Ecoregion 62a and the Low Poconos (62b) follows the break in elevation, potential natural vegetation, and topography that occurs where coarser and finer members of the Catskill Formation abut at the Pocono Plateau Escarpment. The division between the Ridge and Valley (67) and Ecoregion 62a occurs where the high glaciated plateau ends.

62b. Low Poconos

The Low Poconos (62b) is a forested and glaciated plateau. Pleistocene ice sheets smoothed its terrain, disrupted its drainage, and formed many shallow kettle lakes and wetlands. In addition, it has many vacation and suburban developments, widespread public land, very little agriculture, and extensive woodland. Local relief ranges from about 800 feet (244 m) down to 50 feet (15 m), where lakes and wetlands become particularly common. Areas of greatest relief occur adjacent to the Delaware River; here, high-gradient streams and waterfalls occur, including Dingman's Falls, which is the highest waterfall in Pennsylvania (Erdman and Wiegman, 1974, p. 50; Geyer and Bolles, 1987, p. 253; Oplinger and Halma, 1988, p. 27).

Olean Till, glacial outwash, glacial lake deposits, and Recent alluvium partly overlie gently dipping Devonian age sandstone, siltstone, claystone, and shale. These rocks of the Long Run and Walcksville Members of the Catskill Formation are much less resistant to erosion than those of Ecoregion 62a. As a result, Ecoregion 62b is markedly lower in elevation than Ecoregion 62a; crestal elevations of Ecoregion 62b are about 1,300 to 1,500 feet (396-457 m) whereas those of Ecoregion 62a are 1,800 to 2,300 feet (549-701 m).

Inceptisols are common in Ecoregion 62b. They are derived from Wisconsinan drift and are often poorly drained, acidic, very stony, and low in fertility. As a result, these soils are seldom suitable for agriculture and over 90% of the area is wooded.

Vacation and suburban developments occur throughout the region, especially near the larger lakes. These developments have rapidly expanded in number to keep pace with population growth, which has more than doubled in the last 25 years.

The natural vegetation of the Low Poconos (62b) was mostly Appalachian Oak Forest (dominated by white and red oaks). Wetlands are very common and include marshes like those of the Stillwater Natural Area and swamps such as Saw Creek Headwaters Swamp, Nebo Swamp, Bald Hill Swamp, Tannersville Cranberry Bog Preserve, and Walker Lake Swamp (Cuff and others, 1989, p. 54; Erdman and Wiegman, 1974, pp. 49-61). Kettlehole bogs also occur, such as those at Lake Lacawac Sanctuary and Little Mud Pond; they are composed of floating peat mats that grade into hardwood

swamp (Erdman and Wiegman, 1974, pp. 50, 55; Geyer and Bolles, 1979, p. 182). The bog turtle (*Clemmys muhlenbergii*) is found in the marshy meadows and sphagnum bogs of Monroe County and is endangered in Pennsylvania (McCoy, 1985, p. 272). The king rail (*Rallus elegans elegans*) is found in the marshes of Monroe County and is also endangered in Pennsylvania (Gill, 1985, p. 303).

The boundary between Ecoregion 62b and the Northeastern Uplands (60b) is found where woodland density changes; it is much greater in Ecoregion 62b. The border between ecoregions 62b and 62a follows the break in elevation, potential natural vegetation, and topography that occurs where coarser and finer members of the Catskill Formation abut. The division between the Ridge and Valley (67) and Ecoregion 62b occurs where the glaciated plateau ends.

62c. Glaciated Allegheny High Plateau

Ecoregion 62c is a deeply dissected and forested highland composed of plateau remnants, rounded hills, low mountains, and narrow valleys. Locally, especially in the south, the terrain has been noticeably smoothed by glaciation. Here, many closed depressions and blocked valleys occur and contain small lakes or shallow ponds. Nearly horizontal, resistant strata of Mississippian to Devonian age underlie Wisconsinan drift and are responsible for the highland. The Burgoon Sandstone is a prominent ridge former. Hilltop elevations are commonly 1,900-2,300 feet (579-701 m), which is high enough to ensure a short growing season of 100-165 days. Local relief is about 300-700 feet (91-213 m) and reaches approximately 800 feet (244 m) in Pine Creek Gorge. Mean annual precipitation ranges from 33 to 39 inches (84-99 cm). Most of the soils are frigid Inceptisols, derived from acidic glacial drift, that are stony, acidic, low in fertility, and often steep (Ciolkosz, 1989; Cunningham and Ciolkosz, 1983; Higbee, 1967).

The soils, climate, and ruggedness make the area well suited to trees and poorly suited to agriculture. Hardwood forests are predominant. The natural vegetation was primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) with some intermixed bogs, swamps, and marshes. Appalachian Oak Forest Rickets Glen State Park in northwestern Luzerne County contains approximately 2,000 acres of virgin northern hardwood forest, as well as numerous hemlock swamps (Erdman and Wiegman, 1974, p. 43). Pennsylvania's only spruce bald occurs on Bartlett Mountain, western Wyoming County (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995). (dominants: white and red oaks) also occurred, especially on the eastern margin of Ecoregion 62c (Cuff and others, 1989, p. 52).

In terms of rock type, elevation, relief, natural vegetation, and prevailing land use, Ecoregion 62c is similar to the Unglaciated Allegheny High Plateau (62d). However, like the Glaciated Low Plateau (60a), Ecoregion 62c was covered with ice and has soils that were derived from acidic glacial drift. Lakes and marshes and their associated flora and fauna occur in ecoregions 62c and 60a, but not in 62d. The American bittern (*Botaurus lentiginosus*), which is threatened in Pennsylvania, is found in the marshes of southern Ecoregion 62c (Gill, 1985, p. 310).

Ecoregion 62c's boundaries are shown on Figure 1. Its western border with the Unglaciated Allegheny High Plateau (62d) occurs at the westward limit of Wisconsinan Olean Till (Berg and others, 1980) whereas its northwestern boundary occurs at an elevation break. The eastern border with the Glaciated Low Plateau (60a) is based on forest density, elevation, and rock type; Ecoregion 60a has much less forest, is more than 300 feet (91 m) lower, is less rugged, and has less resistant

surficial rock than Ecoregion 62c. The southern boundary is drawn along Huckleberry Mountain and North Mountain, where terrain changes, folding begins, and elevation changes by over 550 feet (168 m).

62d. Unglaciated Allegheny High Plateau

Ecoregion 62d is a deeply dissected highland composed of plateau remnants, rounded hills, low mountains, and narrow valleys. It is characterized by extensive forests, a short growing season, nutrient-poor residual soils, high local relief, nearly horizontal strata, resistant rock, and oil wells. Overall, the area is very rugged with steep valley sides, entrenched streams, high-gradient channels, and many waterfalls. Local relief is typically 550-700 feet (168-213 m) and reaches about 1,300 feet (396 m) in valleys that were cut by large volumes of glacial melt water. The terrain is nowhere muted by glaciation, although its western-most parts were covered by at least two pre-Wisconsinan glaciations. Hilltop elevations increase northeastward across Ecoregion 62d. They are commonly 1,700-2,200 feet (518-671 m) and are high enough to insure a cool, humid climate with long winters. The growing season lasts only 100-160 days, depending on elevation and other microclimatic controls. Mean annual precipitation ranges from 35 to 44 inches (89-112 cm) and increases westward. Most of the soils are frigid Ultisols and Inceptisols that are low in fertility, often steep, stony, and acidic, and were derived from noncarbonate sedimentary rock.

Extensive woodland occurs and national and state forests are common. Oaks, maples, and other hardwoods predominate, but hemlock (*Tsuga canadensis*), pitch pine (*Pinus rigida*), and white pine (*Pinus strobus*) are also found.

The natural vegetation was primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) with some intermixed bogs and a perimeter of Appalachian Oak Forest (Cuff and others, 1989, p. 52). Extensive logging and burning removed most of the natural vegetation during the nineteenth century. Remnants still occur, however, including those at Tionesta Research Natural Area in southwestern McKean County, Cook Forest State Park in eastern Clarion and southern Forest Counties, Hearts Content Scenic Area in southern Warren County, Algerine Tamarack Swamp in northwestern Lycoming County, and the Pine Creek Gorge Natural Area in western Tioga County (Cuff and others, 1989, p. 53; Erdman and Wiegman, 1974, as reported in Brenner, 1985, p. 14; Geyer and Bolles, 1979, p. 67).

Oil wells are common throughout Ecoregion 62d and account for more than 50% of Pennsylvania's total production. There is also surface coal mining in the south and localized valley agriculture in the northeast. Pollution from mine drainage and oil production is a significant problem locally and has degraded stream habitat (Biesecker and George, 1966, Plate 1; Churchill, 1969, p. 3; Dyer, 1982a, pp. 117-118)

The western boundary between Ecoregion 62d and the Low Lime Drift Plain (61c) is associated with the breaks in topography, soil, and forest density that occur near the Wisconsinan ice limit. The eastern boundary between Ecoregion 62d and the Glaciated Allegheny High Plateau (62c) is at the limit of the Olean Till of Wisconsinan age. The southeastern border is drawn 3-6 miles (5-10 km) north of the West Branch of the Susquehanna River and Bald Eagle Creek, where the terrain and elevation markedly change. The southwestern boundary with the Pittsburgh Low Plateau (70c) is drawn where elevation, forest density, and soil changes; Ecoregion 70c has lower elevations, less woodland density, and more Gilpin soils than Ecoregion 62d. The southern border divides the

cooler, more heavily forested Ecoregion 62d from the Uplands and Valleys of Mixed Land Use (69b).

62e. Low Catskills

The Low Catskills (62e) is a forested and highly dissected ecoregion less than 5 miles (8 km) wide in northeastern Pennsylvania. Here, the Delaware River has deeply entrenched into the glaciated Appalachian Plateau, creating cliffs and steep-walled valleys. Many high-gradient tributaries occur and stream organisms associated with riffles are common. Topography is rugged for this part of the commonwealth and local relief ranges from about 450 to 800 feet (137-244 m). Crestal elevations are from approximately 1,300 to 1,800 feet (396-549 m) and are high enough to insure a short growing season of about 130 days, varying according to local topography and slope aspect.

The soils of Ecoregion 62e are mostly Inceptisols. Most formed on Olean Till and some developed on Quaternary alluvium. They overlie nearly horizontal, Devonian age sandstone, siltstone, and shale of the Catskill Formation. The soils are characterized by stoniness, shallowness, low fertility, and acidity, which, together with the rugged terrain and brief growing season, make the area best suited to woodland (Higbee, 1967). The natural vegetation was mostly Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) (Cuff and others, 1989, p. 52). Some wetland vegetation occurs on poorly drained sites, and northern rock plants grow on the Delaware River cliffs in northeastern Wayne County (Erdman and Wiegman, 1974, p. 50).

The boundary between Ecoregion 62e and the less dissected Northeastern Uplands (60b) occurs at the forest density and topography break shown on the Scranton Ecoregion 62e extends across the Delaware River into New York, where it becomes much more extensive. 1:250,000-scale topographic map; Ecoregion 62e is much more rugged and wooded than Ecoregion 60b.

63. Middle Atlantic Coastal Plain

The Middle Atlantic Coastal Plain (63) ecoregion is a low, nearly flat plain, with many swampy or marshy areas that extends northeastward from Georgia to New Jersey. Forest cover in the region is predominantly loblolly-shortleaf pine with patches of oak, gum, and cypress near major streams. Poorly drained soils are common especially in lowest areas.

Elevations range from 0 to 100 feet elevation and local relief is less than 50 feet and often nearly level; Ecoregion 63 is characteristically lower flatter than inland ecoregions. Its low terraces, marshes, dunes, beach ridges, barrier beaches, and beaches are underlain by unconsolidated sediments. Mesic and thermic Ultisols and Histosols typically underlie the ecoregion. They support a potential natural vegetation of Appalachian Oak Forest, Northern Cordgrass Prairie, Southern Floodplain Forest, Live Oak-Sea Oats, and Oak-Hickory-Pine Forest (Kuchler, 1964). Wetlands are common; salt estuarine bay marshes occur.

The boundary between the Middle Atlantic Coastal Plain (63) and the Northern Piedmont (64) occurs at the Fall Line. Its border with the Southeastern Plains (65) is based on elevation, topography, and drainage; Ecoregion 63 is typically lower, flatter, more poorly drained, and more marshy than Ecoregion 65. In addition, although both ecoregions 63 and 65 are underlain by unconsolidated sediments, Holocene-age deposits are restricted to the Middle Atlantic Coastal Plain (63).

On the ecoregion map (Figure 1), the Middle Atlantic Coastal Plain (63) contains six level IV ecoregions: the Delaware River Terraces and Uplands (63a) being the only level IV ecoregion located in Pennsylvania of the six. Others are the Chesapeake-Albemarle Silty Lowlands and Tidal Marshes (63b), Dismal Swamp (63c), Barrier Islands-Coastal Marshes (63d), Mid-Atlantic Flatwoods (63e), and Delmarva Uplands (63f). A description of the individual characteristics of the Middle Atlantic Coastal Plain (63) ecoregion follows.

63a. Delaware River Terraces and Uplands

Ecoregion 63a is a narrow, marshy, nearly level to rolling lowland adjacent to the Delaware River estuary and Delaware Bay that extends from southeastern Pennsylvania to southeastern Delaware. It is characterized by low, nearly level terraces, an ocean modified climate, a long growing season, freshwater intertidal marshes, saltwater marshes, and small, sluggish, meandering streams; physiography is distinct from that of the higher, less level, and much less marshy Delmarva Uplands (63f), Piedmont Uplands (64c), and Northern Rolling Inner Coastal Plain (65n). Low lying areas are commonly saturated during the growing season or flooded. Saline marsh deposits dominate; alluvial and estuarine sand and silt are also widespread. These deposits are underlain by unconsolidated and easily eroded Quaternary gravels, sands, and silts. Elevations are less than 60 feet (18 m), local relief is less than 35 feet (11 m); streams have low gradients and are often tidally influenced. Erosion, dredging, filling, and the construction of embankments and bulkheads has eradicated many wetlands; regulations since the 1970s have reduced annual wetland loss substantially.

Before settlement, freshwater intertidal and brackish marshes were common. In addition, Appalachian Oak Forest (dominated by white and red oaks) grew on uplands in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) grew on uplands in the south (Kuchler, 1964). Today, most of the original forests are gone, but some mature, second growth occurs in the Wissahickon Valley, Philadelphia (Erdman and Wiegman, 1974, p. 99).

The northern part of the Delaware River Terraces and Uplands (63a) is dominated by Philadelphia, Wilmington, and their suburbs; these cities developed on the Fall Line next to the Delaware River estuary. In this area, urban and industrial activities have caused extensive pollution and habitat modification. Erosion, urban development, dredging, filling, and bulkheading have eradicated many wetlands and continue to have an impact on the few that still exist. The remaining freshwater intertidal marshes in the Pennsylvania portion of Ecoregion 63a are home to globally rare species; this habitat is severely endangered in Pennsylvania and the state's only extinct plant, *Micranthemum micranthemoides*, was found there (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995). Wetlands between Andalusia and Bristol, Pennsylvania, including Neshaminy State Park, are reported to contain several plant species that are endangered in the State including the arrowhead (*Sagittaria calycina*), coast violet (*Viola brittoniana*), river bank quillwort (*Isoetes riparia*), and swamp beggar-ticks (*Bidens bidentoides*) (Wiegman, 1985, pp. 44-48, 66-67, 74). The freshwater intertidal and saltwater Tinicum Marshes, near the mouth of Darby Creek, contain several amphibian, reptile, and bird species that are endangered in Pennsylvania, including the coastal plain leopard frog (*Rana utricularia*), red-bellied turtle (*Pseudemys rubriventris*), bog turtle (*Clemmys muhlenbergii*), king rail (*Rallus elegans*), and short-eared owl (*Asio flammeus*) (Gill, 1985, pp. 303-305; McCoy, 1985, pp. 263-271). These marshes are also the wintering ground for many ducks and provide summer habitat for herons, egrets, gallinules, and bitterns, including the least bittern (*Ixobrychus exilis*) and the American

bittern (*Botaurus lentiginosus*), which are threatened in Pennsylvania (Geyer and Bolles, 1979, p. 469; Gill, 1985, pp. 307-310). The Delaware River itself has been severely affected by domestic and industrial pollution. As a result, many associated species have been lost or are threatened with extinction in Pennsylvania. For example, the pirate perch (*Aphredoderus sayanus*), the mud sunfish (*Acantharchus pomotis*), the blackbanded sunfish (*Enneacanthus chaetodon*), and the swamp darter (*Ertheostoma fusiforme*) have been extirpated from the lower Delaware River of Pennsylvania (Cooper, 1985, pp. 239-256). The shortnose sturgeon (*Acipenser brevirostrum*) probably still exists in the Delaware River, but is endangered in Pennsylvania (Cooper, 1983, p. 5; 1985, pp. 171-172). In Pennsylvania, the Coastal Plain boundary approximates an elevation of 59 feet (18 m) (Geyer and Bolles, 1979, p. 467; Guilday, 1985, p. 19). This border is near the Fall Line, which divides the Lower Paleozoic schist and gneiss of Ecoregion 64c from the much younger, less resistant, and flat-lying sedimentary rocks. The boundary between the Piedmont Uplands (64c) and Ecoregion 63a also approximates the juncture of the Chester and Glenelg soils with the Howell and Fallsington soils (U.S. Department of Agriculture, 1972).

Ecoregion 63a's boundaries are shown on Figure 1. Its western border with the Piedmont Uplands (64c) is at the Fall Line. Its western border with the Delmarva Uplands (63f) was drawn from surficial geology maps, topographic maps, and county soil survey information; saline marsh deposits and low terraces with alluvial-estuarine sand and silt were included in Ecoregion 63a (Richmond et al., 1987). Where marsh symbols on the topographic maps extended west of the alluvial-estuarine sand and silt deposits shown on Richmond and others (1987), the ecoregion 63a-63f line followed the marsh symbols. The boundary between ecoregions 63a and 63d is near the boundary between marine and alluvial-estuarine deposits (Richmond and others (1987)) and follows a natural break in marsh distribution; Ecoregion 63a lacks the strand, beach ridges, swales, and barrier islands of the Barrier Islands-Coastal Marshes (63d). The boundary between Ecoregion 63a and the Chesapeake Rolling Coastal Plain (65n) is based on physiography; Ecoregion 63a is lower, more poorly drained, and more marshy than Ecoregion 65n.

64. Northern Piedmont

Ecoregion 64 consists of low rounded hills, irregular plains, and open valleys and is underlain by metamorphic, igneous, and sedimentary rocks. Crestal elevations typically range from about 325 feet (99 m) on limestone to 1,300 feet (396 m) on more resistant metamorphic rock. Isolated, higher, rocky hills and ridges occur and were formed by diabase intrusions. The climate is humid continental, with cold winters, hot summers, and an average of 170-210 days without killing frost. The natural vegetation was mostly Appalachian Oak Forest (dominated by white and red oaks). Some Oak-Hickory-Pine Forest occurred along the Susquehanna River and was dominated by hickory (*Carya* spp.), Virginia pine (*Pinus virginiana*), pitch pine (*Pinus rigida*), chestnut oak (*Quercus prinus*), white oak (*Quercus alba*), and black oak (*Quercus velutina*) (Cuff and others, 1989, p. 52). There are scattered serpentine barrens in Chester, Delaware, and Lancaster counties of Pennsylvania.

Soils within the Northern Piedmont (64) are generally deep, well-developed Alfisols and Ultisols of moderate to excellent fertility. Those derived from the carbonate bedrock in the York and Lancaster valleys are exceptionally fertile. Land use and land cover is a complex mix of small farms interspersed with residential, commercial, and industrial development and scattered woodland.

The boundary with the Middle Atlantic Coastal Plain (63) occurs at the Fall Line. The border with

the Ridge and Valley (67) is based on topography, lithology, and geological structure. The boundary with the Piedmont (45) is based on potential natural vegetation; the dominantly Appalachian Oak Forest of the Northern Piedmont (64) contrasts with the Oak-Hickory-Pine Forest of Ecoregion 45 to the south.

On the ecoregion map (Figure 1), the Northern Piedmont (64) is composed of four level IV ecoregions: the Triassic Lowlands (64a), the Diabase and Conglomerate Uplands (64b), the Piedmont Uplands (64c), and the Piedmont Limestone/Dolomite Lowlands (64d). Descriptions of the individual characteristics of these four ecoregions follow.

64a. Triassic Lowlands

Ecoregion 64a is a plain underlain and delineated by sedimentary rock and characterized by wide undulating ridges, broad nearly level valleys, limited local relief, and a mosaic of farms and houses. Typical hilltop elevations generally rise westward from 175 to 600 feet (53-183 m) and local relief is only 30-200 feet (9-61 m). Ecoregion 64a is higher than the Piedmont Limestone/Dolomite Lowlands (64d), but lower than either the Piedmont Uplands (64c) or the Diabase and Conglomerate Uplands (64b); it is not as deeply dissected as Ecoregion 64c. Springs are rather uncommon because the comparatively flat and undissected relief offers little means for the ground water to flow to the surface (Petro and others, 1956).

The soils of Ecoregion 64a were derived from Triassic sandstone, shale, siltstone, and argillite of the Brunswick, Stockton, Lockatong, Gettysburg, and New Oxford formations; lithology is distinct from the metamorphic rocks of the surrounding portions of the Piedmont. The soils were derived from residuum and are mostly Alfisols containing a moderate to high level of subsoil base saturation. They are less fertile than the Alfisols of Ecoregion 64d, which were derived from carbonates, but are slightly more fertile than the Ultisols and Inceptisols of Ecoregion 64c, which were derived from metamorphic rock (Ciolkosz and Dobos, 1989, p. 295; Kuhl and others, 1984, p. 29). They supported a potential natural vegetation of Appalachian Oak Forest (dominated by white and red oaks) (Kuchler, 1964).

Today, the native Appalachian oak forest has been replaced by a mosaic of farms, houses, and woodland. Agriculture is favored by nearness to market, fairly fertile soils, and a long growing season of 170-183 days. Dairy farming is the main source of farm income; beef cattle, poultry, fruit, vegetables, and grain are also important. Suburbanization increases near Philadelphia. Despite their soils differences, ecoregions 64a and 64c have similar land uses. Hickory (*Carya* spp.) is more abundant than elsewhere in the Piedmont because the soils of Ecoregion 64a are less acidic and more calcium- and magnesium-rich than those derived from nonsedimentary rocks (Farrell and Ware, 1991). Red maple (*Acer rubrum*) and black tupelo (*Nyssa sylvatica*) are less abundant on soils derived from Triassic sediments than on the low calcium, low magnesium, and more acidic soils found elsewhere in the Piedmont over metamorphic rocks (Farrell and Ware, 1991).

Streams, wetlands, and a few ponds and lakes/ponds occur in Ecoregion 64a. In the Schuylkill River system of northern Montgomery and Chester counties, mallards (*Ánas platyrhynchos*), Canada geese (*Branta canadensis*), wood ducks (*Aix sponsa*), and black ducks (*Ánas rúbripes*) are common and the water is warm enough for many species of fish, including bass, bluegill, and carp (Smith and others, 1967). Wetlands are becoming rarer, especially in the Philadelphia area, but they still support populations of the New Jersey chorus frog (*Pseudacris triseriata kalmi*) and the bog turtle

(*Clemmys muhlenbergii*), both endangered in Pennsylvania (McCoy, 1985, pp. 261, 270).

The boundaries of Ecoregion 64a generally occur at the limit of nonresistant Triassic deposits. Changes in topography and soils often coincide with these boundaries.

64b. Diabase and Conglomerate Uplands

Ecoregion 64b is characterized by wooded, stony, hills and steep ridges that are composed of highly resistant igneous (diabase), heat-altered sedimentary rock, or sedimentary rock. Crestal elevations are typically 300-1,150 feet (91-351 m), but in the Conewago Mountains, they rise to about 1,300 feet (396 m). Local relief varies substantially from a minimum of about 50 feet to a maximum of 650 feet (15-198 m).

Ecoregion 64b is underlain mostly by Triassic conglomerates and reddish sandstones that were intruded by Triassic and Jurassic diabase along a series of linear sills and dikes. These intrusions in turn heated nearby sediments and altered them into harder, denser, and less porous material (Geyer and Bolles, 1979, p. 408). The primary ridge formers are the Gettysburg and Hammer Creek conglomerates and, most commonly, diabase (trap rock). A famous example of the latter is Gettysburg's Cemetery Ridge. Triassic diabase has more open joints than sandstone or shale and yields more water; the ground water from diabase is softer than the harder water from wells in shale or sandstone (Petro and others, 1956).

Thin, fine-textured clayey soils have commonly developed over diabase and are non-acidic and shallow. They are hard to till and best suited for forest or pasture. Saprolite is thin to nonexistent unlike elsewhere in the Northern Piedmont (64). Soils are mostly Alfisols and originally supported Appalachian Oak Forest (dominated by white and red oaks)) (Cuff and others, 1989, p. 52). The flora on soils derived from the diabase intrusions which are basic in character are distinctive; acid loving plants are absent from diabase areas (Allard and Leonard, 1962).

Today, woodland is still common in Ecoregion 64b, especially where the surface is steep or covered in rocks or boulders. In other areas, the land is more suitable to agriculture. Here general farms occur, typically scattered among woodland and idle land. Camps and resort cottages are locally common, for example, in eastern Montgomery County (Smith and others, 1967, p. 9).

Lithology, woodland density, elevation, and topography differentiate Ecoregion 64b from the other ecoregions of the Northern Piedmont (64). Ecoregion 64b alone is a wooded upland composed of resistant Jurassic and Triassic diabase and Triassic conglomerate.

64c. Piedmont Uplands

Ecoregion 64c is characterized by rounded hills, low ridges, relative high relief, and narrow valleys and is underlain by metamorphic rock. Irregular plains and narrow valleys typically have elevations that often range from about 450 feet to 1,000 feet (137-304 m) and a local relief that is often 130 feet to 330 feet (40 to 101 m). Ruggedness increases toward the southwest and local relief can be as much as 590 feet (180 m) adjacent to the incised Susquehanna River. Here gorges containing high-gradient streams and waterfalls occur, including Otter Creek, Tucquan Glen, Wildcat Run, Counselman Run, Kelly Run, Ferncliff Run, and Oakland Run (Geyer and Bolles, 1979, pp. 442-465; Guilday, 1985, p. 19). The Piedmont Uplands (64c) has substantially higher relief than the Triassic Lowlands (64a), Piedmont Limestone/Dolomite Lowlands (64d), or the Outer Piedmont (45f). Channel gradient is generally moderate and is greater than that of neighboring ecoregions

with less relief; Piedmont fish habitats vary in relation to gradient (Jenkins and Burkhead, 1993 (1994)).

The Fall Zone occurs near the eastern edge of Ecoregion 64c and is characterized by areas of high stream gradient, exposed bedrock, islands, falls, and a mixture of metamorphic and sedimentary rock. The Fall Zone is an ecologic barrier to lowland, calm-water species. The Great Falls of the Potomac is the largest physical river barrier of natural origin in Virginia and is insurmountable to fishes at low and normal river levels; it has barred anadromous fishes from potential spawning grounds and may have curtailed the upstream distribution of Coastal Plain fish species (Jenkins and Burkhead, 1993 (1994)) and montane fishes.

Metamorphic rocks of Lower Paleozoic and Precambrian age underlie the ecoregion and are folded and faulted; lithology is distinct from the sedimentary rocks of the neighboring Southeastern Plains (65). Schists of the Wissahickon and Peters Creek Very resistant quartzite and phyllite of the Chickies, Antietam, and Harpers formations form the highest areas, the Pigeon Hills and Hellam Hills. Scattered outcrops of very basic serpentinite also occur; formations predominate and Precambrian gneisses are common in the east.

Deep Ultisols and Inceptisols are common and have developed from residuum. Chester and Glenelg soils are common. These Ultisols are capable of supporting highly diversified farms, even though they are less fertile than the soils of Ecoregion 64d. Soils derived from quartzite are commonly stony and are often forested. Chrome soils from serpentinite occur locally and are low in calcium and high in magnesium, chromium, and nickel.

Scattered serpentine barrens occur on chrome soils and support a specialized vegetation composed of dry oak/pine forests (e.g., *Quercus marilandica, Q. stellata, Q. velutina, Pinus virginiana*), greenbrier (*Smilax rotundifolia*), prairie grasses (e.g., *Schizachyrium scoparius, Sporobolus heterolepis*), and herbs (e.g., *Aster depauperatus, Cerastium arvense var. villossissimum, Talinum teretifolium*) (Cuff and others, 1989, p. 56). Most of these are rare in Pennsylvania and some are threatened, including the prairie dropseed (*Sporobolus heterolepis*) (Wiegman, 1985, p. 57). In addition, the buckmoth (*Hemileuca maia*) occurs only in the serpentine barrens and is threatened in Pennsylvania (Opler, 1985, p. 88). Pitch pine (*Pinus rigida*) is a co-dominant in serpentine barren woodlands and an important component of bluestem-dropseed savannas; it is found at seven serpentine barren sites in Chester, Delaware, and Lancaster counties. Those at Nottingham County Park and at Goat Hill State Forest Natural Area are among the largest remaining barrens in the eastern United States (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995). Grazing, quarrying, and suburban development continue to threaten the remaining barrens (Wiegman, 1985, p. 57) and The Nature Conservancy has given them second-highest priority on their state biodiversity conservation agenda (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995).

The potential natural vegetation is mapped as Appalachian Oak Forest (dominated by white and red oaks); it is distinct from the Oak-Hickory-Pine of the Inner Piedmont (45e) (Kuchler, 1964). Some Mixed Mesophytic Forest also occurred. Remnants of the original vegetation can be found in the cool, very rugged Otter Creek gorge, where virgin chestnut oak (*Quercus prinus*), hemlock (*Tsuga canadensis*), beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and basswood (*Tilia heterophylla*) still grow (Erdman and Wiegman, 1974, p. 98).

Today, forests are less extensive than they were originally and there is more agriculture than in the Inner Piedmont (45e). Extensive urban, commercial, and industrial development occurs in the Philadelphia area. Suburban development is common, especially near Philadelphia, Wilmington, and the major transportation corridors. Farms become progressively more common with distance from the cities. Grain, potatoes, and hay are produced and many of the farms have pastures for dairy and beef cattle or ranges for poultry. Farming is favored by nearness to market, rather fertile soils, and Pennsylvania's longest growing season, up to 200 days. Agricultural erosion has been a serious problem in many places (Kunkle, 1963).

The boundary of Ecoregion 64c follows the limit of the Lower Paleozoic and Precambrian metamorphic rocks; they are distinct from the largely sedimentary rock of the surrounding ecoregions. The Northern Piedmont (64) is divided from the Middle Atlantic Coastal Plain (63) by the Fall Line. The southern boundary is close to Braun's (1950) natural vegetation line. The western boundary with the high, rugged, forested Blue Ridge Mountains (66) is based on topography and vegetation density.

64d. Piedmont Limestone/Dolomite Lowlands

Ecoregion 64d is a very fertile and intensively farmed area underlain mostly by limestone and dolomite. These carbonates have been weathered to form a nearly level to undulating terrain that contains sinkholes, caverns, and disappearing streams. Ecoregion 64d is lithologically distinct from the metamorphic rock of the neighboring Piedmont Uplands (64c). Elevations are lower than adjacent ecoregions, typically 250-525 feet (76-160 m). In the York Valley, however, they rise to about 675 feet (206 m). There is little dissection and local relief is typically only 30-125 feet (9-38 m).

Ordovician limestone predominates. It is a high yielding aquifer riddled with solution channels that reduce water filtration; as a result, groundwater is sometimes contaminated. Other Ordovician and Cambrian formations occur and contain limestone, dolomite, and shale.

The soils, unlike those of surrounding ecoregions, are derived largely from carbonate rock and are very fertile. The Duffield and Hagerstown soils are common and, with the exception of sinkholes, pose no limitations for agriculture. These base-rich Alfisols (Hapludalfs) developed under a humid and mild climate. They supported a potential natural vegetation of mostly Appalachian Oak Forest (dominated by white and red oaks) (Kuchler, 1964), but along the Susquehanna River, Oak-Hickory-Pine Forest also grew (Cuff and others, 1989, p. 52).

Today, virtually all of the forest has been replaced by agriculture although a few wetlands still occur, including Gleisner's Swamp near Quarryville, the type locality of the bog turtle (*Clemmys muhlenbergii*), which is endangered in Pennsylvania (Erdman and Wiegman, 1974, p. 96). The Piedmont Limestone/Dolomite Lowlands (64d) has a very favorable natural environment for agriculture; its topography, climate/growing season, and market proximity are conducive to commercial agriculture, and its soils are among the best in the eastern United States (Cuff and others, 1989, p. 20). It is one of the most productive agricultural areas in eastern United States and is dominated by general farming. Land use is similar in both the carbonate and the shale areas of Ecoregion 64d; corn, hay, soybeans, and wheat are commonly produced. Dairy farming also occurs, but is not dominant as in neighboring ecoregions. In addition, tobacco is an economically important

specialty crop in Lancaster County, where it is typically grown on small, rotating plots to reduce soil depletion (Pennsylvania Agricultural Statistics Service, 1990-1991). Rocky land is mostly used for pasture. Residential and industrial developments occur and are expanding, especially in Montgomery County and in the Lancaster area. Present day flora and vegetation on basic soils in the Culpeper Basin are distinct from that occurring on more acid, less fertile soils of the neighboring Piedmont Uplands (64c) that are underlain by Paleozoic and Precambrian metamorphic rock.

The boundary of Ecoregion 64d generally follows the limit of Ordovician-Cambrian carbonate rocks and the karst, agricultural lowland. However, in the Conestoga Valley, shales of the Cocalico Formation also occur.

66. Blue Ridge Mountains

Ecoregion 66 is a narrow strip of mountainous ridges that are forested and well dissected. Crestal elevations range from about 1,000 feet to over 5,700 feet (305-1,737 m) on Mt. Rogers and tend to rise southward. Local relief is high and both the side slopes and the channel gradients are steep. Streams are cool and clear and have many riffle sections; they support a different, less diverse fish assemblage than the streams of the valleys below, which are warmer, lower in gradient, and more turbid.

The Blue Ridge Mountains (66) are underlain by resistant and deformed metavolcanic, igneous, sedimentary, and metasedimentary rock. Inceptisols, Ultisols, and Alfisols have developed on the Cambrian, Paleozoic, and Precambrian rock.

The Blue Ridge Mountains (66) can be divided into northern (ecoregions 66a and 66b) and southern parts (ecoregions 66c, 66d, 66e) at the Roanoke River (Hack, 1982). North of the river, just three different rock types form the crest and the effects of differential erosion partially determine their local altitude. South of the Roanoke River, the Blue Ridge Mountains become higher and lithologically complex.

Climate varies significantly. Generally, both growing season and precipitation increase southward. The frost-free period varies from less than 150 days to more than 175 days, and the precipitation varies from 39 to 49 inches (99-124 cm). Locally, however, relief and topographic position have significant effects on the microclimate.

The natural vegetation varies from north to south. North of a transitional area near the Roanoke River, it is predominantly Appalachian Oak Forest (dominated by white and red oaks). South of the transitional area, grew a mix of Appalachian Oak Forest, Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak), and, in higher areas, Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) (Kuchler, 1964). On the foothills, a mix of loblolly and shortleaf pines occurs and is mixed with Appalachian Oak Forest.

On the ecoregion map (Figure 1), the Blue Ridge Mountains ecoregion (66) is composed of five level IV ecoregions: the Northern Igneous Ridges (66a), the Northern Sedimentary and Metasedimentary Ridges (66b), part of which is located in Pennsylvania, the Interior Plateau (66c), the Southern Igneous Ridges and Mountains (66d), and the Southern Sedimentary Ridges (66e). Each is a highland that is typically wooded and often composed of crystalline rock; each is distinct from the adjacent, agricultural lowlands of the Northern Limestone/Dolomite Valleys (67a), the

Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f), the Southern Shale Valleys (67g), and the Triassic Lowlands (64a). A description of the Northern Sedimentary and Metasedimentary Ridges (66b) ecoregion follows.

66a. Northern Igneous Ridges

Ecoregion 66a extends southwestward from South Mountain, Pennsylvania, to near the Roanoke River. It consists of pronounced ridges separated by high gaps and coves. Mountain flanks are steep and well dissected. Crestal elevations tend to rise southward, from 1,000 to 1,575 feet (305-480 m) in Pennsylvania, to a maximum of over 3,750 feet (1,143 m). Local relief also increases southward to a maximum of about 1,300 feet (396 m).

Precambrian and Paleozoic metavolcanic and igneous rock underlie Ecoregion 66a. Typically occurring in Virginia are basalt and metabasalt of the Catoctin Formation, granite and granodiorite of the Virginia Blue Ridge Complex, and andesite, tuft, and greenstone of the Swift Run Formation. Metarhyolite and metabasalt occur in Pennsylvania; diabase, metabasalt, and metarhyolite are found in Maryland. Inceptisols, Alfisols, and Ultisols have commonly developed from the bedrock. Catoctin, Myersville, and Hayesville soils are widespread. Low fertility, acidity, stoniness, and steepness are characteristics of these soils.

The natural vegetation was Appalachian Oak Forest (dominants: white and red oaks) (Kuchler, 1964). Today, the Northern Igneous Ridges (66a) remain extensively forested. On South Mountain, however, localized dairy farming and poultry raising occur; in addition, orchards are found on Arendtsville soils.

The boundary between Ecoregion 66a and the Northern Sedimentary and Metasedimentary Ridges (66b) is shown in Figure 1; it follows the contact between igneous-metavolcanic rocks and sedimentary-metasedimentary rocks.

66b. Northern Sedimentary and Metasedimentary Ridges

Ecoregion 66b extends from South Mountain, Pennsylvania, to the Roanoke River area. It is composed of high, steeply sloping ridges and deep, narrow valleys. Crestal elevations typically rise southward, from about 1,300 to 2,000 feet (396-610 m) in Pennsylvania, to a maximum of over 3,500 feet (1,067 m). Local relief also increases southward and reaches a maximum of about 1,000 feet (305 m).

Erosion resistant sedimentary and metasedimentary rock of Cambrian age underlies Ecoregion 66b. The Weverton-Loudon, Antietam (Erwin in Virginia), and Harpers (Hampton in Virginia) formations are common. Typically, Inceptisols, Ultisols, and Alfisols developed from the bedrock. Laidig, Wallen, Dekalb, Lily, Berks, and Weikert soils are widespread. Stoniness, steepness, low fertility, and acidity are characteristics of these soils. Streams do not have much buffering capacity and are subject to acidification.

The natural vegetation was Appalachian Oak Forest (dominants: white and red oaks) (Kuchler, 1964). Today, the Northern Sedimentary and Metasedimentary Ridges (66b) remain extensively forested.

The boundary between Ecoregion 66b and the Northern Igneous Ridges (66a) is shown in Figure 1;

it follows the contact between igneous-metavolcanic rocks and sedimentary-metasedimentary rocks.

67. Ridge and Valley

Ecoregion 67 extends from Wayne County, Pennsylvania, through Virginia along a southwesterly axis. It is characterized by alternating forested ridges and agricultural valleys that are elongated and folded and faulted. Elevations range from about 500 to 4,300 feet (152-1,311 m). Local relief varies widely from approximately 50 to 1,500 feet (15-457 m). The Ridge and Valley (67) narrows toward the south and is generally bordered by the higher Blue Ridge Mountains and the higher and less deformed Allegheny and Cumberland plateaus.

Underlying Ecoregion 67 are largely Paleozoic sedimentary rocks that have been folded and faulted. Sandstone, shale, limestone, and dolomite are the predominant rock types. Lithological characteristics often determine surface morphology. Many ridges are formed on well-cemented, relatively resistant material such as sandstone or conglomerate; they are often rather parallel and alternate with valleys but, in central Pennsylvania, they zigzag because resistant strata were compressed into plunging folds during orogeny and later eroded. Valleys tend to be created on weaker strata, including limestone and shale. Inceptisols and Ultisols are common and were developed on noncarbonate rock. Alfisols and Ultisols are found in the limestone valleys.

The valleys vary in microtopography and agricultural potential. Valleys derived from limestone and dolomite are smoother in form and have a lower drainage density than those developed in shale. Shale valleys often display a distinctive rolling topography. Soils derived from limestone are fertile and well suited to agriculture, while those derived from shale have a much lower agricultural potential unless they are calcareous. Poultry operations are locally common and economically important.

Many of the streams networks are trellised; topography dictates that the swift, actively down-cutting streams which run off steep ridges must join the gentle valleys perpendicularly. Other larger rivers such as the Susquehanna River cross structure, cutting deep gorges through ridges in the process. High-gradient streams are common in watergaps and on ridge slopes; elsewhere, gentler gradient, warmer, more meandering streams are common. Partially as a result, the latitudinally extensive Ridge and Valley (67) has good aquatic habitat diversity.

The natural vegetation varied from north to south. From northeastern Pennsylvania to near its border with Maryland, the Ridge and Valley (67) was dominated by Appalachian Oak Forest. Southward, Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) was common to about the James River, whereupon the Appalachian Oak Forest returned (Kuchler, 1964). Hemlock (*Tsuga canadensis*), along with a mixture of white pine (*Pinus strobus*), beech (*Fagus grandifolia*), and other hardwoods also occurred locally (Brenner, 1985, p. 13).

Climate varies significantly in the Ridge and Valley (67). Generally, both growing season and precipitation increase southward. The frost-free period varies from less than 120 days to more than 180 days and the precipitation varies from 36 to 50 inches (91-127 cm). Locally, however, relief and topographic position have significant effects on the microclimate. The Ridge and Valley (67) is significantly lower than the Central Appalachians (69). As a result, it has less severe winters, considerably warmer summer temperatures, and lower precipitation due to a rain shadow effect.

On the ecoregion map (Figure 1), the Ridge and Valley (67) is composed of 10 level IV ecoregions: the Northern Limestone/Dolomite Valleys (67a), the Northern Shale Valleys (67b), the Northern Sandstone Ridges (67c), the Northern Dissected Ridges (67d), the Anthracite (67e), the Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f), the Southern Shale Valleys (67g), the Southern Sandstone Ridges (67h), and the Southern Dissected Ridges and Knobs (67i). Each is underlain by folded and faulted sedimentary rock which is distinctive of the ecoregion. The division between ecoregions 67a, 67b, 67c, and 67d and ecoregions 67f, 67g, 67h, and 67i occurs in a broad zone near the James River. Five level IV Ecoregions are present in Pennsylvania, 67a, 67b, 67c, 67d, and 67e. Descriptions of these follow.

67a. Northern Limestone/Dolomite Valleys

Ecoregion 67a is a lowland characterized by broad, level to undulating, fertile valleys that are extensively farmed. The Great Valley, the Shenandoah Valley, and the Nittany Valley all occur in Ecoregion 67a. Sinkholes, underground streams, and other karst features have developed on the underlying limestone/dolomite, and as a result, the drainage density is low. Where streams occur, they tend to have gentle gradients, plentiful year around flow, and distinctive fish assemblages. Local relief typically ranges from 50 to 500 feet (15-152 m).

Silurian, Ordovician, and Cambrian limestone and dolomite commonly underlie Ecoregion 67a. Interbedded with the carbonates are other rocks, including shale, which give the ecoregion topographic and soil diversity. Mesic Alfisols (Hapludalfs, Fragiudalfs, Paleudalfs) and Ultisols (Hapludults, Paleudults) have developed from the rock. Hagerstown soils are common locally and are very productive. They are also found on the Lancaster Plain and York Valley of the Piedmont Limestone/Dolomite Lowlands (64d).

The climate of Ecoregion 67a varies significantly because of the ecoregion's elevational and latitudinal range. The growing season varies from 145 to 180 days and is sufficient for agriculture. Farming predominates, with scattered woodlands occurring in steeper areas. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominated by white and red oaks) in the north and Oak/Hickory/Pine Forest in the south; bottomland forests also occurred.

Figure 1 shows the boundaries of Northern Limestone/Dolomite Valleys (67a); base-rich soil, muted terrain, low drainage density, and limestone, dolomite, and calcareous shale bedrock are characteristic.

67b. Northern Shale Valleys

Ecoregion 67b extends over a large area from northeastern Pennsylvania to near the James River in Virginia. It is characterized by rolling valleys and low hills and is underlain mostly by shale, siltstone, and fine-grained sandstone. Local relief varies from about 50 feet to 500 feet (15-152 m).

The Hamilton, Hampshire, Chemung, and Brallier formations and, in Maryland, the Chemung Group underlie Ecoregion 67b. They are folded and faulted and are of Devonian age. The underlying rocks are not as permeable as the limestone of Ecoregion 67, so surface streams are larger and drainage density is higher than in limestone areas. There is more soil erosion in Ecoregion 67b than in the Northern Limestone/Dolomite Valleys (67a) (Cuff and others, 1989, p. 21). As a result, the stream turbidity can be comparatively high and the stream habitat relatively impaired.

Inceptisols (Dystrochrepts) have developed from residuum, and Berks, Weikert, and Lehew soils are common. Soils derived from acid shale are poorer than the soils of Ecoregion 67a, which were derived from limestone (Cuff and others, 1989, p. 21). Within Ecoregion 67b, however, there is considerable soil variability, and some soils are more calcareous than others. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south; bottomland forests also occurred. Today, farming predominates, with woodland occurring on steeper sites. Scattered shale barrens occur on steep west and south facing slopes; it is one of rarest types of habitat in Pennsylvania and occurs in Huntingdon, Fulton, and Bedford counties (Cuff and others, 1989, p. 56; Erdman and Wiegman, 1974, pp. 71-74).

The boundaries of Ecoregion 67b are shown in Figure 1; they encompass acidic to neutral, valley and low hill soils that developed on shales and siltstones.

67c. Northern Sandstone Ridges

Ecoregion 67c is characterized by high, steep, forested ridges with narrow crests. Crestal elevations range from about 1,000 feet to 4,300 feet (305-1,311 m) and local relief typically ranges from 500 to 1,500 feet (152-457 m). Most of the major ridges in Ecoregion 67 are found in Ecoregion 67c or in the Southern Sandstone Ridges (67h). High-gradient streams flow off the ridges into narrow valleys. Streams do not have as much buffering capacity as ecoregions 67d or 67i and are subject to acidification. The ridge-forming strata are composed of folded, interbedded Paleozoic sandstone and conglomerate. The Tuscarora Formation, Pocono Formation, Bald Eagle Formation, and Clinton Group predominate. Other less resistant rocks, such as shale and siltstone, may form the side slopes.

Inceptisols (Dystrochrepts) and Ultisols (Fragiudults) have commonly developed in the residuum; they vary significantly within a short distance as do rock type and elevation. Typically, however, the soils are poor and sandy (Cuff and others, 1989, p. 21). Dekalb, Laidig, Berks, Weikert, and Lehew soils are all common and slope angle, fertility, and stoniness are limitations.

Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, extensive forest covers this ecoregion.

Figure 1 shows the location of the sharp, wooded ridges and narrow, minor valleys of Ecoregion 67c. Ridge contour lines are straight and parallel, not crenulated like those of the Northern Dissected Ridges (67d).

67d. Northern Dissected Ridges

Ecoregion 67d is composed of broken, dissected, almost hummocky ridges. It is underlain by interbedded sedimentary rocks including siltstones.

Crestal elevations range from approximately 800 feet to 4,150 feet (244-1,265 m), and local relief varies from about 200 feet to 1,150 feet (61-351 m). Streams tend to be less acidic than those of Ecoregion 67c and to have storm hydrographs with more peaks.

Ecoregion 67d is often underlain by the Brallier, Hampshire, Lock Haven, Chemung, and Trimmers Rock formations and, in Maryland, the Chemung Group. They are Devonian in age and folded. The soils developed from this interbedded rock are mostly Inceptisols (Dystrochrepts). Dekalb, Berks, Weikert, and Lehew soils are common.

Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, forest covers most of this ecoregion, but there are also some pastures. Shale barrens occur on steep west and south facing slopes; they consist of stunted trees (including eastern red cedar (*Juniperus virginiana*), Virginia pine (*Pinus virginiana*), and chestnut oak (*Quercus prinus*)), thickets of shrubs (including hawthorn (*Crataegus uniflora*), Allegheny plum (*Prunus alleghaniensis*), huckleberry (*Gaylussacia baccata*)), and herbaceous vegetation (including mountain parsley (*Taenidia montana*), moss pink (*Phlox subulata*), barrens ragwort (*Senecio antennariifolius*), birdfoot violet (*Viola pedata*) and Kate's mountain clover (*Trifolium virginicum*) (Cuff and others, 1989, p. 56; Erdman and Wiegman, 1974, pp. 71-74). The shale barren habitat type is one of the rarest in Pennsylvania and is found in Huntingdon, Fulton, and Bedford counties.

Figure 1 shows the location of the broken, dissected wooded ridges, knobs, and minor valleys of Ecoregion 67d. They are morphologically distinct from the sharp ridges and narrow valleys of the Northern Sandstone Ridges (67c).

67e. Anthracite

Ecoregion 67e in eastern Pennsylvania comprises an area that has been extensively disturbed by anthracite coal mining and urban-industrial development. Landforms, soils, and vegetation have all been indirectly or directly affected by mining operations and subsequent runoff. Streams tend to be very acidic and to have high amounts of turbidity (Biesecker and George, 1966, Plate 1; Kinney, 1964, p. 16; Dyer, 1982a; Herlihy and others, 1990, Table IV). Associated habitat destruction has occurred. Crestal elevations range from about 1,000 to 1,650 feet (305-503 m) and local relief ranges up to 600 feet (183 m).

Pennsylvanian sandstone, shale, siltstone, conglomerate, and anthracite coal underlie Ecoregion 67e. The Llewellyn Formation and the Pottsville Group are exposed. The soils are typically Entisols (Udorthents), Inceptisols (Dystrochrepts), and Ultisols (Fragiudults).

The natural forest was Appalachian Oak Forest (dominants: white and red oaks) with some Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock). Today cherry and birch are recolonizing some of the mined areas.

The boundaries of the Anthracite (67e) are shown in Figure 1 and enclose areas underlain by anthracite-bearing strata, Udorthents, and low woodland density.

69. Central Appalachians

Ecoregion 69 includes parts of south central Pennsylvania, eastern West Virginia, western Maryland, and southwestern Virginia. It is a high, dissected, and rugged plateau made up of sandstone, shale, conglomerate, and coal of Pennsylvanian and Mississippian age. The plateau is locally punctuated by a limestone valley and a few anticlinal ridges. Its soils have developed from residuum and are mostly frigid and mesic Ultisols and Inceptisols. Local relief varies from less than

50 feet (15 m) in mountain glades to over 1,950 feet (594 m) in watergaps where high-gradient streams are common. Crestal elevations generally increase towards the east and range from about 1,200 feet to 4,600 feet (366-1,402 m). Elevations can be high enough to insure a short growing season, a great amount of rainfall, and extensive forest cover. In lower, less rugged areas, more dairy and livestock farms occur, but they are still interspersed with woodland. The limestone of the Greenbrier River Valley supports permanent bluegrass pasture. Bituminous coal mines are common and associated stream siltation and acidification have occurred (Biesecker and George, 1966, Plate 1; Herlihy and others, 1990, Table IV; Kinney, 1964, pp. 15, 16, 24).

The boundaries of Ecoregion 69 are shown on Figure 1. Its eastern boundary with the folded and faulted strata of the Ridge and Valley (67) occurs along the sandstone escarpment known as the Allegheny Front or near the Greenbrier River or around the perimeter of Broad Top Mountain. Its western boundary with Ecoregion 70 occurs at the elevation and forest density break; the more densely forested Ecoregion 69 is higher, cooler, and steeper than the Western Allegheny Plateau (70) and is underlain by more resistant rock. Its northern border with the North Central Appalachians (62) is based on climate, forest density and land use; Ecoregion 69 has a less severe climate, less forest density, and a much lower oil well density than Ecoregion 62.

On the ecoregion map (Figure 1), the Central Appalachians (69) is composed of four level IV ecoregions: the Forested Hills and Mountains (69a), the Uplands and Valleys of Mixed Land Use (69b), the Greenbrier Karst (69c), and the Cumberland Mountains (69d). Two of the four level IV ecoregions: the Forested Hills and Mountains (69a) and the Uplands and Valleys of Mixed Land Use (69b) exist in Pennsylvania. Descriptions of the individual characteristics of these two ecoregions follow.

<u>69a. Forested Hills and Mountains</u>

Ecoregion 69a occupies the highest and most rugged parts of Ecoregion 69 and is extensively forested. Its highly dissected hills, mountains, and ridges are steep sided and have narrow valleys. Crestal elevations are often 1,800 to 2,600 feet (549-793 m) and reach their maximum, about 4,600 feet (1,402 m), in West Virginia. Resistant sandstone and conglomerate of the Pennsylvanian Pottsville Group, sandstone of the Mississippian Pocono Formation, and sedimentary rocks of the Mississippian Mauch Chunk formations are commonly exposed at the surface and typically have a gentle dip. In some places, however, the strata have been gently folded into a series of northeasterly trending ridges that reach an elevation of 3,200 feet (975 m). These anticlinal ridges, Chestnut Ridge, Laurel Mountain, and Negro Mountain, form a transition between the relatively undeformed Western Allegheny Plateau (70) and the folded and faulted Ridge and Valley (67) (Ciolkosz and others, 1984, p. 9). Broad Top Mountain, Pennsylvania is an outlier of the Forested Hills and Mountains (69a) that is surrounded by Ecoregion 67; its lithology and surface topography resemble Ecoregion 69a despite its geographical position (Guilday, 1985, p. 23). Local relief varies widely; on mountain bogs (glades), topography can be almost flat, whereas adjacent to watergaps, such as the Conemaugh River Gorge, local relief can exceed 1,300 feet (396 m). The eastern woodrat (*Neotoma floridana*), found on the cliff faces and boulder piles of water gaps, has been classified as threatened in Pennsylvania (Genoways, 1985, p. 362). Cool water, steep-gradient streams and waterfalls occur and have a less diverse fish population than those nearer the Ohio River. Characteristically, the streams of Ecoregion 69a do not have much buffering capacity and many reaches, including some not affected by mine drainage, are too acidic to support fish (R. Webb, Department of Environmental Sciences, University of Virginia, written communication, 1995).

69b. Uplands and Valleys of Mixed Land Use

Ecoregion 69b is a dissected upland plateau characterized by a mosaic of woodland and agriculture; it includes a small outlier on Broad Top Mountain, Pennsylvania. Bituminous coal mines are numerous. The rounded hills and low ridges attain elevations of 1,375-2,800 feet (419-853 m), high enough to produce a rather short growing season of 135-165 days. Local relief ranges from less than 50 feet (15 m) in glades to about 1,000 feet (305 m).

Pennsylvanian shales, siltstones, sandstones, and coals of the Allegheny Group, and especially the Conemaugh Group, are extensively exposed and nearly horizontal. Soils of low to moderate fertility have weathered from this rock and are mostly mesic Ultisols (Hapludults, Fragiudults) and Inceptisols (Dystrochrepts).

The natural vegetation was primarily Appalachian Oak Forest (dominants: white and red oaks) and Mixed Mesophytic Forest (Cuff and others, 1989, p. 52; Kuchler, 1964). Scattered glades composed of sphagnum moss, black spruce (*Picea mariana*), and tamarack (*Larix laricina*) also occurred. Isolated remnants of the original vegetation can still be found and Markelysburg Bog, near Farmington, Pennsylvania, is the type locality of the Allegheny glade gentian (*Gentian saponaris* var. *Allegheniensis*) (Erdman and Wiegman, 1974, pp. 25, 32). Today, about 60-70% of Ecoregion 69b is forested, in Christmas tree plantations or reverting to woodland. Dairy farming and livestock raising are the main agricultural pursuits.

Bituminous coal mines are common, and in some areas, such as Clearfield County, Pennsylvania, they affect more than 10% of the land surface (Hallowich, 1988). Associated stream siltation and acidification have occurred (Biesecker and George, 1966, Plate 1; Dyer, 1982b; Herlihy and others 1990, Table IV).

The boundary between ecoregions 69b and 70c is determined primarily by land use, geology, and elevation and is shown in Figure 1; the more densely forested Ecoregion 69b is higher, cooler, and steeper than Ecoregion 70c and is underlain by more resistant rock. Land use, elevation, and rock type differentiate ecoregions 69b from 69a; Ecoregion 69b, largely underlain by the Conemaugh Group, is lower and often less forested than Ecoregion 69a, which is underlain largely by the sandstone and conglomerate of the Pennsylvanian Pottsville Group, sandstone of the Mississippian Pocono Formation, and sedimentary rock of the Mississippian Mauch Chunk formations. The border between ecoregions 62d and 69b is based on forest density and land use; Ecoregion 69b has a lower forest density and a much lower oil well density than Ecoregion 62d.

69b. Uplands and Valleys of Mixed Land Use

Ecoregion 69b is a dissected upland plateau characterized by a mosaic of woodland and agriculture; it includes a small outlier on Broad Top Mountain, Pennsylvania. Bituminous coal mines are numerous. The rounded hills and low ridges attain elevations of 1,375-2,800 feet (419-853 m), high enough to produce a rather short growing season of 135-165 days. Local relief ranges from less than 50 feet (15 m) in glades to about 1,000 feet (305 m).

Pennsylvanian shales, siltstones, sandstones, and coals of the Allegheny Group, and especially the Conemaugh Group, are extensively exposed and nearly horizontal. Soils of low to moderate fertility have weathered from this rock and are mostly mesic Ultisols (Hapludults, Fragiudults) and Inceptisols (Dystrochrepts).

The natural vegetation was primarily Appalachian Oak Forest (dominants: white and red oaks) and Mixed Mesophytic Forest (Cuff and others, 1989, p. 52; Kuchler, 1964). Scattered glades composed of sphagnum moss, black spruce (*Picea mariana*), and tamarack (*Larix laricina*) also occurred. Isolated remnants of the original vegetation can still be found and Markelysburg Bog, near Farmington, Pennsylvania, is the type locality of the Allegheny glade gentian (*Gentian saponaris* var. *Allegheniensis*) (Erdman and Wiegman, 1974, pp. 25, 32). Today, about 60-70% of Ecoregion 69b is forested, in Christmas tree plantations or reverting to woodland. Dairy farming and livestock raising are the main agricultural pursuits.

Bituminous coal mines are common, and in some areas, such as Clearfield County, Pennsylvania, they affect more than 10% of the land surface (Hallowich, 1988). Associated stream siltation and acidification have occurred (Biesecker and George, 1966, Plate 1; Dyer, 1982b; Herlihy and others 1990, Table IV).

The boundary between ecoregions 69b and 70c is determined primarily by land use, geology, and elevation and is shown in Figure 1; the more densely forested Ecoregion 69b is higher, cooler, and steeper than Ecoregion 70c and is underlain by more resistant rock. Land use, elevation, and rock type differentiate ecoregions 69b from 69a; Ecoregion 69b, largely underlain by the Conemaugh Group, is lower and often less forested than Ecoregion 69a, which is underlain largely by the sandstone and conglomerate of the Pennsylvanian Pottsville Group, sandstone of the Mississippian Pocono Formation, and sedimentary rock of the Mississippian Mauch Chunk formations. The border between ecoregions 62d and 69b is based on forest density and land use; Ecoregion 69b has a lower forest density and a much lower oil well density than Ecoregion 62d.

70. Western Allegheny Plateau

Ecoregion 70 is a mostly unglaciated, dissected plateau with 200 to 750 feet (61-229 m) of local relief and crestal elevations of less than 2,000 feet (610 m). The Western Allegheny Plateau (70) is composed of horizontally bedded sedimentary rock. Soils have developed from residuum and support a potential natural vegetation of Appalachian Oak Forest (dominants: white and red oaks) and, especially in the south, Mixed Mesophytic Forest (Kuchler, 1964).

The land use and land cover is a mosaic of forests, urban-suburban-industrial activity, general farms, dairy and livestock farms, pastures, coal mines, and oil-gas fields. Urban and industrial activity is common in valleys along the major rivers. Bituminous coal mining is widespread and has diminished water quality and reduced fish diversity; recent stream quality improvements have occurred in some rivers including the Allegheny, Monongahela, Youghiogheny, and Ohio (Cooper, 1985, p. 170).

The boundary of Ecoregion 70 with the less rugged, more agricultural Erie/Ontario Hills and Lake Plain (61) approximates the Wisconsinan till limit. Its boundary with the North Central Appalachians (62) approximates breaks in land use/land cover and elevation; Ecoregion 70 is less forested, warmer, and lower than Ecoregion 62. Its border with the Central Appalachians (69) approximates the break in elevation and forest density that occurs near the limit of the Pennsylvanian Allegheny Group (Figure 1); Ecoregion 70 is lower, warmer, less steep, and less densely forested than Ecoregion 69 and is underlain by less resistant rock.

On the ecoregion map (Figure 1), the Western Allegheny Plateau (70) is composed of three level IV

ecoregions: the Permian Hills (70a), the Monongahela Transition Zone (70b), and the Pittsburgh Low Plateau (70c). Each is unglaciated, underlain by horizontal sedimentary rock, and mined for coal. Descriptions of the individual characteristics of these three ecoregions follow.

70a. Permian Hills

Ecoregion 70a is hilly. Elevations range from 575 to 1,600 feet (175-488 m) and local relief is 200-750 feet (61-229 m). Few flat areas occur and the ecoregion is generally more rugged, more forested, and cooler than the neighboring Monongahela Transition Zone (70b).

Soils are mostly Alfisols and Ultisols; the mix of soils is distinct from the Ultisols and Inceptisols that dominate Ecoregion 70c. Dormont, Culleoka, Newark, Gilpin, Upshur, and Vandalia soil series are locally common and support a natural vegetation of Appalachian Oak Forest (dominants: white and red oaks) or Mixed Mesophytic Forest (Kuchler, 1964). Soils were derived from shale, siltstone, limestone, sandstone, and coal; flat-lying, Permian Greene and Washington formations are found in Pennsylvania and the Permian/Pennsylvanian Dunkard Group occurs in West Virginia.

Today, forests remain common and most of the acreage is too steep to be farmed or is reverting to woodland. Nevertheless, there are some farms growing corn and hay on the ridges and some pastures on the hillslopes. Grazing and cultivation has caused slope erosion and upland topsoil is often thin or absent (Guilday, 1985, p. 24). Bituminous coal mining and oil and gas production also occur. Coal mining and its environmental impacts are much more common in Ecoregion 70b than in Ecoregion 70a.

The boundaries of Ecoregion 70a are shown on Figure 1. Its border with the Monongahela Transition Zone (70b) generally follows geology, potential natural vegetation, and land use. The Monongahela Group and the Waynesboro Formation are limited to Ecoregion 70b whereas the Greene and Washington formations and the Dunkard Group underlie Ecoregion 70a; coal mining is more common in Ecoregion 70b than in Ecoregion 70a. Appalachian Oak Forest is mapped as dominating Ecoregion 70a whereas Mixed Mesophytic Forest is typical of most parts of Ecoregion 70b (Kuchler, 1964). The boundary or the Permian Hills (70a) with the Pittsburgh Low Plateau (70c) is based on soils; the Alfisols of Ecoregion 70b are distinct from the Ultisols and Inceptisols of Ecoregion 70c.

70b. Monongahela Transition Zone

The unglaciated hills, knobs, and ridges of the Monongahela Transition Zone (70b) are typically underlain by interbedded limestone, shale, sandstone, and coal of the Monongahela Group (Berg and others, 1980; Cardwell and others, 1968). Entrenched rivers, gently dipping strata, and land slips occur. Elevations range from 575 to 1900 feet (175-580 m) and local relief is 200-700 feet (61-213 m). Soils are derived from residuum and are typically Alfisols; they are similar to those of Ecoregion 70a and have a higher base saturation than the Ultisols and Inceptisols of Ecoregion 70c. Guernsey, Dormont, Culleoka, Westmoreland, Clarksburg, and Neward soil series are common. The potential natural vegetation is mapped as mostly Mixed Mesophytic Forest while that of Ecoregion 70a is primarily Appalachian Oak Forest (dominants: white and red oaks) (Kuchler, 1964).

Today, forests are extensive and urban, suburban and industrial activity are found in the river valleys that also serve as transportation corridors. Bituminous coal mining is common and some oil production occurs. There is also some general farming; it is less prevalent than in Ecoregion 70c.

Acid mine drainage, siltation, and industrial pollution have degraded stream habitat in Ecoregion 70b and have affected fish and invertebrates. As a result, the eastern sand darter (*Ammocrypta pellucida*) was extirpated from the Ohio River drainage of Pennsylvania (Cooper, 1983, p. 189) and the obscure clubtail dragonfly (*Progomphus obscurus*) disappeared from the Allegheny River system (Opler, 1985, p. 138). Subsequent improvement of water quality has occurred and some species have reappeared upstream from Pittsburgh, including the smallmouth buffalo (*Ictiobus bubalus*) (Cooper, 1985, pp. 177-183).

The boundary between ecoregions 70b and 70c generally follows the geologic division between the limestone-bearing Monongahela Group and the noncarbonate Conemaugh Group. This line conforms to the break between the Ultisols and Inceptisols of Ecoregion 70c meet the base-saturated Alfisols of Ecoregion 70b (Cunningham and Ciolkosz, 1984). The boundary between ecoregions 70b and 70a in Pennsylvania generally conforms to the junction between the Permian Washington Formation and the Permian and Pennsylvanian Waynesboro Formation (Berg and others, 1980); in West Virginia, it conforms to the junction between the Dunkard Group and the Monongahela Formation (Cardwell and others, 1968).

70c. Pittsburgh Low Plateau

Ecoregion 70c is unglaciated and has rounded hills, narrow valleys, fluvial terraces, entrenched rivers, general farming, land slides, and bituminous coal mining. Its well-dissected landscape has a maximum local relief of 550 feet (168 m); the Pittsburgh Low Plateau (70c) is more rugged than the Low Lime Drift Plain (61c) but lacks the folded ridges of the Forested Hills and Mountains (69a). Hilltop elevations commonly range from 1,100 to 1,400 feet (366-396 m). Generally, Ecoregion 70c is both lower and less forested than the Unglaciated Allegheny High Plateau (62d), the Forested Hills and Mountains (69a), or the Uplands and Valleys of Mixed Land Use (69b). The average annual growing season varies inversely with elevation and ranges from about 170 days in the southwest to 120 days in the northeast. Base-poor Ultisols are common. Gilpin, Ernest, Wharton, Hazleton, Weikert, Cavode, and Rayne soils occur and are derived primarily from Pennsylvanian sandstone, shale, and coal of the Conemaugh and Allegheny Groups. Entisols (Udorthents) are locally common and are byproducts of bituminous coal mining. The potential natural vegetation of Ecoregion 70c is mapped as mostly Appalachian Oak Forest (dominants: white and red oaks); some Mixed Mesophytic Forest also occurs in the south (Kuchler, 1964). Today, farming is more common than woodland. General farming and dairy operations predominate but are often handicapped by sloping terrain, soil wetness, low soil fertility, and a short growing season. There are oil wells in the west and gas fields in the east. Industry and population are concentrated in the Beaver, lower Allegheny, and Ohio valleys. Widespread coal mining has left some land barren or reverting to woodland. Other areas have been reclaimed and releveled but their soils are not always satisfactory for cultivation (Zarichansky and others, 1964, p. 88). Extensive acidic mine drainage and industrial pollution have degraded stream habitat and caused the loss of at least 16 fish species from the Ohio River drainage (Cooper, 1983, p. 5).

Ecoregion 70c's boundaries are shown on the enclosed map. Its western border with Ecoregion 61c generally follows the Wisconsinan ice limit; here, terrain, surficial deposits, natural vegetation, soils, and land use change markedly. The northeastern boundary with Ecoregion 62d is drawn at the break in elevation, forest density, and soils; the warmer Pittsburgh Low Plateau (70c) has lower elevations, less woodland density, and more base-poor Gilpin soils. The eastern boundary divides Ecoregion 70c from the more densely forested, higher, cooler, and steeper Central Appalachians

(69) ecoregion which is underlain by more resistant rock. In Pennsylvania, its border with Ecoregion 70b generally follows the contact between the noncarbonate Glenshaw and Casselman formations of the Conemaugh Group and the limestone-bearing Monongahela Group (Berg and others, 1980); it approximates the juncture of the Ultisols and Inceptisols of Ecoregion 70c and the base-saturated Alfisols of Ecoregion 70b (Cunningham and Ciolkosz, 1984). In West Virginia, the ecoregion 70b-70c boundary is near the limit of the undivided Conemaugh Group (Cardwell and others, 1968) and roughly follows the Ultisol-Alfisol transition.

83. Eastern Great Lakes and Hudson Lowlands

This glaciated region of irregular plains bordered by hills generally contains less surface irregularity and more agricultural activity and population density than the adjacent Northeastern Highlands and Northern Appalachian Plateau and Uplands ecoregions. Although orchards, vineyards, and vegetable farming are important locally, a large percentage of the agriculture is associated with dairy operations. The portion of this ecoregion in close proximity to the Great Lakes experiences an increased growing season, more winter cloudiness, and greater snowfall.

On the ecoregion map (Figure 1), the Eastern Great Lakes and Hudson Lowlands (83) is composed of one level IV ecoregion, the Erie Lake Plain (83a). Descriptions of the individual characteristics of this ecoregion follow.

83a. Erie Lake Plain

The narrow Erie Lake Plain (83a) is characterized by nearly level terrain, lacustrine deposits, a lake-modified climate, and distinctive crops. Inland from the Lake Erie shoreline at about the 570 feet (174 m) elevation are gravelly beach ridges that mark the former shorelines of glacial lakes Warren and Whittlesey. Lacustrine deposits end at the highest late-Quaternary shoreline, approximately 790 feet (241 m). Local relief is typically less than 50 feet (15 m), but can be up to 100 feet (31 m) in the few northwesterly trending, steep-sided valleys. This entrenchment accompanied lake level reductions that occurred during the late-Pleistocene (Van Diver, 1990, p. 99).

Increased winter cloudiness and delayed coastal freezing are characteristics of Ecoregion 83a. Here, the growing season averages 194 days (Taylor, 1960) which is 3-10 weeks longer than anywhere else in the adjacent Low Lime Drift Plain (61c). Lake Erie's effect on climate is especially pronounced within 5 to 6 miles (8-10 km) of the coast and disappears entirely 8 to 16 miles (13-26 km) from the shoreline (Taylor, 1960).

The agricultural crops grown on the Erie Lake Plain are distinctive to Ecoregion 83a and are adjusted to its favorable climate. Grapes are the most valuable agricultural product (Pennsylvania Agricultural Statistics Service, 1990-1991). Early maturing vegetables, including asparagus, and fruit trees, including peach, apple, and cherry, are grown both on sandy soils and on the gravelly soils of beach ridges. Small fruits, including strawberries, and vegetables planted late in the spring are grown on the low-lying silty and clayey soils of the swales (Taylor, 1960).

The natural vegetation was largely Beech-Maple Forest; some chestnut (*Castanea dentata*) grew on gravelly soils (Hicks, 1934). Shoreline vegetation also occurred and is best preserved on the sandy beaches, dunes, and flats of Presque Isle, which shelters Erie harbor. Here grows vegetation such as sea rocket (*Cakile edentula*), beach grass (*Ammophilia breviligulata*), bluestem (*Andropogon gerardi*), and Virginia pine (*Pinus virginiana*) (Cuff and others, 1989, p. 56).

The Erie Lake Plain (83a) contains habitat that is rare or even unique in Pennsylvania. Presque Isle alone "has by far the largest concentration of periphery-of-range and disjunct populations ... in Pennsylvania (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995);" thirty-five state rare species occur here (Cuff and others, 1989, p. 56). In addition, its lake shore bluffs that are composed of "landslide-prone drift and lacustrine deposits have unusual flora (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995)." The threatened least bittern (*Ixobrychus exilis*) and regal fritillary (*Speyeria idalia*) are found, respectively, in marshes and low wet meadows (Gill, 1985, p. 308; Opler, 1985, p. 85).

The boundary between Ecoregion 83a and the Low Lime Drift Plain (61c) follows the 790 foot contour, the highest late-Quaternary shoreline; to the north of this line, lacustrine deposits begin, natural vegetation changes, and the climate moderates.

3.0 BIOLOGICAL RESOURCES

Biological resources include living plant and animal species and the habitats within which they occur. For this analysis, biological resources are divided into the following categories: vegetation; wildlife including terrestrial and aquatic species; and threatened, endangered, and sensitive species and their defined critical habitat. Vegetation, wildlife, and aquatic species refer to the plants and animal species, both native and introduced, which characterize a region. Threatened, endangered, and sensitive species refer to those species which are protected by the Endangered Species Act (ESA) or similar state laws. Critical habitat is designated by the U.S. Fish and Wildlife Service (FWS) as essential for the recovery of threatened and endangered species and like those species, is protected by the ESA.

The region of influence (ROI) for biological resources is the area encompassed within the Commonwealth of Pennsylvania; that is its state boundaries including all areas encompassed by the existing State/FSA CREP agreements as well as the Ohio and Susquehanna Rivers and their tributaries that lie within the existing CREP areas and the waters downstream from the existing CREP areas.

Vegetation

Ecoregions are defined as areas of relatively homogenous ecological systems, that is, those with similar soils, vegetation, climate, and geology. North America is divided into four levels of Ecoregions based on level of detail. The natural vegetation of all the level IV ecoregions of Pennsylvania that could be affected by existing CREP management areas is listed by CREP program area.

The nine Level IV Ecoregions in the Ohio River Basin CREP area (see Figure 3.1-1) are described below relative to vegetation types.

The Mosquito Creek/Pymatuning Lowlands and the Low Lime Drift Plain are located in the northwestern portion of the proposed CREP area (see Figure 3.1-1). On well drained soils, the natural vegetation in the Mosquito Creek/Pymatuning Lowlands is primarily Northern Hardwoods, forests dominated by sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), beech (*Fagus* spp.) and hemlock (*Tsuga canadensis*.). On less well drained sites and Beech-Maple Forests

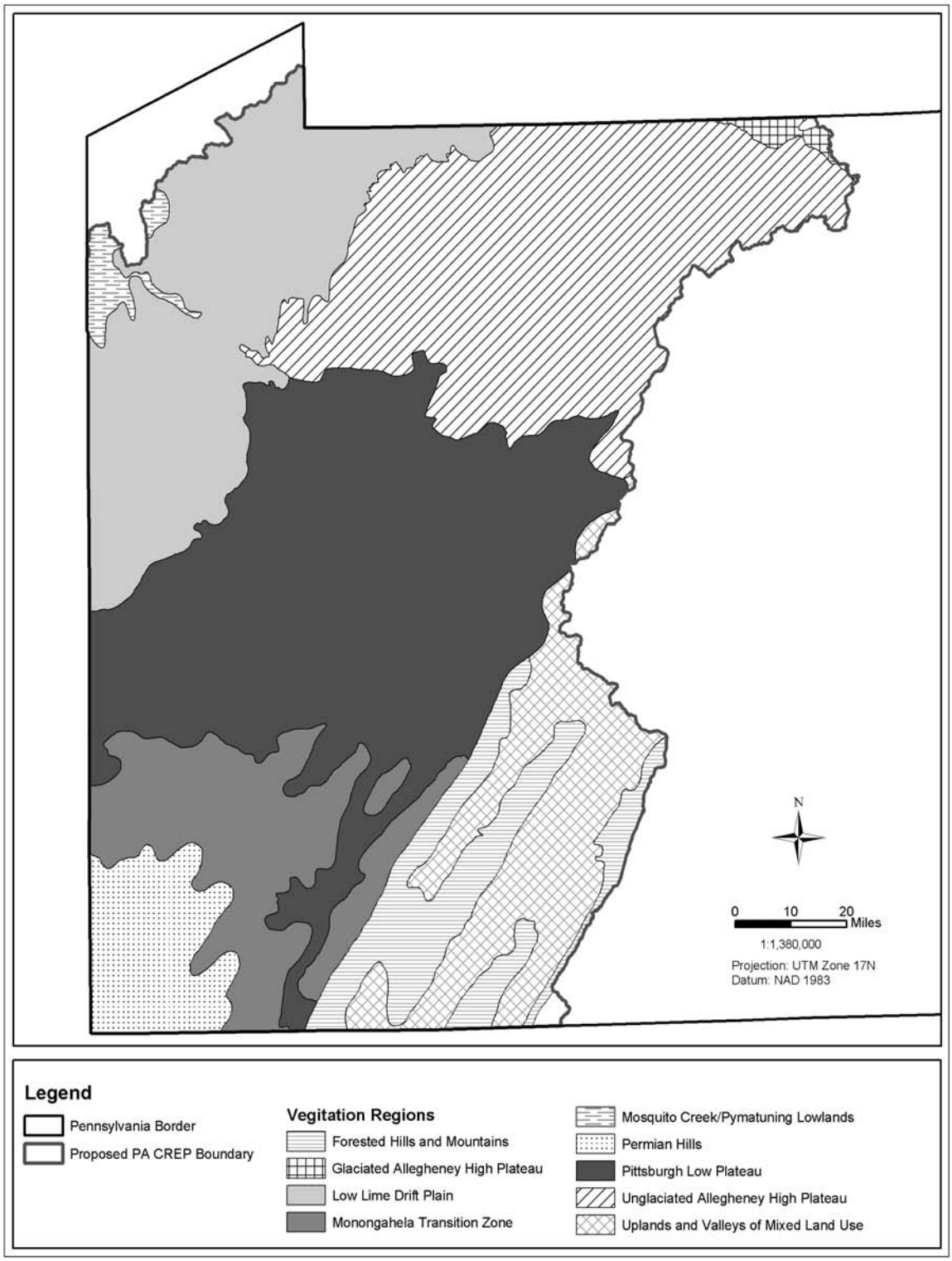
are found. Marshes, shrub swamps, and swamp forests cover large areas. Common marsh species include cattails (*Typha* spp.), bullrushes (*Cladium jamaicensis*), sedges (*Carex* spp.), and reed grass (*Phragmites communis*). Shrub swamps support species such as buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustrus*), and silky dogwood (*Cornus ammomum*). Swamp forests contains such tree species as red maple, white pine (*Pinus strobus*), and larch (*Larix laricina*). Northern hardwoods and Beech-Maple Forests are also common in the Low Lime Drift Plain. Marshes, swamps, and bogs occur in areas of poor drainage. One of the best examples of a northern kettlehole bog is located in Warren County. The area has a floating peat mat of sphagnum, sedges, sundew (*Drosera rotundifolia*), tamarack (*Larix laricinia*), and hemlock.

The Glaciated and Unglaciated Allegheny High Plateau Ecoregions lie in the northeastern corner of the proposed CREP area (see Figure 3.1-1). These regions are characterized by Northern Hardwood Forests with intermixed bogs, swamps and marshes as described above as well as Appalachian Oak Forests, dominated by red oak (*Quercus rubra*) and white oak (*Q. alba*).

The southeastern portion of the Ohio River Basin CREP area is in the Forested Hills and Mountains and Uplands and Valleys of Mixed Land Use Level IV ecoregions (see Figure 3.1-1). The Forested Hills and Mountains ecoregion is characterized by Appalachian Oak Forests, Northern Hardwoods, and Mixed Mesophytic Forest. Mixed Mesophytic Forests are dominated by oaks and hickories (*Carya* spp.) Conifer belts dominated by red spruce (*Picea rubens*) and hemlock can be found at higher elevations. The Uplands and Valleys of Mixed Land Use ecoregion is characterized by Appalachian Oak and Mixed Mesophytic Forests with scattered glades with sphagnum, black spruce (*P. mariana*), and tamarack.

The Permian Hills, Monongahela Transition Zone, and Pittsburg Low Plateau cover the central and south western portions of the Ohio River Basin CREP area (see Figure 3.1-1). The natural vegetation of the Permian Hills region is the Appalachian Oak Forest, the Monongahela Transition Zone is Mixed Mesophytic Forest and the Pittsburg Low Plateau is characterized by both forest types.

Figure 3.1-1 EPA Ecoregions of the Ohio River Basin CREP Area



(USDA-FSA PEA CREP in Pennsylvania, 2004)

The fifteen Level IV Ecoregions in the upper Susquehanna River Basin CREP area (see Figure 3.1-2) are described below relative to vegetation types.

60. Northern Appalachian Plateau and Uplands

Ecoregion 60, in northeastern Pennsylvania, is a plateau made up of horizontally bedded, nonresistant shales and siltstones and moderately resistant sandstones of Devonian age. It is often lower and less forested than the adjacent Glaciated Allegheny High Plateau (62c) and crestal elevations are typically 1,300 to 2,000 feet (396-610 m). The natural vegetation is primarily Appalachian Oak Forest, dominated by white and red oaks. Some Northern Hardwoods occur away from the Susquehanna River at higher elevations; dominant trees include sugar maple (Acer saccharum), yellow birch (Betula allegheniensis), beech (Fagus grandifolia), and hemlock (Tsuga canadensis) (Cuff and others, 1989, p. 52).

60a. Glaciated Low Plateau

The Glaciated Low Plateau (60a) is a mosaic of farmland, woodlots, and lakes upon low, rolling hills. The native vegetation was mostly Appalachian Oak Forest (dominated by white and red oaks), with some Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) occurring away from the Susquehanna River at higher elevations (Cuff and others, 1989, p. 52). Bogs and marshes are common throughout Ecoregion 60a.

60b. Northeastern Uplands

The Northeastern Uplands (60b) shares many environmental characteristics with the Glaciated Low Plateau (60a). The natural vegetation is mostly Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), exemplified by the Woodbourne Forest and Wildlife Sanctuary near Montrose, Susquehanna County (Erdman and Wiegman, 1974, p. 49). Some Appalachian Oak Forest occurs near the Susquehanna River (Cuff and others, 1989, p. 52). Wetlands such as Madisonville and Mud Pond swamps are very common in areas of low relief, especially on the Morris-Wellsboro and Morris-Wellsboro-Oquaga soil associations.

62. North Central Appalachians

Ecoregion 62, in northcentral and northeastern Pennsylvania, is part of a vast, elevated plateau composed of horizontally bedded sandstone, shale, siltstone, conglomerate, and coal. It is made up of plateau surfaces, high hills, and low mountains, and was only partly glaciated. The vegetation is primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), but scattered Appalachian Oak Forest (dominants: white and red oaks) and isolated highland pockets of spruce/fir forest also occur.

62a. Pocono High Plateau

The Pocono High Plateau (62a) is a forested highland of little relief. It is studded with lakes and wetlands and is underlain by undeformed, noncarbonate strata. The natural vegetation of the Pocono High Plateau (62a) is predominantly Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), with some Appalachian Oak Forest (dominants: white and red oaks) on the southern periphery. The mixed hardwood forest is mostly second or third growth. Mature Northern Hardwoods still can be found in Gouldsboro State Park and virgin northern hardwood forest/spruce still occurs in Hickory Run State Park (Brenner, 1985, p. 14; Erdman and Wiegman, 1974, p. 63). Wetlands are widespread and include marshes and swamps such as those in Gouldsboro State Park and along Two Mile Run. Numerous kettlehole bogs occur, including those at Pine Lake Natural

Area and Bruce Lake; they are composed of floating peat mats that grade into mixed hardwood swamps (Erdman and Wiegman, 1974, pp. 62-65; Van Diver, 1990, p. 97). The glacial till barrens are a mosaic of shrublands with scattered pitch pines variously dominated by scrub oak (*Quercus ilicifolia*), sheep-laurel (*Kalimia angustifolia*), and rhodora (*Rhododendron canadense*); a small proportion of the barrens consists of pitch pine woodlands. The Pocono till barrens and adjacent swamps comprise the largest concentration of globally rare communities and species in Pennsylvania; the area is The Nature Conservancy's highest priority for biodiversity conservation in the state.

62b. Low Poconos

The Low Poconos (62b) is a forested and glaciated plateau. The natural vegetation of the Low Poconos (62b) is mostly Appalachian Oak Forest (dominated by white and red oaks). Wetlands are very common and include marshes like those of the Stillwater Natural Area and swamps such as Saw Creek Headwaters Swamp, Nebo Swamp, Bald Hill Swamp, Tannersville Cranberry Bog Preserve, and Walker Lake Swamp (Cuff and others, 1989, p. 54; Erdman and Wiegman, 1974, pp. 49-61). Kettlehole bogs also occur, such as those at Lake Lacawac Sanctuary and Little Mud Pond; they are composed of floating peat mats that grade into hardwood swamp (Erdman and Wiegman, 1974, pp. 50, 55; Geyer and Bolles, 1979, p. 182).

62c. Glaciated Allegheny High Plateau

Ecoregion 62c is a deeply dissected and forested highland composed of plateau remnants, rounded hills, low mountains, and narrow valleys. Hardwood forests are predominant. The natural vegetation is primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) with some intermixed bogs, swamps, and marshes. Appalachian Oak Forest Rickets Glen State Park in northwestern Luzerne County contains approximately 2,000 acres of virgin northern hardwood forest, as well as numerous hemlock swamps (Erdman and Wiegman, 1974, p. 43). Pennsylvania's only spruce bald occurs on Bartlett Mountain, western Wyoming County (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995). (Dominants: white and red oaks) also occur, especially on the eastern margin of Ecoregion 62c (Cuff and others, 1989, p. 52).

62d. Unglaciated Allegheny High Plateau

Ecoregion 62d is a deeply dissected highland composed of plateau remnants, rounded hills, low mountains, and narrow valleys. It is characterized by extensive forests. Extensive woodland occurs and national and state forests are common. Oaks, maples, and other hardwoods predominate, but hemlock (*Tsuga canadensis*), pitch pine (*Pinus rigida*), and white pine (*Pinus strobus*) are also found.

The natural vegetation is primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) with some intermixed bogs and a perimeter of Appalachian Oak Forest (Cuff and others, 1989, p. 52). Extensive logging and burning removed most of the natural vegetation during the nineteenth century. Remnants still occur, however, including those at Tionesta Research Natural Area in southwestern McKean County, Cook Forest State Park in eastern Clarion and southern Forest Counties, Hearts Content Scenic Area in southern Warren County, Algerine Tamarack Swamp in northwestern Lycoming County, and the Pine Creek Gorge Natural Area in western Tioga County (Cuff and others, 1989, p. 53; Erdman and Wiegman, 1974, as reported in Brenner, 1985, p. 14; Geyer and Bolles, 1979, p. 67).

62e. Low Catskills

The Low Catskills (62e) is a forested and highly dissected ecoregion less than 5 miles (8 km) wide in northeastern Pennsylvania. The natural vegetation is mostly Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) (Cuff and others, 1989, p. 52). Some wetland vegetation occurs on poorly drained sites, and northern rock plants grow on the Delaware River cliffs in northeastern Wayne County (Erdman and Wiegman, 1974, p. 50).

67. Ridge and Valley

Ecoregion 67 extends from Wayne County, Pennsylvania, through Virginia along a southwesterly axis. It is characterized by alternating forested ridges and agricultural valleys that are elongated and folded and faulted. The natural vegetation varies from north to south. From northeastern Pennsylvania to near its border with Maryland, the Ridge and Valley (67) is dominated by Appalachian Oak Forest. Southward, Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) was common to about the James River, whereupon the Appalachian Oak Forest returned (Kuchler, 1964). Hemlock (*Tsuga canadensis*), along with a mixture of white pine (*Pinus strobus*), beech (*Fagus grandifolia*), and other hardwoods also occur locally (Brenner, 1985, p. 13).

67a. Northern Limestone/Dolomite Valleys

Ecoregion 67a is a lowland characterized by broad, level to undulating, fertile valleys that are extensively farmed. Farming predominates, with scattered woodlands occurring in steeper areas. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominated by white and red oaks) in the north and Oak/Hickory/Pine Forest in the south; bottomland forests also occur.

67b. Northern Shale Valleys

Ecoregion 67b extends over a large area from northeastern Pennsylvania to near the James River in Virginia. It is characterized by rolling valleys and low hills. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south; bottomland forests also occur. Today, farming predominates, with woodland occurring on steeper sites. Scattered shale barrens occur on steep west and south facing slopes; it is one of rarest types of habitat in Pennsylvania and occurs in Huntingdon, Fulton, and Bedford counties (Cuff and others, 1989, p. 56; Erdman and Wiegman, 1974, pp. 71-74).

67c. Northern Sandstone Ridges

Ecoregion 67c is characterized by high, steep, forested ridges with narrow crests.
Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, extensive forest covers this ecoregion.

67d. Northern Dissected Ridges

Ecoregion 67d is composed of broken, dissected, almost hummocky ridges. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, forest covers most of this ecoregion, but

there are also some pastures. Shale barrens occur on steep west and south facing slopes; they consist of stunted trees (including eastern red cedar (*Juniperus virginiana*), Virginia pine (*Pinus virginiana*), and chestnut oak (*Quercus prinus*)), thickets of shrubs (including hawthorn (*Crataegus uniflora*), Allegheny plum (*Prunus alleghaniensis*), huckleberry (*Gaylussacia baccata*)), and herbaceous vegetation (including mountain parsley (*Taenidia montana*), moss pink (*Phlox subulata*), barrens ragwort (*Senecio antennariifolius*), birdfoot violet (*Viola pedata*) and Kate's mountain clover (*Trifolium virginicum*) (Cuff and others, 1989, p. 56; Erdman and Wiegman, 1974, pp. 71-74). The shale barren habitat type is one of the rarest in Pennsylvania and is found in Huntingdon, Fulton, and Bedford counties.

67e. Anthracite

Ecoregion 67e in eastern Pennsylvania comprises an area that has been extensively disturbed by anthracite coal mining and urban-industrial development. Landforms, soils, and vegetation have all been indirectly or directly affected by mining operations and subsequent runoff.
The natural forest was Appalachian Oak Forest (dominants: white and red oaks) with some Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock). Today cherry and birch are recolonizing some of the mined areas.

69. Central Appalachians

Ecoregion 69 includes parts of south central Pennsylvania, eastern West Virginia, western Maryland, and southwestern Virginia. It is a high, dissected, and rugged plateau. Elevations can be high enough to insure a short growing season, a great amount of rainfall, and extensive forest cover. In lower, less rugged areas, more dairy and livestock farms occur, but they are still interspersed with woodland. The limestone of the Greenbrier River Valley supports permanent bluegrass pasture. Bituminous coal mines are common and associated stream siltation and acidification have occurred (Biesecker and George, 1966, Plate 1; Herlihy and others, 1990, Table IV; Kinney, 1964, pp. 15, 16, 24).

69a. Forested Hills and Mountains

Ecoregion 69a occupies the highest and most rugged parts of Ecoregion 69 and is extensively forested.

69b. Uplands and Valleys of Mixed Land Use

Ecoregion 69b is a dissected upland plateau characterized by a mosaic of woodland and agriculture; it includes a small outlier on Broad Top Mountain, Pennsylvania. Bituminous coal mines are numerous. The natural vegetation is primarily Appalachian Oak Forest (dominants: white and red oaks) and Mixed Mesophytic Forest (Cuff and others, 1989, p. 52; Kuchler, 1964). Scattered glades composed of sphagnum moss, black spruce (*Picea mariana*), and tamarack (*Larix laricina*) also occur. Isolated remnants of the original vegetation can still be found and Markelysburg Bog, near Farmington, Pennsylvania, is the type locality of the Allegheny glade gentian (*Gentian saponaris* var. *Allegheniensis*) (Erdman and Wiegman, 1974, pp. 25, 32). Today, about 60-70% of Ecoregion 69b is forested, in Christmas tree plantations or reverting to woodland.

70. Western Allegheny Plateau

Ecoregion 70 is a mostly unglaciated, dissected plateau with soils that support natural vegetation of Appalachian Oak Forest (dominants: white and red oaks) and, especially in the south, Mixed Mesophytic Forest (Kuchler, 1964).

70c. Pittsburgh Low Plateau

Ecoregion 70c is unglaciated and has rounded hills, narrow valleys, fluvial terraces, entrenched rivers, general farming, land slides, and bituminous coal mining. The natural vegetation of Ecoregion 70c is mostly Appalachian Oak Forest (dominants: white and red oaks); some Mixed Mesophytic Forest also occurs in the south (Kuchler, 1964). Today, farming is more common than woodland. Widespread coal mining has left some land barren or reverting to woodland.

The sixteen Level IV Ecoregions in the lower Susquehanna River Basin CREP area (see Figure 3.1-2) are described below relative to vegetation types.

58. Northeastern Highlands

The Northeastern Highlands comprise a relatively sparsely populated region characterized by nutrient poor soils blanketed by northern hardwood and spruce fir forests.

58h. Reading Prong

The Northeastern Highlands (58) extends from Canada through New England, New York, and New Jersey to Wernersville Ridge in northeastern Pennsylvania. On the ecoregion map (Figure 1), the Northeastern Highlands (58) contains one level IV ecoregion: the Reading Prong (58h).
It originally supported a native vegetation of Appalachian Oak Forest, dominated by white and red oaks (Cunningham and Ciolkosz, 1984; Cuff and others, 1989, p. 52). Today, we see a mosaic of rural residential development, woodland, and general farmland. Forest dominates only the more rugged, stony, or elevated locations.

60. Northern Appalachian Plateau and Uplands

Ecoregion 60, in northeastern Pennsylvania, is a plateau made up of horizontally bedded, nonresistant shales and siltstones and moderately resistant sandstones of Devonian age. It is often lower and less forested than the adjacent Glaciated Allegheny High Plateau (62c) and crestal elevations are typically 1,300 to 2,000 feet (396-610 m). The natural vegetation is primarily Appalachian Oak Forest, dominated by white and red oaks. Some Northern Hardwoods occur away from the Susquehanna River at higher elevations; dominant trees include sugar maple (Acer saccharum), yellow birch (Betula allegheniensis), beech (Fagus grandifolia), and hemlock (Tsuga canadensis) (Cuff and others, 1989, p. 52).

60a. Glaciated Low Plateau

The Glaciated Low Plateau (60a) is a mosaic of farmland, woodlots, and lakes upon low, rolling hills. The native vegetation was mostly Appalachian Oak Forest (dominated by white and red oaks), with some Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) occurring away from the Susquehanna River at higher elevations (Cuff and others, 1989, p. 52). Bogs and marshes are common throughout Ecoregion 60a.

62. North Central Appalachians

Ecoregion 62, in northcentral and northeastern Pennsylvania, is part of a vast, elevated plateau composed of horizontally bedded sandstone, shale, siltstone, conglomerate, and coal. It is made up of plateau surfaces, high hills, and low mountains, and was only partly glaciated. The vegetation is primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), but scattered Appalachian Oak Forest (dominants: white and red oaks) and isolated highland pockets of spruce/fir forest also occur.

62c. Glaciated Allegheny High Plateau

Ecoregion 62c is a deeply dissected and forested highland composed of plateau remnants, rounded hills, low mountains, and narrow valleys. Hardwood forests are predominant. The natural vegetation is primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) with some intermixed bogs, swamps, and marshes. Appalachian Oak Forest Rickets Glen State Park in northwestern Luzerne County contains approximately 2,000 acres of virgin northern hardwood forest, as well as numerous hemlock swamps (Erdman and Wiegman, 1974, p. 43). Pennsylvania's only spruce bald occurs on Bartlett Mountain, western Wyoming County (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995). (Dominants: white and red oaks) also occur, especially on the eastern margin of Ecoregion 62c (Cuff and others, 1989, p. 52).

64. Northern Piedmont

Ecoregion 64 consists of low rounded hills, irregular plains, and open valleys. The natural vegetation is mostly Appalachian Oak Forest (dominated by white and red oaks). Some Oak-Hickory-Pine Forest occurs along the Susquehanna River and is dominated by hickory (*Carya* spp.), Virginia pine (*Pinus virginiana*), pitch pine (*Pinus rigida*), chestnut oak (*Quercus prinus*), white oak (*Quercus alba*), and black oak (*Quercus velutina*) (Cuff and others, 1989, p. 52). There are scattered serpentine barrens in Chester, Delaware, and Lancaster counties of Pennsylvania.

64a. Triassic Lowlands

Ecoregion 64a is a plain underlain and delineated by sedimentary rock and characterized by wide undulating ridges, broad nearly level valleys, limited local relief, and a mosaic of farms and houses. Today, the native Appalachian oak forest has been replaced by a mosaic of farms, houses, and woodland. Agriculture is favored. Hickory (*Carya* spp.) is more abundant than elsewhere in the Piedmont because of soils type (Farrell and Ware, 1991). Red maple (*Acer rubrum*) and black tupelo (*Nyssa sylvatica*) are less abundant on soils derived from Triassic sediments than on the low calcium, low magnesium, and more acidic soils found elsewhere in the Piedmont over metamorphic rocks (Farrell and Ware, 1991).

64b. Diabase and Conglomerate Uplands

Ecoregion 64b is characterized by wooded, stony, hills and steep ridges. It originally supported Appalachian Oak Forest (dominated by white and red oaks)) (Cuff and others, 1989, p. 52). The flora on soils derived from the diabase intrusions which are basic in character are distinctive; acid loving plants are absent from diabase areas (Allard and Leonard, 1962). Today, woodland is still common in Ecoregion 64b, especially where the surface is steep or covered in rocks or boulders. In other areas, the land is more suitable to agriculture. Here general farms occur, typically scattered among woodland and idle land.

64c. Piedmont Uplands

Ecoregion 64c is characterized by rounded hills, low ridges, relative high relief, and narrow valleys. The natural vegetation is mapped as Appalachian Oak Forest (dominated by white and red oaks); it is distinct from the Oak-Hickory-Pine of the Inner Piedmont (45e) (Kuchler, 1964). Some Mixed Mesophytic Forest also occurred. Remnants of the original vegetation can be found in the cool, very rugged Otter Creek gorge, where virgin chestnut oak (*Quercus prinus*), hemlock (*Tsuga canadensis*), beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and basswood (*Tilia heterophylla*) still grow (Erdman and Wiegman, 1974, p. 98).

Today, forests are less extensive than they were originally and there is more agriculture. Scattered serpentine barrens occur on chrome soils and support a specialized vegetation composed of dry oak/pine forests (e.g., *Quercus marilandica, Q. stellata, Q. velutina, Pinus virginiana*), greenbrier (*Smilax rotundifolia*), prairie grasses (e.g., *Schizachyrium scoparius, Sporobolus heterolepis*), and herbs (e.g., *Aster depauperatus, Cerastium arvense var. villossissimum, Talinum teretifolium*) (Cuff and others, 1989, p. 56). Most of these are rare in Pennsylvania and some are threatened, including the prairie dropseed (*Sporobolus heterolepis*) (Wiegman, 1985, p. 57). In addition, the buckmoth (*Hemileuca maia*) occurs only in the serpentine barrens and is threatened in Pennsylvania (Opler, 1985, p. 88). Pitch pine (*Pinus rigida*) is a co-dominant in serpentine barren woodlands and an important component of bluestem-dropseed savannas; it is found at seven serpentine barren sites in Chester, Delaware, and Lancaster counties. Those at Nottingham County Park and at Goat Hill State Forest Natural Area are among the largest remaining barrens in the eastern United States (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995). Grazing, quarrying, and suburban development continue to threaten the remaining barrens (Wiegman, 1985, p. 57) and The Nature Conservancy has given them second-highest priority on their state biodiversity conservation agenda (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995).

64d. Piedmont Limestone/Dolomite Lowlands

Ecoregion 64d is a very fertile and intensively farmed area. Soils support natural vegetation of mostly Appalachian Oak Forest (dominated by white and red oaks) (Kuchler, 1964), but along the Susquehanna River, Oak-Hickory-Pine Forest also grow (Cuff and others, 1989, p. 52). Today, virtually all of the forest has been replaced by agriculture although a few wetlands still occur, including Gleisner's Swamp near Quarryville (Erdman and Wiegman, 1974, p. 96).

66. Blue Ridge Mountains

Ecoregion 66 is a narrow strip of mountainous ridges that are forested and well dissected. The natural vegetation varies from north to south. North of a transitional area near the Roanoke River, it is predominantly Appalachian Oak Forest (dominated by white and red oaks). South of the transitional area, it is a mix of Appalachian Oak Forest, Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak), and, in higher areas, Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) (Kuchler, 1964). On the foothills, a mix of loblolly and shortleaf pines occurs and is mixed with Appalachian Oak Forest.

66a. Northern Igneous Ridges

Ecoregion 66a extends southwestward from South Mountain, Pennsylvania, to near the Roanoke River. It consists of pronounced ridges separated by high gaps and coves. Mountain flanks are steep and well dissected. The natural vegetation is Appalachian Oak Forest (dominants: white and red oaks) (Kuchler, 1964). Today, the Northern Igneous Ridges (66a) remain extensively forested. On South Mountain, however, localized dairy farming and poultry raising occur; in addition, orchards are found on Arendtsville soils.

66b. Northern Sedimentary and Metasedimentary Ridges

Ecoregion 66b extends from South Mountain, Pennsylvania, to the Roanoke River area. It is composed of high, steeply sloping ridges and deep, narrow valleys. The natural vegetation is

Appalachian Oak Forest (dominants: white and red oaks) (Kuchler, 1964). Today, the Northern Sedimentary and Metasedimentary Ridges (66b) remain extensively forested.

67. Ridge and Valley

Ecoregion 67 extends from Wayne County, Pennsylvania, through Virginia along a southwesterly axis. It is characterized by alternating forested ridges and agricultural valleys that are elongated and folded and faulted. The natural vegetation varies from north to south. From northeastern Pennsylvania to near its border with Maryland, the Ridge and Valley (67) is dominated by Appalachian Oak Forest. Southward, Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) was common to about the James River, whereupon the Appalachian Oak Forest returned (Kuchler, 1964). Hemlock (*Tsuga canadensis*), along with a mixture of white pine (*Pinus strobus*), beech (*Fagus grandifolia*), and other hardwoods also occur locally (Brenner, 1985, p. 13).

67a. Northern Limestone/Dolomite Valleys

Ecoregion 67a is a lowland characterized by broad, level to undulating, fertile valleys that are extensively farmed. Farming predominates, with scattered woodlands occurring in steeper areas. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominated by white and red oaks) in the north and Oak/Hickory/Pine Forest in the south; bottomland forests also occur.

67b. Northern Shale Valleys

Ecoregion 67b extends over a large area from northeastern Pennsylvania to near the James River in Virginia. It is characterized by rolling valleys and low hills. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south; bottomland forests also occurred. Today, farming predominates, with woodland occurring on steeper sites. Scattered shale barrens occur on steep west and south facing slopes; it is one of the rarest types of habitat in Pennsylvania and occurs in Huntingdon, Fulton, and Bedford counties (Cuff and others, 1989, p. 56; Erdman and Wiegman, 1974, pp. 71-74).

67c. Northern Sandstone Ridges

Ecoregion 67c is characterized by high, steep, forested ridges with narrow crests. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, extensive forest covers this ecoregion.

67d. Northern Dissected Ridges

Ecoregion 67d is composed of broken, dissected, almost hummocky ridges. Kuchler (1964) mapped the natural vegetation as mostly Appalachian Oak Forest (dominants: white and red oaks) in the north and Oak-Hickory-Pine Forest (dominants: hickory, longleaf pine, shortleaf pine, loblolly pine, white oak and post oak) in the south. Today, forest covers most of this ecoregion, but there are also some pastures. Shale barrens occur on steep west and south facing slopes; they consist of stunted trees (including eastern red cedar (*Juniperus virginiana*), Virginia pine (*Pinus virginiana*), and chestnut oak (*Quercus prinus*)), thickets of shrubs (including hawthorn (*Crataegus uniflora*), Allegheny plum (*Prunus alleghaniensis*), huckleberry (*Gaylussacia baccata*)), and herbaceous vegetation (including mountain parsley (*Taenidia montana*), moss pink (*Phlox*

subulata), barrens ragwort (*Senecio antennariifolius*), birdfoot violet (*Viola pedata*) and Kate's mountain clover (*Trifolium virginicum*) (Cuff and others, 1989, p. 56; Erdman and Wiegman, 1974, pp. 71-74). The shale barren habitat type is one of the rarest in Pennsylvania and is found in Huntingdon, Fulton, and Bedford counties.

67e. Anthracite

Ecoregion 67e in eastern Pennsylvania comprises an area that has been extensively disturbed by anthracite coal mining and urban-industrial development. Landforms, soils, and vegetation have all been indirectly or directly affected by mining operations and subsequent runoff.
The natural forest was Appalachian Oak Forest (dominants: white and red oaks) with some Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock). Today cherry and birch are recolonizing some of the mined areas.

69. Central Appalachians

Ecoregion 69 includes parts of south central Pennsylvania, eastern West Virginia, western Maryland, and southwestern Virginia. It is a high, dissected, and rugged plateau

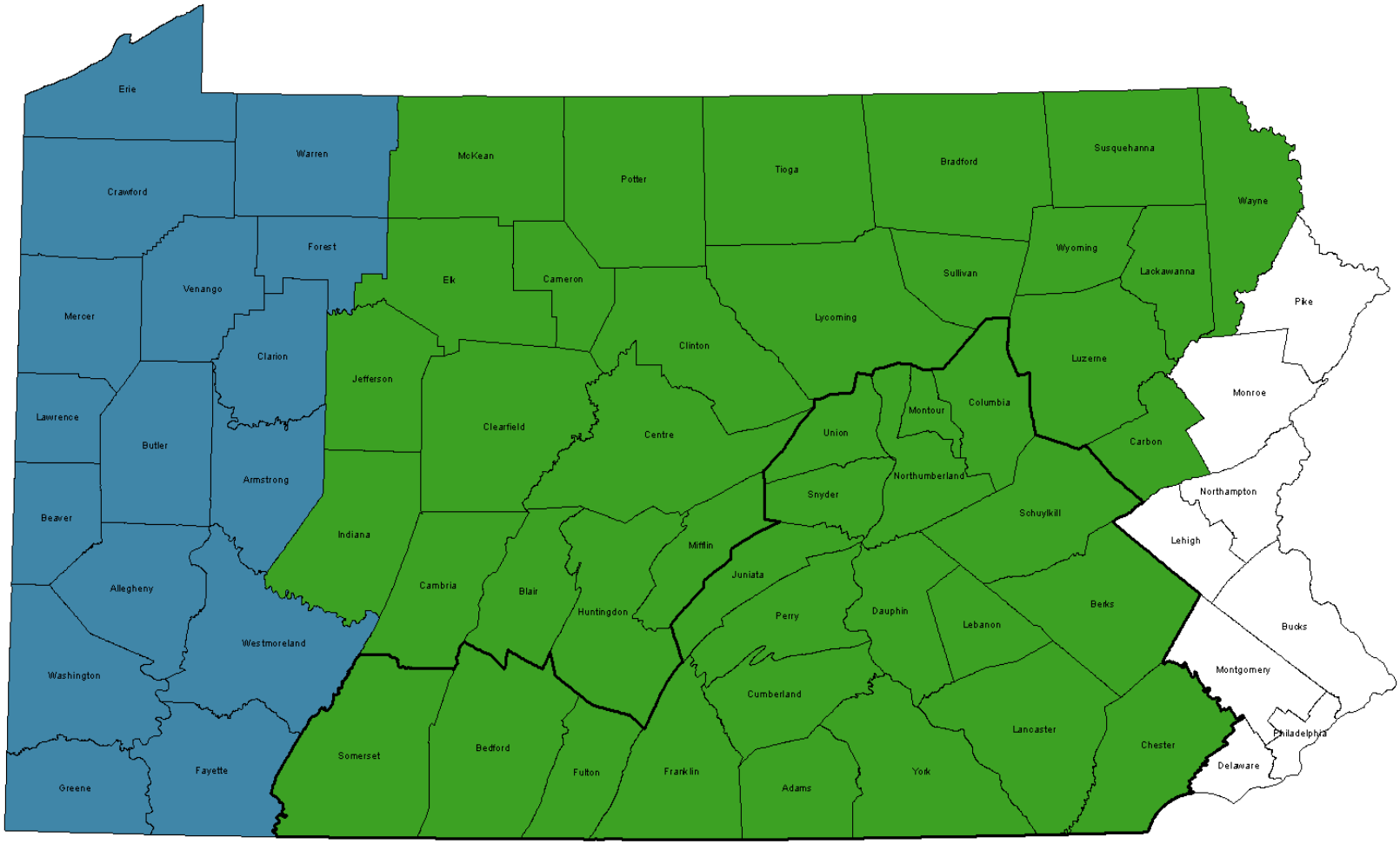
69a. Forested Hills and Mountains

Ecoregion 69a occupies the highest and most rugged parts of Ecoregion 69 and is extensively forested. Its highly dissected hills, mountains, and ridges are steep sided and have narrow valleys.

69b. Uplands and Valleys of Mixed Land Use

Ecoregion 69b is a dissected upland plateau characterized by a mosaic of woodland and agriculture; it includes a small outlier on Broad Top Mountain, Pennsylvania. Bituminous coal mines are numerous. The natural vegetation is primarily Appalachian Oak Forest (dominants: white and red oaks) and Mixed Mesophytic Forest (Cuff and others, 1989, p. 52; Kuchler, 1964). Scattered glades composed of sphagnum moss, black spruce (*Picea mariana*), and tamarack (*Larix laricina*) also occur. Markelysburg Bog, near Farmington, Pennsylvania, is the type locality of the Allegheny glade gentian (*Gentian saponaris* var. *Allegheniensis*) (Erdman and Wiegman, 1974, pp. 25, 32).

Pennsylvania CREP Counties Including Ohio and Susquehanna Lower and Upper River Basins
Figure 3.1-2



It is estimated that 2,103 species of native plants comprise slightly less than 62 percent of the flora of Pennsylvania (PBS 1998). Exotic plant species are a significant threat to the native flora throughout Pennsylvania. Those known to occur in Pennsylvania are listed in associated tables as identified and as follow in this discussion.

There are 13 Pennsylvania Noxious Weeds occurring in Pennsylvania and on the state's Control List. The weeds are listed below by their common names and also the scientific names.

Bull Thistle or Spear Thistle - *Cirsium Vulgare*
Canada Thistle - *Cirsium Arvense*
Giant Hogweed - *Heracleum Mantegazzianum*
Goatsrue - *Galega Officinalis*
Jimsonweed - *Datura Stramonium*
Johnson Grass - *Sorghum Halepense*
Kudzu-Vine - *Pueraria Lobata*
Marijuana - *Cannabis Sativa*
Mile-a-Minute - *Polygonum Perfoliatum*
Multiflora Rose - *Rosa Multiflora*
Musk Thistle or Nodding Thistle - *Carduus Nutans*
Purple Loosestrife - *Lythrum Salicaria*
Shattercane - *Sorghum Bicolor*

****

The species listed below are serious threats to our native ecosystems. Many have been designated as "Noxious Weeds" by the PA Department of Agriculture.

Flowers

Scientific Name	Common Name	Notes
Aegopodium podagraria	Goutweed	Commonly planted in the past and escaped; spreads aggressively by roots
Alliaria petiolata	Garlic mustard	Invasive in many states; spreading aggressively in woodlands by seed
Carduus nutans	Musk thistle	PA noxious Weed
Cirsium arvense	Canada thistle	PA noxious Weed
Cirsium vulgare	Bull thistle	PA noxious Weed
Datura stramonium	Jimsonweed	Sometimes cultivated; spreads by seed, PA Noxious Weed
Galega officinalis	Goatsrue	PA and Federal Noxious Weed
Heracleum mantegazzianum	Giant hogweed	PA and Federal Noxious Weed, sap can cause burning blisters
Hesperis matronalis	Dame's rocket	Planted in gardens; escaped and naturalized along roads; spreads by seed
Lythrum salicaria, L. virgatum	Purple loosestrife	Garden escape which has become invasive in many states; PA noxious Weed
Myriophyllum spicatum	Eurasian water-milfoil	Invasive in many states; aquatic
Ornithogallum nutans, umbellatum	Star-of-Bethlehem	Common garden plant which has widely escaped
Pastinaca sativa	Wild parsnip	Found commonly along roadsides; widespread and abundant; spread by seed
Perilla frutescens	Beefsteak plant	Garden escape; widespread mostly along roadsides; spread by seed
Polygonum (Falopia) cuspidatum	Japanese knotweed	Invasive in many states; difficult to control; spreads by roots and seeds
Ranunculus ficaria	Lesser celandine	Spreads by roots and shoots; can be very aggressive in wetlands
Trapa natans	Water chestnut	Wetland plant; should not be introduced as it will escape, spread, and naturalize

Grasses

Scientific Name	Common Name	Notes
Bromus tectorum	Cheatgrass	Annual grass; invasive throughout the west; spreads by seed
Microstegium vimineum	Japanese stilt grass	Annual grass; invasive in many states; spreading through woodlands by seed
Miscanthus sinensis	Maiden grass	Commonly planted ornamental grass which can escape and spread by seed
Phalaris arundinacea	Reed canary grass	Aggressive wetland grass; native and introduced strains; widespread and abundant
Phragmites australis	Common reed	Native and introduced strains; wetland grass which can form huge colonies
Sorghum bicolor ssp. drummondii	Shattercane	PA noxious Weed
Sorghum halepense	Johnson grass	PA noxious Weed; spreads by roots and seeds

Shrubs

Scientific Name	Common Name	Notes
Berberis thunbergii	Japanese barberry	Escaped from cultivation and invasive in many states; spread by birds
Berberis vulgaris	European barberry	Escaped from cultivation; spread by birds
Elaegnus angustifolia	Russian olive	Escaped from plantings and invasive in many states; spread by birds
Elaeagnus umbellata	Autumn olive	Escaped from plantings and invasive in many states; rapidly spread by birds
Euonymus alatus	Winged Euonymus	Escaped from plantings; invasive in moist forests
Ligustrum obtusifolium	Border privet	Escaped from cultivation; seeds spread by birds
Ligustrum vulgare	Common privet	Planted very commonly in the past and escaped; invasive in many states
Lonicera maackii	Amur honeysuckle	Escaped from plantings; seeds spread by birds
Lonicera morrowii	Morrow's honeysuckle	Escaped from plantings and invasive in many states; seeds spread by birds
Lonicera morrowii x tatarica	Bell's honeysuckle	Escaped from cultivation
Lonicera standishii	Standish honeysuckle	Escaped from plantings; seeds spread by birds
Lonicera tartarica	Tartarian honeysuckle	Escaped from plantings; seeds spread by birds
Rhamnus catharticus	Common buckthorn	Becoming a problem in PA
Rhamnus frangula	Glossy buckthorn	Becoming a problem in PA
Rubus phoenicolasius	Wineberry	Common bramble; not cultivated; spread by seed
Rosa multiflora	Multiflora rose	Invasive in many states; seeds spread by birds; PA noxious Weed
Spiraea japonica	Japanese spiraea	Frequently planted; escaped in some areas
Viburnum opulus var. opulus	Guelder rose	Resembles native *Viburnum trilobum* which it replaces; both are cultivated and planted

Trees

Scientific Name	Common Name	Notes
Acer platanoides	Norway maple	Commonly planted and escaped; invasive in many states; wind spreads prolific seeds
Acer pseudoplatanus	Sycamore maple	Escaped from cultivation; wind spreads prolific seeds
Ailanthus altissima	Tree-of-heaven	Invasive in many states; wind spreads prolific seeds
Paulownia tomentosa	Princess tree	Prolific seeds fall to start new seedlings
Pyrus calleryana	Callery pear	Commonly planted street tree; becoming a problem as an escape
Ulmus pumila	Siberian elm	Escaped from cultivation

Vines

Scientific Name	Common Name	Notes
Akebia quinata	Fiveleaf akebia	Escaped from cultivation
Ampelopsis brevipedunculata	Porcelain-berry	Escaped from cultivation
Celastrus orbiculatus	Oriental bittersweet	Escaped from cultivation and invasive in many states; spreading rapidly (by birds)
Lonicera japonica	Japanese honeysuckle	Invasive in many states
Polygonum perfoliatum	Mile-a-minute vine	Range expanding; PA Noxious Weed
Pueraria lobata	Kudzu	Invasive in many states; PA Noxious Weed

This list of invasive species is not meant to be definitive, but rather a guideline to some of the most troublesome species that degrade native plant communities in Pennsylvania. These species were chosen from a more extensive list compiled from adjacent state or regional lists of invasive plant species. Input was sought from experienced individuals familiar with Pennsylvania's flora from a field perspective.

Trees (6)

Norway maple	*Acer platanoides*
Sycamore maple	*Acer pseudoplatanus*
Tree-of-heaven	*Ailanthus altissima*
Princess tree	*Paulownia tomentosa*
Callery pear	*Pyrus calleryana* (and all cultivars)
Siberian elm	*Ulmus pumila*

Shrubs (19)

European black alder	*Alnus glutinosa*
Japanese barberry	*Berberis thunbergii*
European barberry	*Berberis vulgaris*
Russian olive	*Elaeagnus angustifolia*
Autumn olive	*Elaeagnus umbellata*
Winged Euonymus	*Euonymus alatus*
Border privet	*Ligustrum obtusifolium*
Common privet	*Ligustrum vulgare*
Amur honeysuckle	*Lonicera maackii*
Morrow's honeysuckle	*Lonicera morrowii*
Bell's honeysuckle	*Lonicera morrowii* x tatarica
Standish honeysuckle	*Lonicera standishii*
Tartarian honeysuckle	*Lonicera tatarica*
Common buckthorn	*Rhamnus cathartica*
Glossy buckthorn	*Rhamnus frangula*
Multiflora rose	*Rosa multiflora*
Wineberry	*Rubus phoenicolasius*
Japanese spiraea	*Spiraea japonica*
Guelder rose	*Viburnum opulus* var. opulus

Forbs/Grasses (25)

Goutweed	*Aegopodium podagraria*
Garlic mustard	*Alliaria petiolata*
Cheatgrass	*Bromus tectorum*
Spotted knapweed	*Centaurea maculosa* (syn. C. biebersteinii)
Greater celandine	*Chelidonium majus*
Canada thistle	*Cirsium arvense*
Poison hemlock	*Conium maculatum*
Crown vetch	*Coronilla varia*
Hairy willow herb	*Epilobium hirsutum*
Tall fescue	*Festuca elatior*
English ivy	*Hedera helix*
Orange day-lily	*Hemerocallis fulva*
Giant hogweed	*Heracleum mantegazzianum*
Dame's rocket	*Hesperis matronalis*
Purple loosestrife	*Lythrum salicaria, L. virgatum*
Japanese stilt grass	*Microstegium vimineum*
Star-of-Bethlehem	*Ornithogalum nutans, O. umbellatum*
Wild parsnip	*Pastinaca sativa*
Beefsteak plant	*Perilla frutescens*
Reed canary grass	*Phalaris arundinacea*
Common reed	*Phragmites australis* ssp. australis
Japanese knotweed	*Polygonum cuspidatum, P. sachalinense*
Lesser celandine	*Ranunculus ficaria*
Narrow-leaved cattail	*Typha angustifolia*
Hybrid cattail	*T. x glauca* (T. ang. x T. latifolia)

Vines (7)

Fiveleaf akebia	*Akebia quinata*
Porcelain-berry	*Ampelopsis brevipedunculata*
Oriental bittersweet	*Celastrus orbiculatus*
Japanese honeysuckle	*Lonicera japonica*
Mile-a-minute weed	*Polygonum perfoliatum*
Kudzu	*Pueraria lobata*
Periwinkle	*Vinca minor*

Aquatics (3)

Eurasian water-milfoil	*Myriophyllum spicatum*
Curly pondweed	*Potamogeton crispus*
Water chestnut	*Trapa natans*

Total Species = 60

Aquatic invasive species (AIS) (also referred to as aquatic nuisance species or ANS) are aquatic plants that have been introduced into waterways in which they do not live naturally. They have harmful effects on the natural resources in these ecosystems and the human uses of these resources. In addition to the banned species mentioned in this evaluation, some of the least-wanted aquatic invasive plant species in Pennsylvania are include hydrilla and purple loosestrife.

Wildlife Including Terrestrial and Aquatic Species

The level of wildlife diversity in Pennsylvania is comparable to that of surrounding states in the mid-Atlantic/ northeastern United States due to the varying physiography; moderate climate; geologic history; and abundance of streams, natural lakes, and wetlands across the Commonwealth. There are more than 460 species of wild birds and mammals occurring in Pennsylvania throughout some of their life-cycle requirement. Many bird species occur in Pennsylvania during their seasonal migration and utilize critical habitats in both the spring and fall migration periods.

White-tailed deer, black bear and turkey are the primary big game animals in the Commonwealth area. These species account for the highest harvest statistics that are maintained by the Pennsylvania Game Commission (PGC 2003). Important game birds in the state include pheasant, dove, ruffed grouse and waterfowl. Small game includes squirrel and rabbits. Furbearers such as raccoon, fox, beaver, muskrat and coyote are trapped extensively across the state.

There are five exotic bird species that regularly nest throughout the state. The Rock Dove (Pigeon), European Starling, and House Sparrow are abundant and widespread pests. The Mute Swan and Ring-necked Pheasant were introduced as ornamental waterfowl and for upland game bird hunting. In addition there exist feral ducks and geese across the Commonwealth. There are two exotic mammal species in Pennsylvania: Norway rat and house mouse. Feral cats, dogs and swine complete the list of invasive mammal species.

In Pennsylvania, with some 85,000 miles of streams and rivers and hundreds of lakes, there are currently over 160 species of fish in about 24 different families. The numbers are approximate because non-native fish species may be stocked or accidentally released. In addition, fish that were once present may have disappeared from the state (extirpated), or they may have become extinct. Game fish include both coldwater and warm water species and include salmon, steelhead, trout, striped, largemouth and smallmouth bass, pike, pickerel, muskellunge, crappies and other panfish.

Aquatic invasive species (AIS) (also referred to as aquatic nuisance species or ANS) are aquatic animals that have been introduced into waterways in which they do not live naturally. They have harmful effects on the natural resources in these ecosystems and the human uses of these resources. In addition to the banned species below, some of the least-wanted AIS in Pennsylvania are: European ruffe, sea lamprey, spiny water flea, Asian clam, and red-eared slider (turtle). In 2004, northern snakeheads were first found in Pennsylvania waters.

It's not always "foreign invaders" that are the problem. White perch and flathead catfish are other examples of species that have turned up where they don't belong. While native to some PA watersheds, they have been introduced to other areas where they are not wanted.

Aquatic species banned in Pennsylvania (sale, barter, possession or transportation)

- Bighead carp (*Hypophtalmichtys nobilis*)
- Black carp (*Mylopharyngodon piceus)*
- European rudd (*Scardinius erythropthalmus*)
- Quagga mussel (*Dreissena bugensis*)
- Round goby (*Neogobius melanostomus*)
- Ruffe (*Gymnocephalus cernuus*)
- Rusty crayfish (*Orconectes rusticus*)

- Silver carp (*Hypophtalmichtys molitrix*)
- Snakehead (all species)
- Tubenose goby (*Proterothinus marmoratus*)
- Zebra mussel (*Dreissena polymorpha*)

There are 78 species of amphibians and reptiles native to Pennsylvania. Although a native species in Pennsylvania, the shorthead garter snake is considered an exotic reptile species in the Ohio River CREP area because it was moved to an area of the state where it did not naturally occur.

Threatened, Endangered, and Sensitive Species and Their Defined Critical Habitat

Historically, the Fish & Boat Commission and Game Commission have directed management efforts primarily at 85 species of game animals and sport fish. An additional 27 species receive targeted management attention and funding because they are classified as state or federally threatened and/or endangered. The remaining 400 species of mammals, birds, fish, reptiles, and amphibians in the Commonwealth are managed with limited funding sources such as the State Wildlife Grants program and similar programs. Non-game species represent 75 percent of Pennsylvania's fish and wildlife.

PENNSYLVANIA'S ENDANGERED and THREATENED BIRDS and MAMMALS

ENDANGERED BIRDS

American bittern (*Botaurus lentiginosus*) [5]
black-crowned night-heron (*Nycticorax nycticorax*) [4]
blackpoll warbler (*Dendroica striata*) [4,5]
black tern (*Childonias niger*) [5]
common tern (*Sterna hirundo)* [4,5]
dickcissel (*Spiza americana*) [4]
great egret (*Ardea herodias*) [4]
king rail (*Rallus elegans*) [4]
least bittern (*Ixobrychus exilis*)[4,5]
loggerhead shrike (*Lanius ludovicianus)* [4,5]
peregrine falcon (*Falco peregrines)* [4]
sedge wren (*Cistothorus platensis*) [4,5]
short-eared owl (*Asio flammeus*) [4,5]
yellow-bellied flycatcher (*Empidonax flaviventris*) [4,5]
yellow-crowned night-heron (*Nyctanassa violacea*) [4]

EXTIRPATED

piping plover (*Charadrius melodus*) [2]

ENDANGERED MAMMALS

Delmarva fox squirrel (*Sciurus niger cinereus*) [1]
Indiana bat (*Myotis sodalis*) [1]
least shrew (*Cryptotis parva*)
northern flying squirrel (*Glaucomys sabrinus macrotis*)

THREATENED BIRDS

bald eagle (*Haliaeetus leucocephalus*) [3]
osprey (*Pandion haliaetus)* [4]
upland sandpiper (*Bartramia lonaicauda*) [4.5]

THREATENED MAMMALS

Allegheny woodrat (*Neotoma magister*)
small-footed bat (*Myotis leibii*)
West Virginia water shrew (*Sorex palustris punctulatus*)

1federally endangered
2Great Lakes population federally endangered
3protected under federal Bald and Golden Eagle Protection Act
4protected under federal Migratory Bird Treaty Act
5USFWS Migratory Bird of Conservation Concern

THREATENED FISH, REPTILES, AMPHIBIANS and INVERTEBRATES

Status	Species
E	Clubshell (*Pleurobema clava*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
E	Plover, piping - Great Lakes watershed (*Charadrius melodus*)
E	Riffleshell, northern (*Epioblasma torulosa rangiana*)
E	Ring pink (mussel) (*Obovaria retusa*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)

FISH. The following species are Endangered:

(1) Northern brook lamprey, *Ichthyomyzon fossor*.
(2) Shortnose sturgeon, *Acipenser brevirostrum*.
(3) Lake sturgeon, *Acipenser fulvescens*.
(4) Atlantic sturgeon, *Acipenser oxyrhynchus*.
(5) Spotted gar, *Lepisosteus oculatus*.
(6) Hickory shad, *Alosa mediocris*.
(7) Cisco, *Coregonus artedi*.
(8) Northern redbelly dace, *Phoxinus eos*.
(9) Gravel chub, *Erimystax x-punctatus*.
(10) Bridle shiner, *Notropis bifrenatus*.
(11) River shiner, *Notropis blennius*.
(12) Ghost shiner, *Notropis buchanani*.
(13) Ironcolor shiner, *Notropis chalybaeus*.
(14) Blackchin shiner, *Notropis heterodon*.
(15) Redfin shiner, *Lythrurus umbratilis*.
(16) Longnose sucker, *Catostomus catostomus*.
(17) Bigmouth buffalo, *Ictiobus cyprinellus*.
(18) Black bullhead, *Amerius melas*.
(19) Mountain madtom, *Noturus eleutherus*.
(20) Tadpole madtom, *Noturus gyrinus*.
(21) Northern madtom, *Noturus stigmosus*.
(22) Burbot, *Lota lota* (inland populations only).
(23) Threespine stickleback, *Gasterosteus aculeatus*.
(24) Banded sunfish, *Enneacanthus obesus*.
(25) Warmouth, *Lepomis gulosus*.
(26) Longear sunfish, *Lepomis megalotis*.
(27) Iowa darter, *Etheostoma exile*.
(28) Eastern sand darter, *Etheostoma pellucida*.

REPTILES and AMPHIBIANS. The following species are Endangered:

(1) Bog Turtle, *Glyptemys muhlenbergii*.
(2) New Jersey Chorus Frog, *Pseudacris kalmi*.
(3) Southern Leopard Frog, *Lithobates sphenocephalus utricularius.*
(4) Massasauga Rattlesnake, *Sistrurus catenatus*.
(5) Kirtland's Snake, *Clonophis kirtlandii*.
(6) Eastern Mud Salamander, *Pseudotrion m. montanus.*
(7) Eastern Spadefoot Toad, *Scaphiopus holbrookii*.
(8) Rough Green Snake, *Opheodrys aestivus.*
(9) Northern Cricket Frog, *Acris crepitans*.
(10) Blue-spotted Salamander, *Ambystoma laterale*.

INVERTEBRATES. The following species are Endangered:

(1) Northern rifffleshell mussel, *Epioblasma torulosa rangiana*.
(2) Clubshell mussel, *Pleurobema clava*.
(3) Dwarf wedgemussel, *Alasmidonta heterodon*.
(4) Eastern pearlshell mussel, *Margaritifera margaritifera*.
(5) Rabbitsfoot mussel, *Quadrula cylindrica cylindrical*.
(6) Snuffbox mussel, *Epioblasma triquetra*.
(7) Salamander mussel, *Simpsonaias ambigua*.

FISH. The following species are Threatened:

(1) Mountain brook lamprey, *Ichthyomyzon greeleyi*.
(2) Bigmouth shiner, *Notropis dorsalis.*
(3) Southern redbelly dace, *Phoxinus erythrogaster.*
(4) Spotted sucker, *Minytrema melanops.*
(5) Brindled madtom, *Noturus miurus*.
(6) Bluebreasted darter, *Etheostoma camurum*.
(7) Spotted darter, *Etheostoma maculatum*.
(8) Tippecanoe darter, *Etheostoma tippecanoe*.
(9) Gilt darter, *Percina evides*.

AMPHIBIANS and REPTILES. The following species are Threatened:

(1) Green Salamander, *Aneides aeneus.*
(2) Eastern Redbelly Turtle, *Pseudemys rubriventris.*

INVERTEBRATES. The following species are Threatened:

(1) Sheepnose mussel, *Plethobasus cyphyus.*

Critical habitat is designated by the U.S. Fish and Wildlife Service (FWS) as essential for the recovery of threatened and endangered species and like those species, is protected by the ESA Federally protected critical habitats in Pennsylvania include forested areas within 10 miles of bat hibernacula containing Indiana Bat and certain distances from those hibernacula depending on proposed activities. These critical areas also include certain wetland areas within the state based on

the presence of wetland dependant animal and plant species and further defined by the USFWS State College field office staff relevant to a proposed activity.

The Pennsylvania Game Commission considers critical habitat to be 1.) Any environment that supports all or part of a Pennsylvania listed Endangered, Threatened or other Special Concern bird or mammal specie's life requisites. 2.) Any environment that supports or provides unusually high value conditions for birds or mammals as determined by the Commission. This may include but not be limited to important streams, all wetlands, riparian areas, cliffs supporting raptors, areas offering special shelter or protection, migration routes, wildlife travel corridors, concentrated reproduction areas such as heron rookeries, wintering areas such as bat hibernacula or thermal cover, selected large grasslands, certain forest interiors and any other areas containing vegetation types or geographic land forms of special ecological importance.

3.1 CULTURAL AND TRIBAL RESOURCES

Cultural resources consist of prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activities considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources (prehistoric and historic), architectural resources, and traditional cultural properties (TCP). Archaeological resources are locations and objects from past human activities. Architectural resources are those standing structures that are usually over 50 years of age and are of significant historic or aesthetic importance to be considered for inclusion in the National Register of Historic Places (NRHP). Traditional cultural resources hold importance or significance to Native Americans or other ethnic groups in the persistence of traditional culture.

The significance of such resources relative to the American Indian Religious Freedom Act, the Archaeological Resources Protection Act, Native America Graves Protection and Repatriation Act, EO 13007, and/or eligibility for inclusion in the NRHP is considered a part of the EA process. The regulations and procedures in 36 CFR 800, which implements Section 106 of the National Historic Preservation Act (NHPA), requires federal agencies to consider the effects on properties listed in or eligible for inclusion in the NRHP. Prior to approval of the proposed action, Section 106 requires that the Advisory Council on Historic Preservation be afforded the opportunity to comment.

Region of Influence
The ROI for cultural resources is statewide.

Archaeological Resources
Due to its rich cultural history, thousands of archaeological sites are recorded in the Commonwealth of Pennsylvania. As of November 2003, approximately 18,000 prehistoric and historic archaeological sites are included in the archaeological database at the Pennsylvania Historical Museum Commission (PHMC), Bureau for Historic Preservation, which serves as State Historic Preservation Office (SHPO). The following reviews the principal prehistoric and historic periods relevant to Pennsylvania.

Prehistoric Period
The prehistory of Pennsylvania is typically divided into three periods: Paleo-Indian, Archaic, and Woodland. The Paleo-Indians (ca. 14,000–8,000 B.C.) were the first people to occupy what is now

western Pennsylvania, moving into the region following retreat of glaciers during the last ice age. They lived in small, mobile groups whose subsistence was based on hunting and gathering. Paleo-Indians hunted large and small game, some of which are now extinct, and consumed nuts from deciduous trees. Paleo-Indian artifacts, often found on surfaces, consist of stone tools including knives, scrapers, gravers, and fluted and unfluted lanceolate spear points. In Washington County, the NHRP listed Meadowcroft Rockshelter is located on a tributary of the upper Ohio River; the site contains evidence of Paleo-Indian occupation dating to 11,000 B.C (PHMC 2003a).

The Archaic period (ca. 8000–1800 B.C.) is divided into three subperiods – Early, Middle and Late. Archaic groups were increasingly efficient at exploiting deciduous forest food resources, including white-tailed deer, birds, squirrels, fish and mollusks, and a greater variety of plant foods. Early Archaic technologies indicate a new way of hafting spear points and the atlatl (spear thrower) came into use. Grinding and pitted stones reveal methods of processing wild plant foods. During the Middle Archaic (ca. 6000–3000 B.C.) long term base camps indicate increasing sedentism. Rapid population growth occurred during the Late Archaic (ca. 3000–1000 B.C.), as sites appear in greater number. Stone mortars, pestles, nutting stones, and grinders imply greater utilization of plant resources. Woodworking implements (axes, adzes, celts), bone and antler tools (awls, fishhooks), shell ornaments (beads, pendants, gorgets), and raw copper are found in the archaeological record. Late Archaic sites have also yielded evidence of long distance trade, ritualism, small scale cultivation of native plants, and some social ranking.

The Woodland period (ca. 1000 B.C. – A.D. 1000) is also divided into three sub periods – Early, Middle, and Late. The adaptive cultural trends from the Late Archaic became more intensified and there was greater diversification of food sources, increased sedentism, long distance trade, and emergence of social ranking. The Early Woodland in the upper Ohio valley corresponds to what is called the Adena complex, known from burial mounds and related sites centered in the Ohio River Basin. Burial mounds were typically conical, sometimes located within an earthen walled enclosure, or over a burned house or log tomb. Characteristic Adena artifacts include carved stone pipes, decorative stone tablets and reel shaped gorgets, implements of marine conch shell, and a variety of bone, antler, and copper ornaments.

The Middle Woodland (ca. 100 B.C. – A.D. 500) represents an elaboration of the characteristics of the Early Woodland and is largely represented by the Hopewell culture. The Hopewell culture had elaborate ceremonial, mortuary, and exchanges systems and long distance trade. During the Late Woodland (ca. A.D. 500–1000), mortuary ceremonialism and interregional trade declined sharply while settlements became larger. Late Woodland habitation sites are found in most river and large creek valleys. Horticulture was practiced across the state and, by the end of this period most groups practiced agriculture and lived in permanent stockaded villages. Native Americans organized into tribes. Numerous pottery shapes and designs were used along with elaborate clay smoking pipes. Stone celts were common and the bow and arrow developed as the main mode of weaponry. In Greene County, the NRHP listed Late Woodland Fisher site produced bird bone beads, bone and antler awls and chisels, a shale pendant, a turtle shell cup, a celt, and cord marked pottery (PHMC 2003).

Protohistoric and Historic Period

During the Protohistoric period (ca. A.D. 1600–1750) European trade goods, including glass beads and pieces of brass or iron, are found on Native American sites. Permanent settlements declined

during the 17th century due to hostilities between native groups and spread of diseases from European communities. By the early to mid 18th century, various Native American groups, including the Shawnee and Delaware, moved into the Ohio River valley from other areas.

Native Americans, Indigenous Peoples of Pennsylvania

When first discovered by Europeans, Pennsylvania, like the rest of the continent, was inhabited by groups of people of Mongoloid ancestry long known as American Indians. Today they are proudly designated the Native Americans. The culture reflected their Stone Age background, especially in material arts and crafts. Tools, weapons, and household equipment were made from stone, wood, and bark. Transportation was on foot or by canoe. Houses were made of bark, clothing from the skins of animals. The rudiments of a more complex civilization were at hand in the arts of weaving, pottery, and agriculture, although hunting and food gathering prevailed. Some Indians formed confederacies such as the League of the Five Nations, which was made up of certain New York-Pennsylvania groups of Iroquoian speech. The other large linguistic group in Pennsylvania was the Algonkian, represented by the Delawares (or Lenape), Shawnees, and other tribes.

During the 17th century, the fork of the Ohio, Allegheny, and Monongahela Rivers was a wilderness crossroads were Native Americans traded furs with French and British frontiersman. France and England struggled to establish empires in North America extracting profits from the fur trade. The territory claimed for New France included western Pennsylvania as well as the Great Lakes, the Ohio, and Mississippi rivers, while the British settled the eastern seaboard. However, eastern colonists actively sought land and furs west of the Allegheny Mountains in areas claimed by the French who established forts along interior waterways. As the frontier moved westward, the Ohio River became a vital link in trade and communication between the eastern cities, the Mississippi valley, and the Great Lakes region (WQED 2003).

The Lenape or Delawares, calling themselves Leni-Lenape or “real men,” originally occupied the basin of the Delaware River and were the most important of several tribes that spoke an Algonkian language. Under the pressure of white settlement, they began to drift westward to the Wyoming Valley, to the Allegheny and, finally, to eastern Ohio. Many of them took the French side in the French and Indian War, joined in Pontiac’s War, and fought on the British side in the Revolutionary War. Afterward, some fled to Ontario and the rest wandered westward. Their descendants now live on reservations in Oklahoma and Ontario. The Munsees were a division of the Delawares who lived on the upper Delaware River, above the Lehigh River.

The Susquehannocks were a powerful Iroquoian-speaking tribe who lived along the Susquehanna in Pennsylvania and Maryland. An energetic people living in Algonkian-speaking tribes’ territory, they engaged in many wars. In the end, they fell victim to new diseases brought by European settlers, and to attacks by Marylanders and by the Iroquois, which destroyed them as a nation by 1675. A few descendants were among the Conestoga Indians who were massacred in 1763 in Lancaster County.

The Shawnees were an important Algonkian-speaking tribe who came to Pennsylvania from the west in the 1690s, some groups settling on the lower Susquehanna and others with the Munsees near Easton. In the course of time they moved to the Wyoming Valley and the Ohio Valley, where they joined other Shawnees who had gone there directly. They were allies of the French in the French and Indian War and of the British in the Revolution, being almost constantly at war with settlers for

forty years preceding the Treaty of Greenville in 1795. After Wayne's victory at Fallen Timbers (1794), they settled near the Delawares in Indiana, and their descendants now live in Oklahoma.

The Iroquois Confederacy of Iroquoian-speaking tribes, at first known as the Five Nations, included the Mohawks, Oneidas, Onondagas, Cayugas, and Senecas. After about 1723, when the Tuscaroras from the South were admitted to the confederacy, it was called the Six Nations. The five original tribes, when first known to Europeans, held much of New York State from Lake Champlain to the Genesee River. From this central position they gradually extended their power. As middlemen in the fur trade with the western Indian nations, as intermediaries skilled in dealing with the whites, and as the largest single group of Native Americans in northeastern America, they gained influence over Indian tribes from Illinois and Lake Michigan to the eastern seaboard. During the colonial wars their alliance or their neutrality was eagerly sought by both the French and the British. The Senecas, the westernmost tribe, established villages on the upper Allegheny in the 1730s. Small groups of Iroquois also scattered westward into Ohio and became known as Mingoes.

During the Revolution, most of the Six Nations took the British side, but the Oneidas and many Tuscaroras were pro-American. Gen. John Sullivan's expedition up the Susquehanna River and Gen. Daniel Brodhead's expedition up the Allegheny River laid waste to their villages and cornfields in 1779 and disrupted their society. Many who had fought for the British moved to Canada after the Revolution, but the rest worked out peaceful relations with the United States under the leadership of such chiefs as Cornplanter. The General Assembly recognized this noted chief by granting him a tract of land on the upper Allegheny in 1791.

Other Tribes, which cannot be identified with certainty, occupied western Pennsylvania before the Europeans arrived, but were eliminated by wars and diseases in the seventeenth century, long before the Lenapes, Shawnees, and Senecas began to move there. The Eries, a great Iroquoian-speaking tribe, lived along the south shore of Lake Erie but were wiped out by the Iroquois about 1654. The Mahicans, an Algonkian-speaking tribe related to the Mohegans of Connecticut, lived in the upper Hudson Valley of New York but were driven out by pressure from the Iroquois and from the white settlers, some joining the Lenapes in the Wyoming Valley about 1730 and some settling at Stockbridge, Massachusetts. Two Algonkian-speaking tribes, the Conoys and the Nanticokes, moved northward from Maryland early in the eighteenth century, settling in southern New York, and eventually moved westward with the Delawares, with whom they merged. The Saponis, Siouan-speaking tribes from Virginia and North Carolina, moved northward to seek Iroquois protection and were eventually absorbed into the Cayugas. In the latter part of the eighteenth century there were temporary villages of Wyandots, Chippewas, Mississaugas, and Ottawas in western Pennsylvania.

The French Longueuil and Celoron expeditions in 1739 and 1749 traversed western Pennsylvania and French efforts to establish control over the upper Ohio valley led to the French and Indian War (1754-1763). French forts at Erie (Fort Presque Isle), Waterford (Fort LeBoeuf), Pittsburgh (Fort Duquesne), and Franklin (Fort Machault) threatened all the middle colonies. During the war, General Braddock's British and colonial army was slaughtered on the Monongahela in 1755, but General Forbes captured the site of Pittsburgh in 1758. After the war, the Indians rose up against the British colonies in Pontiac's War, but in 1763, they were defeated at Bushy Run by Colonel Henry Bouquet, ending the threat to the frontier (PHMC 2003). The Bushy Run Battlefield located in Westmoreland County is a National Historic Landmark (PHMC 2003).

Pennsylvania was initially settled and developed as a result of agriculture production, which by the late 1700s was its main business. At first, farmers were limited to subsistence farming then gradually began to produce surplus, which was bartered for other goods. The population was well distributed throughout the countryside, including the Ohio River valley. In 1796, Pittsburgh had a population of 300 that included skilled craftsmen who processed raw materials from the region's farmers into goods for Pittsburgh merchants. Products produced on local farms included wool for cloth; livestock for meat, leather, and lard; and grain for food and alcohol.

During the Civil War, Pennsylvania played an important role in preserving the Union. Regional industrial enterprise and natural resources were essential factors in its economic strength. Its railroad system, iron and steel industry, and agricultural wealth were vital to the war effort. Following the discovery of oil near Titusville in 1859, production and marketing of this product began. The oil producing counties extended from Tioga west to Crawford and south to West Virginia, and by 1891, Warren and Venango counties had established leadership in production. Anthracite coal was the main fuel used to smelt iron until the 1880s and the bituminous and coke industries were responsible for the late 19th century industrial growth of western Pennsylvania. During the early industrial period, the manufacture of steel and iron products was the largest single industry in western Pennsylvania. The U.S. Steel Corporation was the largest steel manufacturer utilizing local sources of oil, coal, coke, limestone, and iron ore. By 1900, sixty percent of the nation's steel production came from western Pennsylvania (PHMC 2003).

Archaeological Sites

Projects are listed by Subbasin. The Lower Susquehanna River Subbasin includes all of York, Lancaster, and Cumberland Counties, and parts of Perry, Dauphin, Lebanon, Chester, Adams, Berks, and Schuylkill Counties. The region consists of rolling valley floor cut by small streams. Major tributaries of the Susquehanna River include Conodoguinet Creek, Yellow Breeches Creek, Codorus Creek, Pequea Creek, and the Conestoga River. The major research in this region has been conducted by the Pennsylvania Historical and Museum Commission, which has been working here since the 1930s. Franklin and Marshall College has also conducted research in the subbasin and most recently has conducted historic archaeology in Lancaster.

Approximately 2,865 archaeological sites are recorded in the Lower Susquehanna River Subbasin. Of these, 1,188 can be dated to specific prehistoric time periods and 174 to specific historic time periods.

The Upper Delaware River Subbasin includes all of Pike and parts of Lackawanna, Monroe, Northampton, and Wayne Counties. The region is mountainous with many small streams flowing east and southeast into the Delaware River. The largest of these streams is the Lackawaxen River. The major archaeological investigations in this basin occurred in the 1960s and 1970s in preparation for the Tocks Island Reservoir. Numerous stratified prehistoric sites were excavated during this project. These sites greatly increased our understanding of the Paleoindian, Late Archaic, Transitional and Late Woodland Periods.

Approximately 637 archaeological sites are recorded in the Upper Delaware River subbasin although only 237 can be assigned to a specific time period.

The Monongahela River Subbasin includes all of Fayette County, and parts of Allegheny, Greene, Somerset, Washington, and Westmoreland Counties. The terrain consists of broad upland flats cut by deeply entrenched streams. The major archaeological research has been conducted by the Carnegie Museum and they have excavated numerous sites from all time periods. California University of Pennsylvania has also conducted significant research in the Lower Monongahela Valley and they continue to do so through summer field schools.

Approximately 1,850 archaeological sites are recorded in the Monongahela River Subbasin. Of these, 893 sites can be assigned to specific prehistoric time periods and 239 can be assigned to specific historic time periods.

Traditional Cultural Properties (TCP)

A TCP is defined as a property that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. In most cases, TCP are associated with Native Americans but may also be associated with other sociocultural or ethnic groups. TCP may be difficult to recognize and may include a location of a traditional ceremonial location, a mountaintop, a lake, or a stretch of river, or culturally important neighborhood (DOI 2003). There are currently no federally recognized Native American tribes in Pennsylvania, although numerous tribes no longer present in the Commonwealth have traditional ties to the region.

Very few TCPs have been identified in western Pennsylvania, and the PHMC does not maintain a list of TCPs within the Commonwealth (Strattan [PHMC] 2003). Existing federally recognized tribes with traditional ties to the Ohio River valley include the Shawnee Tribe, Delaware Nation, and Seneca Nation (Federal Register 2002).

Historic Architectural Resources

Historic architectural resources in Pennsylvania include traditional centers of communities – town halls, main streets, and neighborhoods that have been at the heart of cities and towns for generations. Individual homes within rural areas also provide links to individuals important to Pennsylvanian history. Many showcase architectural styles and building materials that are distinctive to particular regions in the state. Western Pennsylvania has a very strong agricultural heritage and farmhouses, barns, silos, and other outbuildings are considered important architectural resources.

Within the CREP area counties there are numerous National Historic Landmarks, Historic Districts, and individual Historic Properties listed in the National Register. However, many NRHP Districts are located within historic towns or urbanized areas, which would typically be outside of CREP areas.

3.2 WATER RESOURCES

The Clean Water Act (CWA) is the primary Federal law that protects the nation’s waters including lakes, rivers aquifers, wetlands, and coastal areas. For this analysis, water resources include surface water, groundwater, wetlands, and floodplains. Surface water includes lakes, ponds, streams, and rivers including impaired waters. Impaired waters are defined by the Environmental Protection

Agency (EPA) as those surface waters with levels of pollutants that exceed water state water quality standards. Every two years, states must publish lists of impaired rivers: those streams and lakes that do not meet their designated uses because of excess pollutants (EPA 2004a). Wild and Scenic Rivers are addressed in Sections 3.5 and 4.7, Recreational Resources.

Groundwater refers to subsurface hydrologic resources, such as aquifers, that are used for domestic, agricultural and industrial purposes. In this analysis, groundwater includes no sole source aquifers. Wetlands are defined by the U.S. Army Corps of Engineers (COE) as areas which are characterized by a prevalence of vegetation adapted to saturated soil conditions. Wetlands can be associated with groundwater or surface water and are identified based on specific soil, hydrology, and vegetation criteria defined by COE. For this analysis floodplains will be defined as 100 year floodplains, designated by the Federal Emergency Management Agency (FEMA) as those low lying areas that are subject to major flooding once every 100 years.

Region of Influence

The ROI includes the surface waters, groundwater, and wetlands statewide as well as surface waters downstream.

Surface Waters

The following table is presented for a perspective on Pennsylvania's surface water resources:

Table 1 - Atlas of Surface Waters in Pennsylvania

State Population	12,406,292†
State Surface Area (square miles)	45,333
Number of Water Basins (major basins)	6
Total Miles of Rivers and Streams	86,000*
Number of Lakes/Reservoirs/Ponds** -Number of Significant, Publicly Owned Lakes (subset)	3,956 215
Acres of Lakes/Reservoirs/Ponds** -Acres of Significant, Publicly Owned Lakes (subset)	161,445†† 98,942
Square Miles of Estuaries/Harbors/Bays -Delaware Estuary -Presque Isle Bay	 17 6
Miles of Great Lakes Shore	63†††
Acres of Freshwater Wetlands	403,924
Acres of Tidal Wetlands	512

† US Census estimate 2004
†† Lakes and ponds greater than two acres
††† Lake Erie - Fourteen miles comprise the Presque Isle Peninsula.
*DEP estimate based on 1:24,000 scale National Hydrography Data (NHD) GIS stream coverage. This 86,000 may change as the NHD is quality assured and corrected.
** "Total Water Estimates for United States Streams and Lakes", EPA, August 1993

Surface Water

Pennsylvania plays an important role in the overall health of the Ohio and Mississippi Rivers, as well as the Gulf of Mexico, because the headwaters of the Ohio River are located almost exclusively within Pennsylvania (WPC 2003). It also plays a major role in the health of the Chesapeake Bay as the largest surface water supply to the bay is the Susquehanna River Basin

which lies primarily within Pennsylvania. The Pennsylvania CREP areas lie within three major river basins: the Ohio River Basin, The Susquehanna River Basin and the Potomac River Basin (see Figure 3.1-2). No CREP area exists in the Delaware River Basin to its west (the eastern border of Pennsylvania where it exists); however properties in this drainage are eligible for certain incentives unrelated to CREP payments as evaluated in this EA.

In Pennsylvania, there are six major river basins and their associated watershed systems; in the northwest part of Pennsylvania is the Lake Erie watershed, in most of the rest of western Pennsylvania water flows into the Ohio River. Most of central Pennsylvania drains into the Susquehanna River and its branches, which flow to the Chesapeake Bay. The smallest Pennsylvania watershed is the Genesee River, which collects water along the central part of Pennsylvania's boundary with New York State and sends it north to Lake Ontario. Along the central section of Pennsylvania's southern boundary, streams flow to the Potomac River which then flows into the Chesapeake Bay. Eastern Pennsylvania lies in the Delaware River watershed, which drains into the Atlantic Ocean. Figure 3.1-3 below shows these River Basins and watersheds in relation to locations in the Commonwealth.

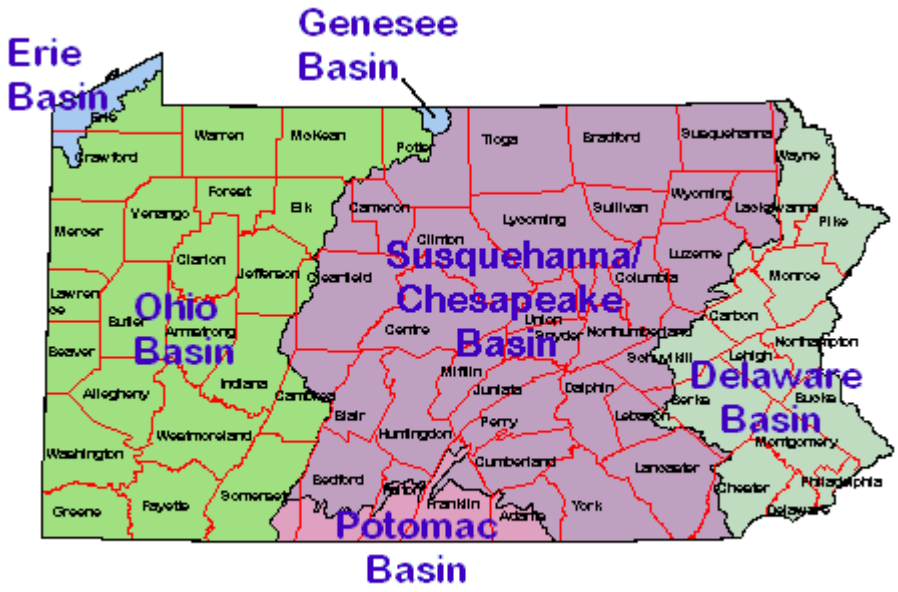


Figure 3.1-3

Lake Erie Basin

Pennsylvania has a total drainage area of 511 square miles flowing into Lake Erie. Known as the Lake Erie Basin, it includes the entire Pennsylvania portion of the Lake Erie basin. The basin encompasses much of Erie County and a portion of Crawford County. This watershed, known as the Lake Erie Watershed, includes its major streams of Walnut Creek, Elk Creek, and Conneaut Creek. (http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/wsnotebks/ws15a.htm).

Ohio River Basin

Subbasin (The Upper Allegheny)

This subbasin has a total drainage area of 4474 square miles. Known as the Upper Allegheny Subbasin, it includes the uppermost portion of the Allegheny River before it flows into New York and the portion of the Allegheny River between New York and Emlenton. The subbasin encompasses all of Warren County, much of McKean, Crawford, Venango, Forest, and Erie Counties, and portions of Potter, Elk, Cameron, Mercer, Clarion, and Butler Counties. Watersheds within this subbasin are listed as follows.

The Upper French Creek Watershed has a total drainage area of 568 square miles. Its major streams include Muddy Creek and the upper half of French Creek.

The Kinzua-Brokenstraw Creeks Watershed has a total drainage area of 781 square miles. Its major streams include Kinzua Creek, Brokenstraw Creek and Conewango Creek.

The Potato-Oswayo Creeks Watershed has a total drainage area of 889 square miles. Its major streams include Potato Creek, Oswayo Creek and Tunungwant Creek.

The Lower French Creek Watershed has a total drainage area of 556 square miles. Its major streams include Sugar Creek, Cussewago Creek and the lower half of French Creek.

The Oil Creek Watershed has a total drainage area of 525 square miles. Its major stream is Oil Creek.

The Tionesta Creek Watershed has a total drainage area of 710 square miles. Its major stream is Tionesta Creek.

The Sandy Creek Watershed has a total drainage area of 445 square miles. Its major stream is Sandy Creek.

Subbasin (The Central Allegheny)

This subbasin has a total drainage area of 2930 square miles. Known as the Central Allegheny Subbasin, it includes the portion of the Allegheny River between Emlenton and Clinton. The subbasin encompasses almost all of Jefferson County, much of Clarion, Armstrong, Elk, and Indiana Counties, and portions of Butler, Forest, McKean, and Clearfield Counties. Watersheds within this subbasin are listed as follows.

The Upper Clarion River Watershed has a total drainage area of 638 square miles. Its major streams include Toby Creek, East Branch Clarion River, West Branch Clarion River, and Spring Creek.

The Lower Clarion River Watershed has a total drainage area of 618 square miles. Its major streams include Piney Creek, Mill Creek, Paint Creek, and the lower portion of the Clarion River.

The Redbank Creek Watershed has a total drainage area of 728 square miles. Its major streams include Redbank Creek, North Fork Redbank Creek, and Sandy Lick Creek.

The Mahoning Creek Watershed has a total drainage area of 444 square miles. Its major streams include Mahoning Creek and Little Mahoning Creek.

The Cowanshannock-Crooked Creeks Watershed has a total drainage area of 502 square miles. Its major streams include Cowanshannock Creek and Crooked Creek.

Subbasin (The Lower Allegheny)

This subbasin has a total drainage area of 2394 square miles. Known as the Lower Allegheny Subbasin, it includes the lowermost portion of the Allegheny River from Clinton to Pittsburgh, including the entire Kiskiminetas-Conemaugh River system. The subbasin encompasses much of Allegheny, Indiana, Cambria, Somerset, and Westmoreland Counties, and portions of Butler and Armstrong Counties. Watersheds within this subbasin are listed as follows.

The Lower Allegheny River Watershed has a total drainage area of 324 square miles. Its major waterways include Deer Creek and the lowest portion of the Allegheny River.

The Kiskiminetas River Watershed has a total drainage area of 164 square miles. Its major waterways include the Kiskiminetas River and Beaver Run.

The Loyalhanna Creek Watershed has a total drainage area of 370 square miles. Its major waterways include Loyalhanna Creek, Blacklegs Creek and the lower portion of the Conemaugh River.

The Conemaugh River-Blacklick Creek Watershed has a total drainage area of 700 square miles. Its major waterways include Blacklick Creek, Two Lick Creek and the middle portion of the Conemaugh River.

The Stonycreek River Watershed has a total drainage area of 653 square miles. Its major waterways include Stonycreek River and the headwaters of the Conemaugh River.

Subbasin (The Monongahela)

This subbasin has a total drainage area of 2737 square miles. Known as the Monongahela Subbasin, it includes the Pennsylvania portion of the Monongahela River, from West Virginia and Maryland to Pittsburgh. The subbasin encompasses all of Fayette County, much of Greene, Washington, Westmoreland, and Somerset Counties, and a small portion of Allegheny County. Watersheds within this subbasin are listed as follows.

The Turtle Creek Watershed has a total drainage area of 202 square miles. Its major stream is Turtle Creek.

The Tenmile Creek Watershed has a total drainage area of 388 square miles. Its major streams include Tenmile Creek and South Fork Tenmile Creek.

The Middle Monongahela River Watershed has a total drainage area of 509 square miles. Its major waterways include the middle portion of the Monongahela River, Pigeon Creek and Redstone Creek.

The Lower Youghiogheny River Watershed has a total drainage area of 478 square miles. Its major streams include Sewickley Creek, Jacobs Creek and the lower portion of the Youghiogheny River.

The Upper Youghiogheny River Watershed has a total drainage area of 384 square miles. Its major waterways include Indian Creek, Laurel Hill Creek and the upper portion of the Youghiogheny River.

The Casselman River Watershed has a total drainage area of 399 square miles. Its major waterway is the Casselman River.

The Upper Monongahela River Watershed has a total drainage area of 377 square miles. Its major waterways include Whitely Creek, Dunkard Creek, and the uppermost Pennsylvania portion of the Monongahela River.

Subbasin (The Ohio)
This subbasin has a total drainage area of 3084 square miles. Known as the Ohio Subbasin, it includes the Pennsylvania portion of the Ohio River, from its beginning at the confluence of the Allegheny and Monongahela Rivers in Pittsburgh to the borders of Ohio and West Virginia. The subbasin encompasses all of Beaver and Lawrence Counties, much of Mercer, Butler, Allegheny, and Washington Counties, and small portions of Crawford, Venango and Greene Counties. Watersheds within this subbasin are listed as follows.

The Shenango River Watershed has a total drainage area of 781 square miles. Its major waterways include the Shenango River and Neshannock Creek.

The Beaver River Watershed has a total drainage area of 316 square miles. Its major waterways include the Beaver River and Mahoning Creek.

The Slippery Rock Creek Watershed has a total drainage area of 836 square miles. Its major streams include Slippery Rock Creek, Connoquenessing Creek and Brush Creek.

The Raccoon Creek Watershed has a total drainage area of 327 square miles. Its major stream is Raccoon Creek.

The Wheeling-Buffalo Creeks Watershed has a total drainage area of 319 square miles. Its major streams include Wheeling Creek, Enlow Fork and Buffalo Creek.

The Chartiers Creek Watershed has a total drainage area of 296 square miles. Its major stream is Chartiers Creek.

Susquehanna River Basin

Subbasin (The Upper Susquehanna)
This subbasin has a total drainage area of 3286 square miles. Known as the Upper Susquehanna Subbasin, it includes the Susquehanna River from the New York border to the Lackawanna River. The subbasin encompasses all of Bradford, Susquehanna, and Wyoming Counties, and portions of Tioga, Potter, Sullivan, Luzerne, Lackawanna, Wayne and Lycoming Counties. Watersheds within this subbasin are listed as follows.

The Tioga-Cowanesque Rivers Watershed has a total drainage area of 676 square miles. Its major waterways are the Tioga and Cowanesque Rivers

The Wappasening Creek-Chemung River Watershed has a total drainage area of 348 square miles. Its major streams include Wappasening Creek, Bentley Creek, and the lower portions of the Chemung River.

The Sugar-Towanda Creeks Watershed has a total drainage area of 467 square miles. Its major streams include Towanda Creek and Sugar Creek.

Watershed D has a total drainage area of 553 square miles. Known as the Wysox - Wyalusing Creeks Watershed, its major streams include Wysox Creek and Wyalusing Creek.

The Great Bend Susquehanna River Watershed has a total drainage area of 309 square miles. Its major streams include Snake Creek and Starrucca Creek.

The Tunkhannock Creek Watershed has a total drainage area of 413 square miles. Its major stream is Tunkhannock Creek.

The Mehoopany-Bowman Creeks Watershed has a total drainage area of 520 square miles. Its major streams include Mehoopany Creek, Bowman Creek and Meshoppen Creek.

Subbasin (The Upper Central Susquehanna)
This subbasin has a total drainage area of 1761 square miles. Known as the Upper Central Susquehanna Subbasin, it includes the Susquehanna River from the Lackawanna River to the West Branch Susquehanna River. The subbasin encompasses most of Luzerne, Columbia, and Lackawanna Counties, and portions of Schuylkill, Northumberland, Montour, Lycoming, Sullivan, Wayne, Wyoming and Susquehanna Counties. Watersheds within this subbasin are listed as follows.

The Lackawanna River Watershed has a total drainage area of 348 square miles. Its major streams include the Lackawanna River and Roaring Brook Creek.

The Toby-Wapwallopen Creeks Watershed has a total drainage area of 403 square miles. Its major streams include Toby Creek, Wapwallopen Creek and Harvey Creek.

The Fishing Creek Watershed has a total drainage area of 386 square miles. Its major streams include Fishing Creek and Little Fishing Creek.

The Nescopeck Creek Watershed has a total drainage area of 261 square miles. Its major stream is Nescopeck Creek.

The Catawissa-Roaring Creeks Watershed has a total drainage area of 363 square miles. Its major streams include Catawissa Creek and Roaring Creek.

Subbasin (The Lower Central Susquehanna)
This subbasin has a total drainage area of 1449 square miles. Known as the Lower Central Susquehanna Subbasin, it includes the Susquehanna River from the West Branch Susquehanna River to the Juniata River. The subbasin encompasses most of Snyder County, and portions of Northumberland, Dauphin, Union, Centre, Mifflin, Juniata, Perry, Schuylkill, Columbia, Huntingdon and Montour Counties. Watersheds within this subbasin are listed as follows.

The Penns-Middle Creeks Watershed has a total drainage area of 583 square miles. Its major streams include Penns Creek and Middle Creek.

The Mahanoy-Shamokin Creeks Watershed has a total drainage area of 341 square miles. Its major streams include Mahanoy Creek and Shamokin Creek.

The Mahantango-Wiconisco Creeks Watershed has a total drainage area of 525 square miles. Its major streams include Mahantango Creek and Wiconisco Creek.

Subbasin (The Lower Susquehanna)
This subbasin has a total drainage area of 4158 square miles. Known as the Lower Susquehanna Subbasin, it includes the Susquehanna River from the Juniata River to the Maryland line, and several tributaries to the Chesapeake Bay. The subbasin encompasses all of Cumberland and York Counties, nearly all of Lancaster County, and portions of Lebanon, Adams, Dauphin, Perry, Berks, Chester, Franklin, and Schuylkill Counties. Watersheds within this subbasin are listed as follows.

The Sherman Creek Watershed has a total drainage area of 307 square miles. Its major stream is Sherman Creek.

The Conodoguinet Creek Watershed has a total drainage area of 524 square miles. Its major stream is Conodoguinet Creek.

The Clark-Paxton Creeks Watershed C has a total drainage area of 177 square miles. Its major streams include Clark Creek, Paxton Creek and Stony Creek.

The Swatara Creek Watershed has a total drainage area of 570 square miles. Its major streams include Swatara Creek, Little Swatara Creek and Quittapahilla Creek.

The Yellow Breeches Creek Watershed has a total drainage area of 237 square miles. Its major streams include Yellow Breeches Creek and Mountain Creek.

The Conewago Creek Watershed has a total drainage area of 510 square miles. Its major stream is Conewago Creek (west of the Susquehanna River).

The Chickies Creek Watershed has a total drainage area of 253 square miles. Its major streams include Chickies Creek, Little Chickies Creek and Conewago Creek (east of the Susquehanna River).

The Codorus Creek Watershed has a total drainage area of 293 square miles. Its major stream is Codorus Creek.

The Kreutz-Muddy Creeks Watershed has a total drainage area of 301 square miles. Its major streams are Kreutz Creek and Muddy Creek.

The Conestoga River Watershed has a total drainage area of 491 square miles. Its major waterway is the Conestoga River.

The Pequea-Octoraro Creeks Watershed has a total drainage area of 495 square miles. Its major streams include Pequea Creek and Octoraro Creek. It also includes the headwaters of the Elk and Northeast Rivers.

Subbasin (The Upper West Branch Susquehanna)

This subbasin has a total drainage area of 2631 square miles. Known as the Upper West Branch Susquehanna Subbasin, it includes the West Branch Susquehanna River from its origins to just downstream of Sinnemahoning Creek. The subbasin encompasses almost all of Cameron County, much of Clearfield, Cambria, Centre, Elk, and Potter Counties, and portions of Indiana, Clinton, Blair, McKean and Jefferson Counties. Watersheds within this subbasin are listed as follows.

The Sinnemahoning Creek Watershed has a total drainage area of 1034 square miles. Its major streams include Sinnemahoning Creek, Bennett Branch, and Driftwood Branch.

The Chest-Anderson Creeks Watershed has a total drainage area of 501 square miles. Its major streams are Chest Creek and Anderson Creek.

The Clearfield Creek Watershed has a total drainage area of 612 square miles. Its major stream is Clearfield Creek.

The Moshannon-Mosquito Creeks Watershed has a total drainage area of 484 square miles. Its major streams are Moshannon Creek and Mosquito Creek.

Subbasin (The Central West Branch Susquehanna)

This subbasin has a total drainage area of 2539 square miles. Known as the Central West Branch Susquehanna Subbasin, it includes the West Branch Susquehanna River from just downstream of Sinnemahoning Creek to just downstream of Pine Creek. The subbasin encompasses most of Clinton County, and portions of Centre, Tioga, Potter, Lycoming, Cameron and Union Counties. Watersheds within this subbasin are listed as follows.

The Pine Creek Watershed has a total drainage area of 983 square miles. Its major streams include Pine Creek and Little Pine Creek.

The Kettle-McElhattan Creeks Watershed has a total drainage area of 787 square miles. Its major streams are Kettle Creek and McElhattan Creek.

The Bald Eagle Creek Watershed has a total drainage area of 769 square miles. Its major streams include Bald Eagle Creek, Spring Creek, and Beech Creek.

Subbasin (The Lower West Branch Susquehanna)

This subbasin has a total drainage area of 1809 square miles. Known as the Lower West Branch Susquehanna Subbasin, it includes the West Branch Susquehanna River from just downstream of Pine Creek to its confluence with the main stem Susquehanna River. The subbasin encompasses much of Sullivan, Lycoming, Union, and Montour Counties, and portions of Columbia, Wyoming, Bradford, Tioga, Northumberland and Clinton Counties. Watersheds within this subbasin are listed as follows.

The Antes-Lycoming Creeks Watershed has a total drainage area of 498 square miles. Its major streams are Antes Creek and Lycoming Creek.

The Loyalsock Creek Watershed has a total drainage area of 514 square miles. its major stream is Loyalsock Creek.

The White Deer-Buffalo Creeks Watershed has a total drainage area of 342 square miles. Its major streams include White Deer Creek and Buffalo Creek.

The Muncy-Chillisquaque Watershed has a total drainage area of 455 square miles. Its major streams include Muncy Creek and Chillisquaque Creek.

Subbasin (The Upper Juniata)

This subbasin has a total drainage area of 1943 square miles. Known as the Upper Juniata Subbasin, it includes the Juniata River from its origins downstream to the Raystown Branch Juniata River, which it also includes. The subbasin encompasses all of Blair County, much of Bedford and Huntingdon Counties, and portions of Fulton, Cambria, Somerset and Centre Counties. Watersheds within this subbasin are listed as follows.

The Frankstown Branch-Little Juniata Rivers Watershed has a total drainage area of 738 square miles. Its major streams include the Little Juniata River and the Frankstown Branch Juniata River.

The Crooked-Standing Stone Creeks Watershed has a total drainage area of 241 square miles. Its major streams include Crooked Creek and Standing Stone Creek.

The Dunning Creek Watershed has a total drainage area of 548 square miles. Its major stream is Dunning Creek.

The Raystown Branch Juniata Watershed has a total drainage area of 416 square miles. Its major stream is the Raystown Branch Juniata River, including Lake Raystown.

Subbasin (The Lower Juniata)

This subbasin has a total drainage area of 1462 square miles. Known as the Lower Juniata Subbasin, it includes the Juniata River from just downstream of the Raystown Branch Juniata River to its confluence with the Susquehanna River. The subbasin encompasses most of Mifflin and Juniata Counties, and portions of Perry, Huntingdon, Snyder, Centre, Fulton, and Franklin Counties. Watersheds within this subbasin are listed as follows.

The Kishacoquillas-Jacks Creek Watershed has a total drainage area of 459 square miles. Its major streams include Kishacoquillas Creek and Jacks Creek.

The Tuscarora-Buffalo Creeks Watershed has a total drainage area of 557 square miles. Its major streams include Tuscarora Creek and Buffalo Creek.

The Aughwick Creek Watershed has a total drainage area of 446 square miles. Its major stream is Aughwick Creek.

Genesee River Basin

Subbasin (The Genesee)
This subbasin has a total drainage area of 99 square miles. Known as the Genesee Subbasin, it includes the entire Pennsylvania portion of the Genesee River basin. The subbasin lies within Potter County.

The Genesee River Watershed has a total drainage area of 99 square miles. This is the only watershed within the Genesee Subbasin.

Potomac River Basin

Subbasin (The Potomac)
This subbasin has a total drainage area of 1584 square miles. Known as the Potomac Subbasin, it includes the entire Pennsylvania portion of the Potomac River basin. The subbasin encompasses much of Adams, Fulton, and Franklin Counties, and portions of Bedford, Somerset, and Cumberland Counties. Watersheds within this subbasin are listed as follows.

The Wills-Town Creeks Watershed has a total drainage area of 345 square miles. Its major streams include Wills Creek and Town Creek.

The Licking-Tonoloway Creeks Watershed has a total drainage area of 402 square miles. Its major streams include Licking Creek and Tonoloway Creek.

The Conococheague-Antietam Creeks Watershed has a total drainage area of 609 square miles. Its major streams include Conococheague Creek, West Branch Conococheague Creek and Antietam Creek.

The Marsh-Rock Creeks Watershed has a total drainage area of 228 square miles. Its major streams include Marsh Creek and Rock Creek.

Delaware River Basin

Subbasin (The Upper Delaware)
This subbasin has a total drainage area of 1,816 square miles. Known as the Upper Delaware Sub-basin, it includes the area draining into the Delaware River above the Lehigh River, and embracing all of Pike and portions of Wayne, Northampton, Monroe, and Lackawanna Counties. Watersheds within this subbasin are listed as follows.

The Shehawken and Rattlesnake Creeks Watershed has a total drainage area of 292 square miles. Its major streams include Shehawken Creek, Rattlesnake Creek, Equinunk Creek and Calkins Creek.

The Lackawaxen River Watershed has a total drainage area of 369 square miles. Its major streams include the Lackawaxen River, Dyberry Creek, and Middle Creek.

The Wallenpaupack Creek Watershed has a total drainage area of 229 square miles. Its major feature is Lake Wallenpaupack.

The Shohola-Bushkill Creeks Watershed has a total drainage area of 433 square miles. Its major streams include Shohola Creek and Bushkill Creek.

The Brodhead Creek Watershed has a total drainage area of 309 square miles. Its major streams include Brodhead Creek, Marshall Creek, Pocono Creek and McMichaels Creek.

The Jacoby-Bushkill Creeks Watershed has a total drainage area of 184 square miles. Its major streams include Jacoby Creek, Bushkill Creek, Oughoughton Creek, and Martins Creek.

Subbasin (The Central Delaware)

This subbasin has a total drainage area of 1942 square miles. Known as the Central Delaware Subbasin, it includes the drainage area of the Lehigh River and several streams south of the Lehigh. The subbasin encompasses most of Bucks, Lehigh, and Carbon Counties, and portions of Northampton, Monroe, Lackawanna, Luzerne, Wayne, Schuylkill, Berks, and Montgomery Counties. Watersheds within this subbasin are listed as follows.

The Upper Lehigh River Watershed has a total drainage area of 420 square miles. Its major streams are Tobyhanna Creek and the upper portion of the Lehigh River.

The Middle Lehigh River Watershed has a total drainage area of 462 square miles. Its major streams include Pohopoco Creek, Aquashicola Creek, and the middle portion of the Lehigh River.

The Lower Lehigh River Watershed has a total drainage area of 479 square miles. Its major streams include Jordon Creek, Lehigh Creek, Saucon Creek, and the lower portion of the Lehigh River.

The Cooks-Tohickon Creeks Watershed has a total drainage area of 211 square miles. Its major streams include Cooks Creek, Tohickon Creek and Three Mile Run.

The Pidcock-Mill Creeks Watershed has a total drainage area of 134 square miles. Its major streams include Pidcock Creek, Mill Creek, Common Creek and other tributaries to the Delaware River.

The Neshaminy Watershed has a total drainage area of 236 square miles. Its major stream is Neshaminy Creek.

Subbasin (The Lower Delaware)

This subbasin has a total drainage area of 2708 square miles. Known as the Lower Delaware Subbasin, it includes the drainage area of the Schuylkill River and several nearby streams. The subbasin encompasses all of Philadelphia and Delaware Counties, most of Chester, Montgomery, and Berks Counties, and portions of Schuylkill, Carbon, Lehigh, Bucks, Lancaster, and Lebanon Counties. Watersheds within the subbasin are listed as follows.

The Upper Schuylkill River Watershed has a total drainage area of 341 square miles. Its major streams include the West Branch Schuylkill River and the upper portions of the Schuylkill River.

The Maiden Creek Watershed has a total drainage area of 300 square miles. Its major stream is Maiden Creek.

The Tulpehocken Creek Watershed has a total drainage area of 358 square miles. Its major stream is Tulpehocken Creek.

The Manatawny-French Creeks Watershed has a total drainage area of 330 square miles. Its major streams include Manatawny Creek and French Creek.

The Perkiomen Creek Watershed has a total drainage area of 362 square miles. Its major stream is Perkiomen Creek.

The Lower Schuylkill River Watershed has a total drainage area of 226 square miles. Its major streams include Wissahickon Creek and the lower portions of the Schuylkill River.

The Darby-Crum Creeks Watershed has a total drainage area of 244 square miles. Its major streams include Darby Creek, Crum Creek and Ridley Creek.

The Brandywine Creek Watershed has a total drainage area of 301 square miles. Its major stream is Brandywine Creek.

The White Clay Creek Watershed has a total drainage area of 98 square miles. Its major streams include White Clay Creek and Red Clay Creek.

The Poquessing-Pennypack Creeks Watershed has a total drainage area of 149 square miles. Its major streams include Poquessing Creek and Pennypack Creek.

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Of all streams and rivers monitored for assessment in Pennsylvania, monitoring information indicates that 68,670 miles support designated aquatic life use. A total of 11,276 miles are reported as impaired and still requiring a TMDL and 3,283 miles are impaired but have an approved TMDL. There are 2,311 miles with pollution problems not requiring a TMDL and 57 miles impaired but expected to improve in a reasonable time pending agreed upon corrective action. **The three largest sources of reported impairment are abandoned mine drainage, agriculture, and urban runoff/storm sewers.** The leading causes are siltation, metals, pH, nutrients and organic/ enrichment. Agricultural impairments are generally caused by nutrients and siltation associated with surface runoff, groundwater input and unrestricted access of livestock to streams. Estimated edge of stream nutrient and sediment loading from agricultural land in the Ohio Basin CREP area in metric tons per year are 10,546.01 Total Nitrogen, 656.36 Total Phosphorous, and 293,932.80 Total Sediment (WPC 2003). Nutrient and sediment loading reductions from the Susquehanna CREP Drainage area in Pennsylvania are reducing total sediment by 193,000 tons and total nitrogen and phosphorous loading by more than 13,000 tons annually (DeLong and Finn- USDA-NRCS 2006). Estimated edge of stream nutrient and sediment loading from agricultural land in the PA-Delaware River proposed CREP counties in metric tons per year is 557 tons total sediment, 175 tons total nitrogen and 6.1 tons of total phosphorous (PA Delaware River Basin CREP Draft Document 2010).

Low pH, elevated concentrations of metals and siltation are the result of abandoned mine drainage runoff from mine lands and refuse piles. Increased levels of nutrients and siltation, along with flow variability, are associated with urban runoff.

There are 590 assessed miles supporting the fish consumption use and 1,080 miles impaired and still requiring a TMDL. There are approved TMDLs for 711 miles. The 590 supporting miles is a conservative estimate. As a rule, when fish tissue samples are clean the results are only extrapolated to represent two miles on small streams and ten on larger. The major source of contamination resulting in fish consumption advisories is listed as unknown because it is difficult to trace the sources. The contamination can be in the soil, groundwater, stream sediment, or point sources. The contaminants do not readily breakdown and can linger for decades. In addition fish can move considerable distances. The contaminants documented are mercury, PCB, chlordane, and dioxin in

decreasing order. Atmospheric deposition is the most likely source of the mercury. There is a statewide advisory limiting fish consumption of recreational caught fish to one fish meal per week. If fish tissue mercury concentrations are greater than the one meal per week level (higher concentrations), they are placed on a list of waters impaired for fish consumption.

Recreational use is assessed primarily by measuring bacteria levels. High bacteria levels indicate conditions that might cause sickness from contact with the water. Many of the waters targeted for sampling were suspected of having bacteria problems so the 244 miles of impaired miles versus the 365 miles attaining is not unexpected. There are 8 miles with an approved pathogen TMDL. The major source of pathogens is listed as source unknown followed by agriculture. If there are several potential sources of bacteria in the watershed or varied land use, the assessor lists the source as unknown until better information becomes available.

Potable water supply use was supported in 1,569 miles, not in 88, and 36 had approved TMDLs. This potable water supply use is measured before the water is treated for consumption. The primary assessment measures are nitrate+nitrite levels and bacteria. There are some records listed for pH and metals coming from abandon mine drainage.

A total of 74,652 acres of Commonwealth lakes have been assessed for aquatic life use. Of these, 36,295 acres support the use. There are 5,593 assessed lake acres that are impaired and still require a TMDL. Approved TMDLs are in place for 11,898 acres. Pollution problems that do not require TMDLs impair 20,866 acres. The major sources of aquatic life use impairment in lakes are “other”, and agriculture. “Other” is the source used for lakes which are impaired but not requiring a TMDL. These lakes show short term fluctuations in DO or pH but support a healthy fish community. The primary stressors are nutrients, suspended solids, organic enrichment, low DO, and pH. Low DO and high pH problems are associated with summer lake stratification.

Fish consumption assessments covered 36,057 lake acres (excluding Lake Erie but not Presque Isle Bay). Of these, 2,987 acres are assessed as supporting, 27,587 acres are reported as requiring a TMDL, and 5,483 acres have approved TMDLs. The reason for the large proportion of impaired acres is the implementation of a risk-based mercury fish consumption advisory methodology in 2001. Nearly all of the lake advisories are due to mercury with atmospheric deposition listed as the source.

A total of 70,306 lake acres have been assessed for recreation use support and only 1,649 of those acres require TMDLs. Pathogens and nutrients from agriculture and unknown sources are responsible for the impairments.

All 11,469 acres assessed for potable water supply use were found to be attaining that use.

Groundwater

Pennsylvania is divided into regions of distinct geology and landscape. The differences in geology and landscape result in differences in the movement and quality of groundwater in various parts of the state. The following map and sketches, Figure GW-1, show the geology and resulting landscape in different regions of Pennsylvania.

Region 1 (Atlantic Coastal Plain province) is a narrow strip of flat lowlands underlain by layers of clay, sand, and gravel that are tilted very slightly to the southeast.

Region 2 (Piedmont, Blue Ridge, and New England provinces) is subdivided into rolling lowlands (2A) and broad highlands and ridges (2B). This region is underlain by a great variety of rock types, many of which have been intensely deformed and altered, producing the most complex geology in Pennsylvania.

Region 3 (Ridge and Valley province) is a mountainous area consisting of long valleys underlain by limestone and shale, alternating with long narrow ridges underlain by hard sandstone. The rock layers in this region have been deformed into a series of folds that differ in size and shape. The northeastern part of the province (3B) is covered with glacial sediments.

Region 4 (Appalachian Plateaus province) is a rugged, hilly area consisting of narrow valleys eroded into plateaus and broad ridges underlain by shale or sandstone layers that are nearly horizontal or gently titled. The northeastern and northwestern parts of the province (4B) are covered with glacial sediments.

Region 5 (Central Lowland province) is a narrow strip along Lake Erie. It consists of gently rolling land underlain by gently tilted shale and siltstone layers. It is marked by low ridges of sand and gravel that are beaches formed by Lake Erie, when its lake level was much higher at the end of the last Ice Age than it is now.

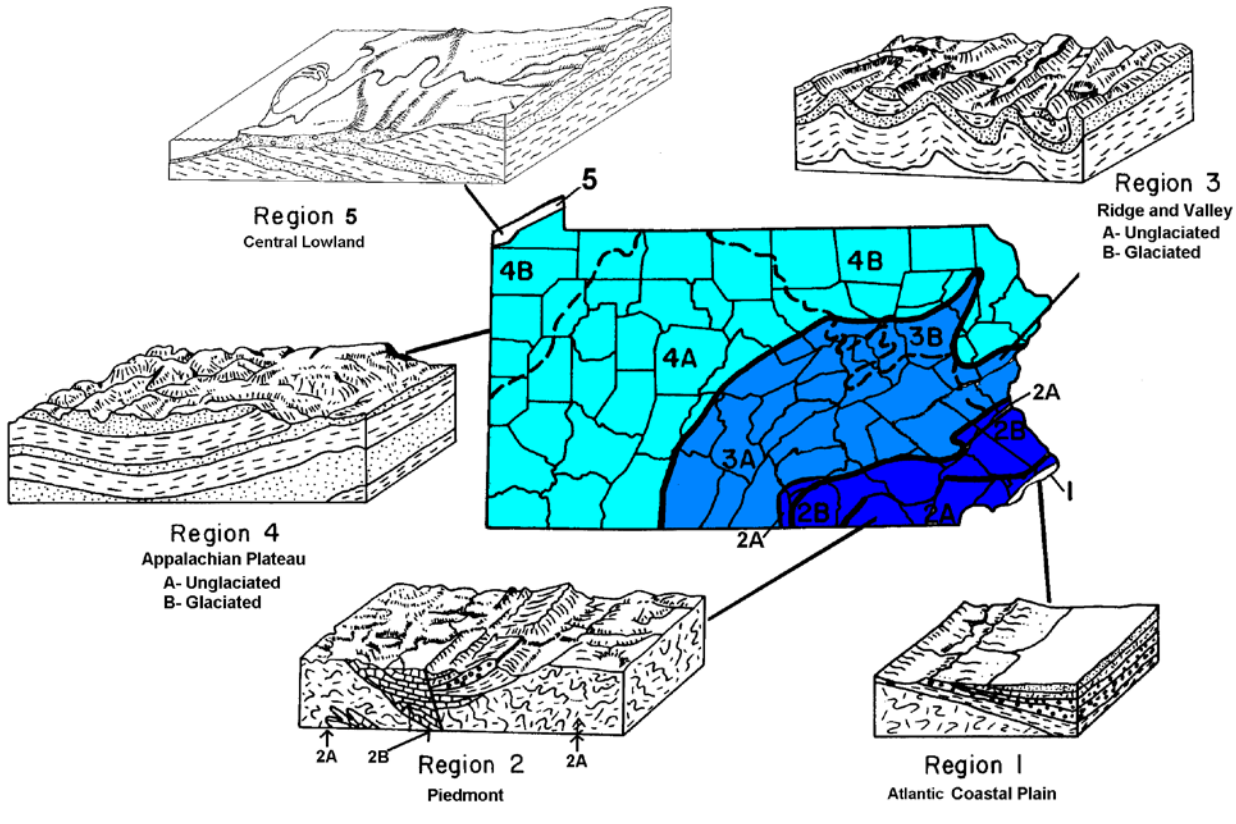


Figure GW-1

Fleeger, G. M., 1999, The Geology of Pennsylvania's Groundwater (3rd ed.): Pennsylvania Geological Survey, 4th ser., Educational Series 3, 34 p.

Pennsylvania Web site: www.state.pa.us, Department of Conservation and Natural Resources- www.dcnr.state.pa.us
Bureau of Topographic and Geologic Survey- www.dcnr.state.pa.us/topogeo y

A generalized map of Pennsylvania with types of groundwater aquifers is shown in Figure GW-2. Information is also included relative to well depths and yields statewide based upon aquifer types.

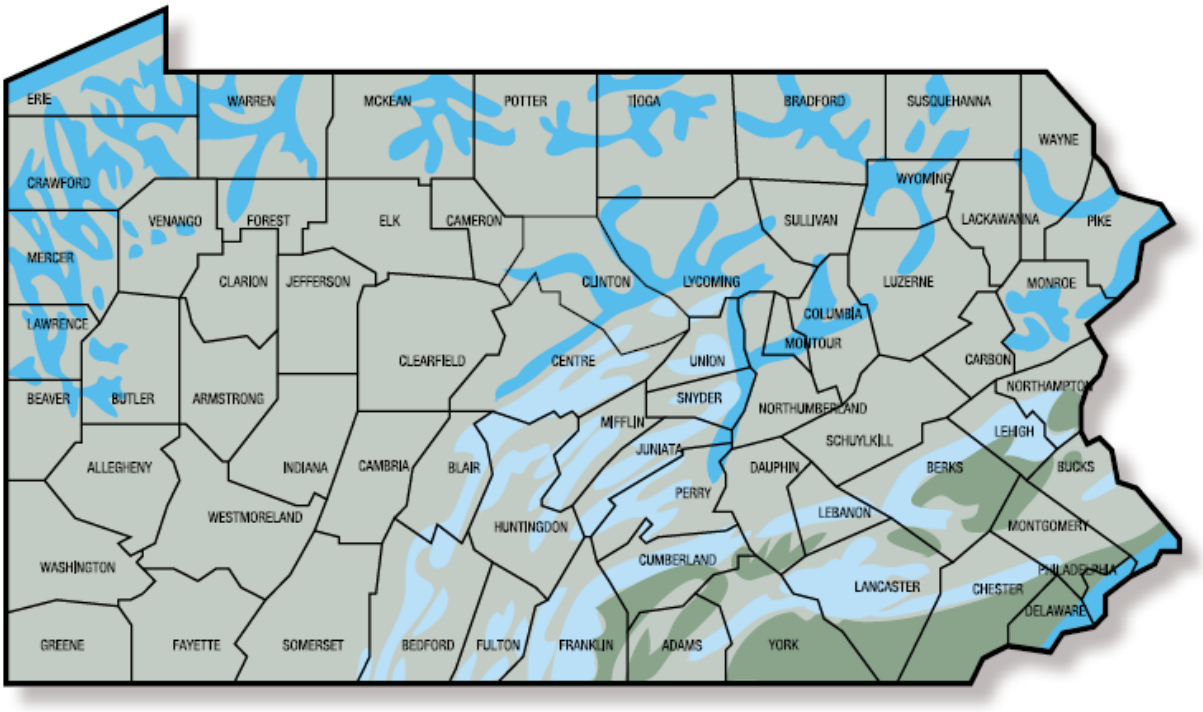


Figure GW-2. The four major types of groundwater aquifers in Pennsylvania.

Generalized map of aquifer and well characteristics in Pennsylvania

Aquifer type and description		Depth (ft)		Yield (gal/min)		Typical water quality
		Common range	May exceed	Common range	May exceed	
Unconsolidated sand and gravel aquifers: sand, gravel, clay, and silt		20–200	250	100–1,000	2,300	Soft water with less than 200 mg/l dissolved solids; some high iron concentrations
Sandstone and shale aquifers: fractured sandstone and shale		80–200	400	5–60	600	Sandstone layers have soft water with less than 200 mg/l dissolved solids; shale layers have hard water and 200–250 mg/l dissolved solids
Carbonate rock aquifers: fractured limestone and dolomite		100–250	500	5–500	3,000	Very hard water with more than 250 mg/l dissolved solids
Crystalline rock aquifers: fractured schist and gneiss		75–150	—	5–25	220	Soft water containing less than 200 mg/l dissolved solids; some moderately hard water with high iron concentrations

Note: ft = feet; mg/l = milligrams per liter; gal/min = gallons per minute

From *Pennsylvania Geological Survey*, 1999

GroundWater Quality Data for Pennsylvania

Under a joint funding agreement with the DEP, the USGS has issued a digital Data Series report that provides a compilation of ambient groundwater quality data for a 25-year period based on water samples from wells throughout Pennsylvania. Eight data sources from local, state, and federal agencies were used in the compilation that covers 12 different analyte groups. The data are presented both in terms of the 35 watershed-based planning teams used by DEP as well as the 13 major geolithologic units determined. Over 8,000 wells were included in the project and the number of analyses ranged from several thousand for nutrients and other inorganic compounds to a few hundred for wastewater compounds. The number of wells sampled varies considerably across the state with most being concentrated near major urban centers. Minimal data exists for about a third of the state.

When compared to maximum contaminant levels, the analyte group with the highest MCL exceedance was microbiological (53%), followed by major ions (34%). The lowest MCL exceedances were for wastewater compounds (0 %) and herbicides/pesticides (0.3%). MCL exceedances for volatile organic compounds and nutrients were 14% and 8.8%, respectively. With limited monitoring of ambient ground water underway in only a handful of basins under the Ambient/Fixed Station Monitoring Networks, this compilation helped fill in data gaps and shed light on how to establish a true statewide groundwater monitoring network. (Low, D.J. and Chichester, D.C., 2006)

The U.S. Geological Survey (USGS) in cooperation with the Pennsylvania Department of Environmental Protection (PADEP), provided a compilation of ground-water-quality data for a 25-year period (January 1, 1979, through August 11, 2004) based on water samples from wells. The data are from eight source agencies—Borough of Carroll Valley, Chester County Health

Department, Pennsylvania Department of Environmental Protection-Ambient and Fixed Station Network, Montgomery County Health Department, Pennsylvania Drinking Water Information System, Pennsylvania Department of Agriculture, Susquehanna River Basin Commission, and the U.S. Geological Survey. The ground-water-quality data from the different source agencies varied in type and number of analyses; however, the analyses are represented by 12 major analyte groups: biological (bacteria and viruses), fungicides, herbicides, insecticides, major ions, minor ions (including trace elements), nutrients (dominantly nitrate and nitrite as nitrogen), pesticides, radiochemicals (dominantly radon or radium), volatile organic compounds, wastewater compounds, and water characteristics (dominantly field pH, field specific conductance, and hardness).

The number of wells sampled for ground-water-quality data varies considerably across Pennsylvania. Of the 8,012 wells sampled, the greatest concentration of wells are in the southeast (Berks, Bucks, Chester, Delaware, Lancaster, Montgomery, and Philadelphia Counties), in the vicinity of Pittsburgh, and in the northwest (Erie County). The number of wells sampled is relatively sparse in south-central (Adams, Cambria, Cumberland, and Franklin Counties), central (Centre, Indiana, and Snyder Counties), and north-central (Bradford, Potter, and Tioga Counties) Pennsylvania. Little to no data is available for approximately one-third of the state. Water characteristics and nutrients were the most frequently sampled major analyte groups; approximately 21,000 samples were collected for each group. Major and minor ions were the next most-frequently sampled major analyte groups; approximately 17,000 and 12,000 samples were collected, respectively. For the remaining eight major analyte groups, the number of samples collected ranged from a low of 307 samples (wastewater compounds) to a high of approximately 3,000 samples (biological).The number of samples that exceeded a maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) by major analyte group also varied. Of the 2,988 samples in the biological analyte group, 53 percent had water that exceeded an MCL. Almost 2,500 samples were collected and analyzed for volatile organic compounds; 14 percent exceeded an MCL.

Other major analyte groups that frequently exceeded MCLs or SMCLs included major ions (17,465 samples and a 33.9 percent exceedence), minor ions (11,905 samples and a 17.1 percent exceedence), and water characteristics (21,183 samples and a 20.3 percent exceedence). Samples collected and analyzed for fungicides, herbicides, insecticides, and pesticides (4,062 samples), radiochemicals (1,628 samples), wastewater-compounds (307 samples), and nutrients (20,822 samples) had the lowest exceedences of 0.3, 8.4, 0.0, and 8.8 percent, respectively.

The quality of groundwater is a concern in many areas of the state. Contrary to popular belief, natural groundwater is not always free of pollutants and impurities. Some pollutants occur naturally when water interacts with impurities in the rock layers encompassing an aquifer. For example, hard water deposits from calcium and magnesium are common in groundwater from limestone aquifers, while hydrogen sulfide, iron, and manganese often occur in certain sandstone and shale aquifers. Also worth noting is that some of the naturally occurring pollutants discussed above, such as iron, manganese and sulfate can also come from mining. Additional pollutants related to oil and gas well resource development and exploitation have contaminated groundwater in many areas of the Commonwealth. Recent Marcellus shale exploitation across Pennsylvania Agricultural uses have been linked to nitrates from fertilizers in groundwater.

Wetlands

Pennsylvania has 403,924 acres of wetlands and 412,905 acres of deep-water habitats such as ponds and lakes. About 1.4 percent of the Commonwealth's land surface is represented by wetlands, with 97 percent classified as palustrine wetlands. Approximately 76 percent of the palustrine wetlands are further classified as forested and scrub/shrub wetlands. Lacustrine wetlands, mainly composed of the shallow zone (less than 6.6 feet deep) of Lake Erie, represent about two percent of the total, while riverine wetlands make up the remaining one percent. Pennsylvania has 512 acres of tidal wetlands in the Delaware Estuary.

Wetlands are most abundant in the glaciated portions of northeastern and northwestern Pennsylvania. Crawford, Mercer, Erie, Monroe, Pike, Wayne and Luzerne counties contain 40 percent of the Commonwealth's wetlands. Pike and Monroe counties have the highest percentages of land covered by wetlands with 6.7 percent and 6.4 percent, respectively.

The 1987 COE Wetland Delineation Manual (USACE 1987) specifies three criteria for the identification of wetlands including hydrophytic vegetation, hydric soil, and positive indicators of wetland hydrology. Wetlands are defined by the Environmental Protection Agency (EPA) (Federal Register 1980) and the COE (Federal Register 1982) as:

"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." (33 CFR 3283 (b) 1984)

Statewide Wetland Acreage Totals

Wetland and Deepwater Habitat Acreage

Pennsylvania possessed 403,924 acres of wetlands and 412,905 acres of deepwater habitats, excluding farmed wetlands, and smaller rivers and streams that either appeared as linear features on wetland maps or wetlands that were not identified due to their small size or other limitations of the aerial photos. About 1.4 % of the state's land surface is represented by wetlands. About 97% of the state's wetlands fall within the palustrine system (Table 6). Lacustrine wetlands, mainly composed of the shallow water zone (less than 6.6 feet in depth) of Lake Erie, represented about two percent of the state total, while riverine wetlands made up the remaining one percent.

Nearly 393,000 acres of palustrine wetlands were mapped by the National Wetlands Inventory Project. Thirty-six percent of Pennsylvania's wetlands were deciduous forested wetlands, excluding mixed forested-shrub and forested emergent wetlands. In contrast, evergreen forested wetlands only accounted for 8 % of the state's wetlands. Small ponds comprised about 15 % of the total. Emergent wetlands (i.e., marshes and wet meadows) and shrub swamps were nearly equally abundant, making 13% and 12% of the state's wetlands, respectively.

County Wetland Acreage Totals

Wetlands were most prevalent in Crawford, Erie, Monroe, Pike, Wayne, Luzerne, and Mercer counties (Table 7). These counties contained 40% of the state's wetlands. Wetlands were also common in Bradford, McKean, Warren, Susquehanna, Bucks, and Lackawanna counties. Pike and Monroe Counties had the highest percentages of land area covered by wetlands, with 6.7% and 6.4%, respectively (Table 7). Other counties with 2.0% or more of their land surface represented by

wetlands included: Crawford (5.2%), Erie (4.8%), Wayne (4.4%), Mercer (3.7%), Lackawanna (3.2%), Luzerne (3.0%), Bucks (2.6%), Wyoming (2.5%), Susquehanna (2.3%), McKean (2.2%), Sullivan (2.2%), Warren (2.2%), Adams (2.1 %), Bradford (2.0%), and Lawrence (2.0%).

Deepwater habitats in Pennsylvania totaled 412,905 acres. Due to Lake Erie and many reservoirs and natural lakes, lacustrine waters predominated with 242,433 acres, representing 58.7% of the total. Freshwater rivers and streams made up 41.2 % or 170,207 acres. Only 265 acres of estuarine waters were inventoried; these areas represent the upper limit of brackish water penetration in the Delaware River. Table 8 summarizes deepwater habitat acreages for each county. Due to the presence of Lake Erie, Erie County had the most lacustrine deepwater habitat acreage (103,677). Other counties with more than 5,000 acres of lacustrine waters included Lancaster (15,258 acres), Crawford (13,811), Wagner (10,647), Pike (9,515), Huntington (7,763), Warren (6,536) and Mercer (5,339). Dauphin County had the highest acreage of riverine deepwater habitats, with 19,972 acres. Northumberland County had 11,540 acres, while other counties with more than 5,000 acres of rivers and streams included Allegheny (9,564), Lancaster (6,618), Lycoming (5,661), Venango (5,462), and Armstrong (5,425). Wetland and deepwater habitat acreage data for each county (in alphabetical order) are presented on the following one page summaries. (Note: Data presented represents polygon acreages from NWI maps and does not include linear features, e.g., narrow streams, or farmed wetlands.)
http://www.fws.gov/northeast/wetlands/publications.html#9statewlreports

Floodplains
Floodplains are areas of low-lying land that are subject to inundation by the lateral overflow of waters from rivers or lakes with which they are associated. EO 11988, Floodplain Management, requires that federal agencies: “take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, heath and welfare, and to restore and preserve the natural and beneficial values served by floodplains.”

Accordingly, agencies must review FEMA floodplain maps to determine whether a proposed action is located in or will impact 100-year floodplains. A 100-year floodplain is that area that would be inundated by a 100-year flood, a flood that has a 1-percent chance of being equaled or exceeded in any given year. There is no completed or calculated total acreage of floodplains in Pennsylvania.

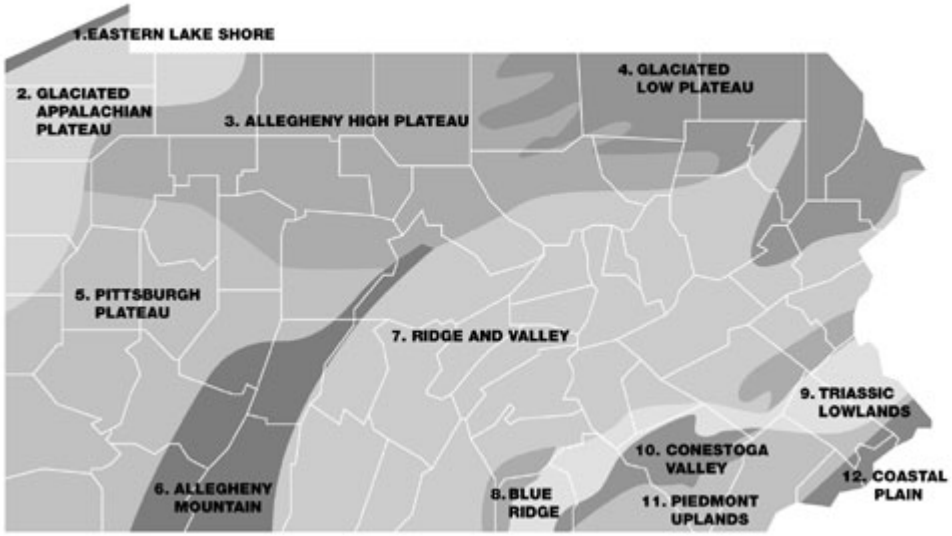
3.3 SOILS

For this analysis, the discussion of soils will include an in-depth discussion of soils to include the origin and general characteristics of soils as well as those aspects of soils relevant to agriculture.

Region of Influence
The ROI includes all land within Pennsylvania.

SOILS
Twelve broad soil regions can be distinguished in Pennsylvania (Figure S-1). They are described in the sections that follow.

Figure S-1 Soils of Pennsylvania



1. Eastern Lake Shore

The soils on the shores of Lake Erie developed in beach sand and lacustrine silts and clays. The soils developed in the beach sands are mostly sandy and gravelly and have rapid internal drainage, although some have a shallow water table where the silts and clays underlie the beach deposits. The landscape is mostly level, and erosion potential is therefore low. The lacustrine soils generally contain few rock fragments and have moderate root zone available water-holding capacity. This region has a mild climate due to the proximity of Lake Erie, making it suitable for the cultivation of rather unique crops such as grapes.

2. Glaciated Region of the Appalachian Plateau

The soils in northwest Pennsylvania are derived from glacial till. Glacial till is a dense material that was once under huge masses of ice (glaciers). Water percolates very slowly through the till. Many soils in this region also have fragipans, a dense subsoil that cannot be penetrated by roots and allows very slow water and air movement. The poor drainage of many soils in this region is characterized by gleying (gray color of reduced iron) and mottling (spots of color) caused by a perched seasonal high water table and impeded percolation.

The landscape is mostly level or undulating, and erosion potential is low to moderate. Rock fragments can be present if the till is near the soil surface. The root zone available water-holding capacity of these soils is primarily determined by the depth to the impermeable layer. If the soil is shallow, crop roots will have a small volume of soil to explore for water. The result is that crops may suffer drought stress in summer on soils that are saturated in spring. Although the growing season is short, the soils in this area can be highly productive if properly drained.

3. Allegheny High Plateau

Soils in the Allegheny High Plateau of northcentral Pennsylvania developed primarily in sandstone. The dominant texture of these soils is sandy loam. They are mostly well drained. If slopes are steep, erosion potential is substantial. Rock fragment content can be high. The root zone available water-

holding capacity of these soils is often low due to their coarse texture and the presence of rock fragments. The growing season in this region is short (<100 days) because of the high elevation. Due to their low agricultural productivity, most soils of the Allegheny Plateau are under forest vegetation, but there are some notable exceptions, such as potato and pasture production.

4. Glaciated Low Plateau

The soils in northeast Pennsylvania are derived from glacial till. The till in this area is typically more discontinuous than in the northwestern portion of the state. Some of these soils have a fragipan at shallow depth and therefore are somewhat poorly drained. The surface texture of these soils is predominantly silt loam. The landscape is undulating and the erosion potential is low to moderate. Rock fragments are common in the soils of this area. Some of the soils have very low root zone available water-holding capacity due to their limited rooting depth. The growing season is short due to the elevation and northern latitude.

5. Pittsburgh Plateau

The Pittsburgh Plateau in central and southwest Pennsylvania is dominated by soils developed in acid clay shales and interbedded shales and sandstones. These soils contain more clay and silt than those derived from sandstone. The surface texture of these soils is predominantly silt loam. The soils are usually well drained. The landscape of this region has rather steep slopes, and erosion is a major concern. Many of these soils also contain substantial amounts of rock fragments. The root zone available water-holding capacity of many soils in this region is moderate due to their limited depth. However, in the southwest region of this area, soils tend to be deeper and have a moderately high root zone available water-holding capacity. The growing season is rather short in most of the area, with the exception of the southwest. Agriculturally, the most productive area is located in the southwest of this region.

6. Allegheny Mountains

The Allegheny Mountain section is dominated by soils developed in sandstone. The texture is mostly sandy loam to loamy sand. Drainage is good. The landscape is often steeply sloping, and erosion potential is high. Rock fragments are common, resulting in low root zone available water-holding capacity. The high elevation of the Allegheny Mountain section gives this region a short growing season (<100 days). Much of this area is under forest vegetation, although there are some important agricultural areas.

7. Ridge and Valley Province

The ridges and valleys in the central/ eastern part of Pennsylvania are a distinct landscape characterized by sandstone ridges, shale footslopes, and shale and limestone valleys. Sandy loam soils similar to those on the Allegheny High Plateau and Allegheny Mountains sections are found on the forested ridgetops. Colluvial soils that are a mixture of sandstone and shale are found on the slopes. In the valleys, limestone-derived soils predominate, although some are shale-derived. The limestone-derived soils are among the most productive in Pennsylvania. They are usually deep, well drained, have high root zone available water-holding capacity, and have few rock fragments. The shale-derived soils are less productive because of their acidic nature, steep slopes, and generally low root zone available water-holding capacity. The soils in the valleys are on level or undulating land, and erosion potential is low to moderate. The valley soils are used intensively for agriculture.

8. Blue Ridge

The Blue Ridge province covers eastern Franklin, southern Cumberland, and western Adams Counties. The soils in this area are derived primarily from igneous and metamorphic rocks. Igneous rocks are of volcanic origin. Metamorphic rocks have been altered under great pressure below the surface of the earth. The soils in these areas are generally well drained. Their surface texture is silt loam. They often contain significant amounts of rock fragments. Steep slopes are common, giving many soils in this area high erosion potential. The root zone available water-holding capacity of the soils is commonly moderate. The high elevation results in a short growing season. Much of this area is under forest.

9. Triassic Lowlands

The soils in the Triassic Lowland section of the Piedmont developed in reddish sandstone, shale, and siltstone. The soils are generally silt loams, well drained, and located on sloping land. The erosion potential of these soils is moderate to high. The Abbottstown-Doylestown-Reading association in Bucks and Montgomery Counties is an exception to this rule. The soils in that part of this region are poorly drained and are located on level land. The soils in the Triassic Lowland section can contain substantial amounts of rock fragments. The root zone available water-holding capacity of these soils is moderate. The region has a long growing season.

10. Conestoga Valley

Limestone-derived soils predominate in the Conestoga Valley section. These soils are comparable to those in the valleys of the Ridge and Valley province. They have a silt loam surface texture and a clayey subsurface horizon. They are well drained. The landscape is level to undulating, and erosion potential is low. Rock fragments are scarce, and the root zone available waterholding capacity is high. The growing season is long. These are productive soils that are used intensively for agriculture.

11. Piedmont Upland

Soils in the Piedmont Upland section are predominantly derived from metamorphic rock. These soils have a silt loam texture, and are well drained. The landscape has rather steep slopes, and erosion potential is moderately high. Rock fragments are scarce on these soils. Their water-holding capacity is moderate to high. The growing season is long. These soils can be very productive if they are deep, and they are used intensively for agriculture.

12. Coastal Plain

The soils of the Coastal Plains section developed in coastal sands. These soils usually have a sandy surface texture and are well drained. Because the topography is level, erosion potential is typically low. The soils contain few rock fragments but have moderate root zone available water content due to the coarse soil texture. This region has the longest and warmest growing season of Pennsylvania. Most of the area is occupied by the city of Philadelphia and its suburbs.

SOIL EROSION

Soil erosion is the most important soil degradation problem in Pennsylvania. It contributes to the loss of soil quality and pollution of surface waters. Soil erosion above a certain level will reduce soil productivity over the long haul. Soil erosion exposes subsoil, which has often poor qualities for crop establishment and growth. It can also lead to stand loss by sediment deposition. Three types of

soil erosion are classified as water erosion, wind erosion, and tillage erosion. Water and tillage erosion are the more important types of erosion in Pennsylvania.

3.4 AIR QUALITY

The Clean Air Act (CAA) requires the maintenance of National Ambient Air Quality Standards (NAAQS). NAAQS, developed by EPA to protect public health, establish limits for six criteria pollutants: ozone (O3), nitrogen dioxide (NO2), carbon monoxide (CO), sulfur dioxide (SO2), lead (Pb), and respirable particulates [particulate matter less than 10 microns in diameter] (PM10). CAA requires states to achieve and maintain the NAAQS within their borders. Each state may adopt requirements stricter than those of the national standard. Each state is required by the EPA to develop a State Implementation Plan (SIP) that contains strategies to achieve and maintain the national standard of air quality within the state. Areas that violate air quality standards are designated as nonattainment areas for the relevant pollutants. Areas that comply with air quality standards are designated as attainment areas for relevant pollutants.

Region of Influence

The ROI for this air quality analysis includes the Southwest Pennsylvania Intrastate (197) and Northwest Pennsylvania Interstate (178) Air Quality Control Regions

Affected Environment

Three agencies in Pennsylvania conduct air quality monitoring to evaluate compliance with air quality standards: Department of Environmental Protection (DEP), Allegheny County Health Department, and Philadelphia Department of Health Air Management Services (DEP 2001). DEP focuses their monitoring efforts in those areas having high population density and/or high levels of contaminants. The majority of the monitoring is conducted in the 13 air basins throughout the state. Air basins are geographic areas where air tends to stagnate, typically valleys, and would therefore have higher concentrations of pollutants. These “air basins” are defined in 25 Pa. Code § 121.1 and consist of the following geographical areas:

- Allegheny County Air Basin
- Allentown - Bethlehem - Easton Air Basin
- Erie Air Basin
- Harrisburg Air Basin
- Johnstown Air Basin
- Lancaster Air Basin
- Lower Beaver Valley Air Basin
- Monongahela Valley Air Basin
- Reading Air Basin
- Scranton, Wilkes-Barre Air Basin
- Southeast Pennsylvania Air Basin
- Upper Beaver Valley Air Basin
- York Air Basin

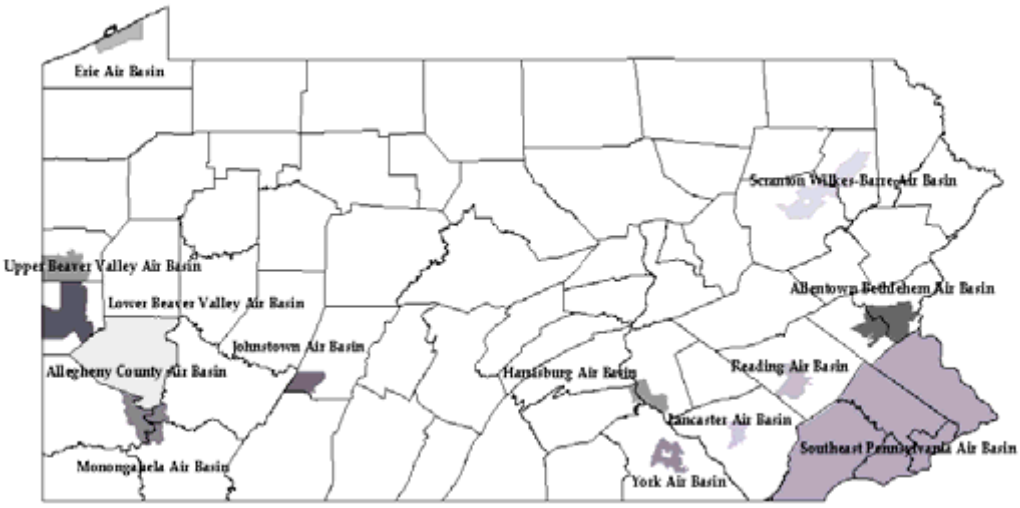


Figure 3.4-1 Map of Pennsylvania Air Basins

Air monitoring surveillance is conducted in the 13 air basins. The Allegheny County Health Department conducts the majority of the air quality monitoring in the Allegheny County Air Basin. The Philadelphia Department of Public Health, Air Management Services, which is located in the Southeast Pennsylvania Air Basin, conducts air monitoring only for the Philadelphia County portion of the air basin. In addition to the aforementioned 13 air basins, DEP conducts surveillance in several non-air basin regions. DEP also performs monitoring in Allegheny County at the Carnegie Science Center in Pittsburgh as part of an air quality exhibit. A listing of DEP air quality monitoring site locations is provided in Appendix C of this report.

DEP continued in 2007 with a cooperative agreement with Pennsylvania State University's (PSU) Department of Plant Pathology to conduct ozone monitoring in four remote areas - Adams County (near Biglerville), Centre County (near State College, Clearfield County (near Moshannon) and Tioga County (near Gleason). The university uses ozone data collected from this cooperative monitoring effort to determine the extent of detrimental effects to Pennsylvania's forests and crops, and to assess ozone transport in rural Pennsylvania.

DEP devotes the bulk of its ambient air monitoring program to monitoring Pennsylvania's air for pollutants for which health-based National Ambient Air Quality Standards (NAAQS) have been established and defined in the Federal Code of Regulations (CFR). These pollutants include ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter (PM2.5 and PM10) and lead. Supplemental particulate matter monitoring results presented in this report include those for total suspended particulates (TSP), nitrates, and sulfates. In addition to NAAQS-related monitoring, DEP also monitors for two contaminants, beryllium and hydrogen sulfide, for which air quality standards have been established and defined in the Pennsylvania Code.

DEP operates one Photochemical Assessment Monitoring Station (PAMS) air monitoring station in Arendtsville, Pennsylvania. This site utilizes specialized air monitoring instruments to gather air quality information relating to volatile organic compounds (VOCs) - chemical compounds that serve as precursors for ozone formation. DEP also operates a monitor for Mercury, another toxic air pollutant, at a monitoring station in Lancaster, Pennsylvania.

DEP utilizes federally-approved sampling and analytical methods for all NAAQS-regulated pollutants.

Acid Rain and Mercury in Rain

DEP, under cooperative agreement with the Pennsylvania State University, has maintained the Pennsylvania Atmospheric Deposition Monitoring Network (PADMN) since 1981. The purpose of this program is to determine the chemistry of rain falling in Pennsylvania for environmental assessment purposes. Parameters monitored include pH, sulfate, nitrate, ammonium, chloride, calcium, magnesium, potassium, sodium and specific conductance. Starting in 1997, measurements of the amount of mercury in rain were included as part of the National Atmospheric Deposition Program Mercury Deposition Network (NAPD/MDN).

Eighteen acid rain monitoring sites were in operation in Pennsylvania in 2007. Included in this network were eleven acid rain and seven mercury monitoring sites supported by the DEP. The remaining sites were National Atmospheric Deposition Program National Trends Network (NADP/NTN) sites and were supported by various federal agencies.

Latest Air Quality Data Trends

The 2007 Ambient Air Quality Monitoring and Emission Trends Report contains summaries of air quality data collected by DEP's Bureau of Air Quality Ambient Air Monitoring Program during the 2007 calendar year. Monitoring results from 207 air quality monitors at 58 sites throughout the Commonwealth of Pennsylvania were reviewed. Multi-year trends from 1999 through 2007 from data submitted to DEP for point source and non-point source air quality data is presented for selected pollutants.

Data collected during 2007 demonstrate that of the six criteria pollutants regulated by the Environmental Protection Agency (EPA), sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO) and lead (Pb) continue to remain in concentrations well below the National Ambient Air Quality Standards (NAAQS). Statewide average concentrations for these pollutants have been consistently below one-half the level of their respective NAAQS for the past ten years. Ozone (O3) and particulate matter (PM), however, continue to be a challenge in Pennsylvania. While the statewide average ozone concentration has declined by about 12% over the past ten years, the level remains close to the ozone 8-hour NAAQS. The highest ozone concentrations are found in southeastern Pennsylvania, where two counties, Bucks and Delaware, exceeded ozone 8-hour NAAQS concentration levels in 2007. Particulate matter concentrations are measured using two criteria – an aggregate average of all particles less than or equal to 10 microns in diameter (PM10), and an average isolating fine particles, or particles with a diameter less than or equal to 2.5 microns (PM2.5). Although statewide average PM10 concentrations have remained at levels less than half of the PM10 annual NAAQS for the past ten years, fine particle concentrations have hovered near the level of the PM2.5 annual and 24-hour NAAQS and have demonstrated a slight increasing trend during that time. The highest PM2.5 concentrations are predominantly found in southeastern and western Pennsylvania. Nine counties, Beaver, Berks, Chester, Dauphin, Lancaster, Northampton, Washington, Westmoreland and York exceeded the level at least one of the PM2.5 annual or 24-hour NAAQS during 2007.

Air toxics monitoring continued in 2007. Data from the Arendtsville transport study site demonstrate an overall decline in Photochemical Assessment Monitoring Station (PAMS) hydrocarbon compounds over the past ten years.

Emission inventories data also show a decreasing trend for the most common point source pollutants in Pennsylvania. From 1999 through 2007 sulfur dioxide (SO2) emissions have decreased 5%, nitrogen oxides (NOx) emissions have decreased 15%, carbon monoxide (CO) emissions have decreased 14% and volatile organic compounds (VOC) emissions have decreased 40%. (DEP-BAQ 2007 Report)

3.5 RECREATIONAL RESOURCES

Definition of Resource

Recreational resources are those activities or settings either natural or manmade that are designated or available for recreational use by the public. In this analysis, recreational resources include lands and waters utilized by the public for hunting, fishing, birding, canoeing and other water sports, and related activities.

Region of Influence

The ROI for recreational resources includes all lands and the bodies of water that lie within the Commonwealth and the waters downstream from affected areas.

Affected Environment

Because the lands that could be enrolled in VPA-HIP are privately held, access to these lands for recreational activities is controlled by landowners. However, there are existing PGC Public Access Cooperator lands and state and federal public lands available for recreation statewide. The Allegheny National Forest is the only national forest in Pennsylvania. It covers over 513,000 acres in northwest Pennsylvania in Elk, McKean, Forest and Warren Counties. The forest contains two wilderness areas, Hickory Creek Wilderness and Allegheny Islands Wilderness. Additionally, there are 20 state forests, 117 state parks and 3 conservation areas in Pennsylvania providing 2.4 million acres for outdoor recreation. The Pennsylvania Game Commission State Game Land system provides nearly 1.45 million acres primarily for hunting and wildlife related recreation. These public lands provide recreational activities such as hunting, hiking, camping, fishing, biking, and backpacking. Lands available for public hunting including private, state and federal, and NGO lands and those lands managed under separate agreement by the Pennsylvania Game Commission are shown on the large Public Hunting Map example at the end of this section. These maps are currently available on the PGC website by county of interest. Hunting and fishing require state issued licenses for both public and private lands.

There are 6 federally designated Wild and Scenic Rivers in the Commonwealth and 13 rivers, streams or portions thereof designated as Pennsylvania Scenic Rivers. The federally designated Rivers are the Allegheny River and the Clarion River in northwestern Pennsylvania, the Upper, Middle and Lower Delaware Rivers along the eastern boundary of Pennsylvania with New Jersey and New York and White Clay Creek in southeastern Pennsylvania near the Delaware border. See Table SR-1 below.

Pennsylvania			Federal		
	Name	*Date designated*		*Name*	*Date designated*
1	LeTort Spring Run	March 1988	1	Middle Delaware River	September 1965
2	Yellow Breeches Creek	December 1992	2	Upper Delaware River	November 1978
3	Stony Creek	March 1980	3	Allegheny River	April 1992
4	Pine Creek	December 1992	4	Clarion River	October 1996
5	Lehigh River	April 1982	5	White Clay Creek	October 2000
6	Lick Run	December 1982	6	Lower Delaware River	November 2000
7	French Creek	April 1982			
8	Schuylkill River	November 1978			
9	Tulpehocken Creek	December 1992			
10	Lower Brandywine	June 1989			
11	Octoraro Creek	October 1983			
12	Tucquan Creek	December 1988			
13	Bear Run	December 1988			

Table SR-1 Scenic Rivers in Pennsylvania

The classification criteria for Scenic Rivers in Pennsylvania is that rivers included in the Scenic Rivers System are classified, designated and administered as Wild, Scenic, Pastoral, Recreational and Modified Recreational Rivers. A designated river may have more than one classification; each segment has its own classification and is "long enough" to provide a meaningful experience. Wild or Scenic River designations are intended to preserve the primitive qualities, the natural, and aesthetic values of a river, and also to protect the existing character and quality of both the river and its adjacent land environment. Wild rivers are free-flowing and supportive of native fish and wildlife. The shorelines and adjacent environments are pristine in character. Access to segments is restricted to foot and/or nonpowered watercraft. While significant access points are by private land, some of these rivers/streams are located on State Forest lands. See Figure 3.5-1.

Yellow Breeches Creek	(Michaux State Forest)
Pine Creek	(Tioga State Forest)
Lick Run	(Sproul State Forest)
Schuylkill River	(Weiser State Forest)
Octorora Creek	(Valley Forge State Forest)

Figure 3.5-1 Pennsylvania Scenic Rivers on state forest land

The map below, Figure 3.5-2, shows the location of Pennsylvania designated Scenic Rivers. Federally designated Scenic Rivers are not depicted in this map.

Figure 3.5-2 Pennsylvania Scenic Rivers

A discussion of the economic impacts of hunting, fishing, and other recreational activities can be found in Section 3.6 and 4.8, Socioeconomics. Game species are discussed in Section 3.0 and 4.2, Biological Resources and water quality is discussed in Section 3.2 and 4.4, Water Resources.

3.6 SOCIOECONOMICS

Definition of Resource

For this analysis, socioeconomics includes investigations of farm and nonfarm employment and income, farm production expenses and returns, agricultural land use, and recreation spending.

Region of Influence

The ROI for analysis of impacts to socioeconomics is those counties where lands eligible for VPA-HIP enrollment are located which is statewide with minimum acreages of enrolled properties at 50 acres.

Affected Environment in Pennsylvania

HOUSEHOLDS AND FAMILIES: In 2006-2008 there were 4.9 million households in Pennsylvania. The average household size was 2.5 people. Families made up 66 percent of the households in Pennsylvania. This figure includes both married-couple families (50 percent) and other families (16 percent). Nonfamily households made up 34 percent of all households in Pennsylvania. Most of the nonfamily households were people living alone, but some were composed of people living in households in which no one was related to the householder.

NATIVITY AND LANGUAGE: Five percent of the people living in Pennsylvania in 2006-2008 were foreign born. Ninety-five percent was native, including 75 percent who were born in Pennsylvania. Among people at least five years old living in Pennsylvania in 2006-2008, 9 percent spoke a language other than English at home. Of those speaking a language other than English at home, 40 percent spoke Spanish and 60 percent spoke some other language; 37 percent reported that they did not speak English "very well."

INDUSTRIES: In 2006-2008, for the employed population 16 years and older, the leading industries in Pennsylvania were Educational services, health care and social assistance, 24 percent, and Manufacturing, 13 percent.

INCOME: The median income of households in Pennsylvania was $50,272. Seventy-seven percent of the households received earnings and 20 percent received retirement income other than Social Security. Thirty-one percent of the households received Social Security. The average income from Social Security was $15,386. These income sources are not mutually exclusive; that is, some households received income from more than one source.

OCCUPATION				
Civilian employed population 16 years and over	**5,933,390**	**+/-9,991**	**5,933,390**	**(X)**
Management, professional, and related occupations	2,053,628	+/-10,965	34.6%	+/-0.2
Service occupations	960,220	+/-8,222	16.2%	+/-0.1
Sales and office occupations	1,539,138	+/-9,503	25.9%	+/-0.2
Farming, fishing, and forestry occupations	27,004	+/-1,919	0.5%	+/-0.1
Construction, extraction, maintenance and repair occupations	515,553	+/-6,681	8.7%	+/-0.1
Production, transportation, and material moving occupations	837,847	+/-7,290	14.1%	+/-0.1

PERCENTAGE OF FAMILIES AND PEOPLE WHOSE INCOME IN THE PAST 12 MONTHS IS BELOW THE POVERTY LEVEL				
All families	8.2%	+/-0.1	(X)	(X)
With related children under 18 years	13.6%	+/-0.3	(X)	(X)
With related children under 5 years only	15.6%	+/-0.6	(X)	(X)
Married couple families	3.4%	+/-0.1	(X)	(X)
With related children under 18 years	4.6%	+/-0.2	(X)	(X)
With related children under 5 years only	3.8%	+/-0.4	(X)	(X)
Families with female householder, no husband present	26.7%	+/-0.6	(X)	(X)
With related children under 18 years	36.7%	+/-0.8	(X)	(X)
With related children under 5 years only	47.0%	+/-1.8	(X)	(X)

HISPANIC OR LATINO AND RACE				
Total population	**12,418,756**	*****	**12,418,756**	**(X)**
Hispanic or Latino (of any race)	566,637	+/-147	4.6%	+/-0.1
Mexican	97,330	+/-4,162	0.8%	+/-0.1
Puerto Rican	312,730	+/-5,482	2.5%	+/-0.1
Cuban	13,317	+/-1,473	0.1%	+/-0.1
Other Hispanic or Latino	143,260	+/-5,189	1.2%	+/-0.1
Not Hispanic or Latino	11,852,119	+/-147	95.4%	+/-0.1
White alone	10,134,119	+/-2,139	81.6%	+/-0.1
Black or African American alone	1,250,563	+/-3,780	10.1%	+/-0.1
American Indian and Alaska Native alone	14,304	+/-1,034	0.1%	+/-0.1
Asian alone	292,121	+/-1,799	2.4%	+/-0.1
Native Hawaiian and Other Pacific Islander alone	3,260	+/-733	0.0%	+/-0.1
Some other race alone	20,812	+/-2,363	0.2%	+/-0.1
Two or more races	136,940	+/-4,124	1.1%	+/-0.1
Two races including Some other race	4,975	+/-825	0.0%	+/-0.1
Two races excluding Some other race, and Three or more races	131,965	+/-4,139	1.1%	+/-0.1

Adams County statistics were provided as that county is considered one of the most rural counties in the Commonwealth.

Adams County

Race alone or in combination with one or more other races				
Total population	**100,499**	*****	**100,499**	**(X)**
White	94,551	+/-525	94.1%	+/-0.5
Black or African American	2,195	+/-60	2.2%	+/-0.1
American Indian and Alaska Native	559	+/-127	0.6%	+/-0.1
Asian	872	+/-140	0.9%	+/-0.1
Native Hawaiian and Other Pacific Islander	N	N	N	N
Some other race	3,688	+/-458	3.7%	+/-0.5
HISPANIC OR LATINO AND RACE				
Total population	**100,499**	*****	**100,499**	**(X)**
Hispanic or Latino (of any race)	5,336	*****	5.3%	*****
Mexican	4,231	+/-461	4.2%	+/-0.5
Puerto Rican	656	+/-484	0.7%	+/-0.5
Cuban	28	+/-33	0.0%	+/-0.1
Other Hispanic or Latino	421	+/-199	0.4%	+/-0.2
Not Hispanic or Latino	95,163	*****	94.7%	*****
White alone	91,587	+/-89	91.1%	+/-0.1
Black or African American alone	1,706	+/-284	1.7%	+/-0.3
American Indian and Alaska Native alone	151	+/-80	0.2%	+/-0.1
Asian alone	695	+/-97	0.7%	+/-0.1
Native Hawaiian and Other Pacific Islander alone	18	+/-36	0.0%	+/-0.1
Some other race alone	55	+/-60	0.1%	+/-0.1
Two or more races	951	+/-284	0.9%	+/-0.3
Two races including Some other race	60	+/-70	0.1%	+/-0.1
Two races excluding Some other race, and Three or more races	891	+/-279	0.9%	+/-0.3

PERCENTAGE OF FAMILIES AND PEOPLE WHOSE INCOME IN THE PAST 12 MONTHS IS BELOW THE POVERTY LEVEL				
All families	5.1%	+/-0.9	(X)	(X)
With related children under 18 years	7.8%	+/-1.7	(X)	(X)
With related children under 5 years only	9.1%	+/-3.9	(X)	(X)
Married couple families	2.4%	+/-0.7	(X)	(X)
With related children under 18 years	3.3%	+/-1.2	(X)	(X)
With related children under 5 years only	4.3%	+/-3.1	(X)	(X)
Families with female householder, no husband present	22.2%	+/-5.5	(X)	(X)
With related children under 18 years	26.4%	+/-7.2	(X)	(X)
With related children under 5 years only	37.8%	+/-21.6	(X)	(X)
All people	7.3%	+/-1.0	(X)	(X)
Under 18 years	10.3%	+/-2.4	(X)	(X)
Related children under 18 years	9.9%	+/-2.4	(X)	(X)
Related children under 5 years	15.3%	+/-5.2	(X)	(X)
Related children 5 to 17 years	8.0%	+/-2.3	(X)	(X)
18 years and over	6.4%	+/-0.8	(X)	(X)
18 to 64 years	6.0%	+/-1.0	(X)	(X)
65 years and over	8.3%	+/-2.2	(X)	(X)
People in families	5.3%	+/-1.0	(X)	(X)
Unrelated individuals 15 years and over	18.6%	+/-2.8	(X)	(X)

Source: American Community Survey, 2006-2008 USCB

Demographic Profile

The total population within the ROI exceeded 12.4 million people in 2008 (USCB 2008). The majority of the population was located within urban areas or urban clusters (USCB 2008). Approximately 1.1 percent of the population was employed in agriculture (USDA 2007).

Demographically the ROI population was 95.4 percent White, non-Hispanic, 10.1 percent Black or African American, non-Hispanic, 0.1 percent Native American or Alaska Native, non-Hispanic, 2.4 percent Asian, non-Hispanic, 0.0003 percent Native Hawaiian or Pacific Islander, non-Hispanic, 2.2 percent all other races or combination of races, non-Hispanic, and 4.6 percent Hispanic (USCB 2008). The total minority population within the ROI was 2,284,637 or 18.39 percent of the total ROI population (USCB 2008). The ROI is not a location of a concentrated minority population.

Total Farms operated in 2007 were 63,163 with 7,809,244 acres. In 2007, Hispanics operated 526 farms within the statewide ROI. Black or African Americans operated 63 farms on 4,682 acres, Native Americans operated 155 farms on 19,683acres, and 55 farms on 4,770 acres were operated by Asians (USDA 2007). Within the state of Pennsylvania, these minority farm operators controlled and operated 799 farms accounting for 1.26 percent of the total number of farms within the ROI (USDA-National Agricultural Statistics Service 2007).

Non-Farm Employment and Income

Between 2002 and 2007 the non-farm labor force within the Commonwealth ranged from 5.65 million in 2002 to 5.8 million in 2007 (BLS 2010). The unemployment rate within the ROI varied from 5.5 percent in 2002 to a low of 4.5 percent in 2007 (BLS 2011).
Median household income in 2007 in Pennsylvania was ($50,702) and the lowest median household income occurring in Fayette County ($34,050) (USCB 2011). The average poverty rate for the ROI in 2007 was 12.1 percent, a decrease of approximately 0.4 percent from the 2003 poverty rate (USCB 2003, 2011). The 2007 poverty rate varied from a high of 20.8 percent in Fayette County to a low of 7.8 percent in Adams County (USCB 2011). The ROI would not be considered a poverty area.

Farm Employment and Income

In 2007, there were 79,608 farm workers on 63,163 farms within the state accounting for a payroll of over $590 million (USDA 2007). Tables 1 and 4 list the hired farm labor costs of $11.7 million within the ROI and contract labor costs of $2.5 million as well as total production costs of $4.9 billion. In 2007, 58,128 farms within the ROI had sales less than $250,000 classifying them as small farms, while 5,035 large farms had sales greater than $250,000 (USDA 2007). Realized net farm income was in excess of $1.17 billion in 2007; this was an increase of 35.8 percent compared to the 2002 net farm income amount of $863 million. Total government payments to farms within the ROI exceeded $75.9 million in 2007, a decrease of 11.4 percent over the 2002 government payments to farms within the ROI (USDA 2007). Farm proprietor's income within Pennsylvania in 2007 exceeded $1.3 billion (USDA 2007).

Table 3. **Economic Class of Farms by Market Value of Agricultural Products Sold and Government Payments: 2007 and 2002**

[For meaning of abbreviations and symbols, see introductory text]

Item		2007			2002		
		Market value of agricultural products sold and government payments	Market value of agricultural products sold	Government payments	Market value of agricultural products sold and government payments	Market value of agricultural products sold	Government payments
Total	farms	63,163	63,163	17,441	58,105	58,105	11,991
	$1,000	5,884,779	5,808,803	75,975	4,342,753	4,256,959	85,794
Average per farm	dollars	93,168	91,965	4,356	74,740	73,263	7,155
By economic class (see text):							
Less than $1,000 (see text)	farms	17,692	17,692	1,071	15,967	15,967	795
	$1,000	3,319	2,820	499	2,080	1,757	323
$1,000 to $2,499	farms	7,549	7,549	2,040	7,644	7,644	1,537
	$1,000	12,578	9,773	2,805	12,576	10,888	1,688
$2,500 to $4,999	farms	6,600	6,600	1,679	6,238	6,238	1,102
	$1,000	23,676	19,420	4,256	22,411	20,731	1,680
$5,000 to $9,999	farms	6,371	6,371	1,717	5,295	5,295	1,051
	$1,000	45,386	39,828	5,558	37,523	35,500	2,023
$10,000 to $24,999	farms	6,860	6,860	2,156	6,115	6,115	1,419
	$1,000	110,246	102,420	7,825	96,967	93,703	3,264
$25,000 to $49,999	farms	4,232	4,232	1,662	3,282	3,282	927
	$1,000	149,376	143,759	5,618	117,303	114,257	3,046
$50,000 to $99,999	farms	3,122	3,122	1,468	3,796	3,796	1,217
	$1,000	226,397	220,550	5,847	279,743	272,411	7,332
$100,000 to $249,999	farms	5,702	5,702	2,774	6,239	6,239	2,215
	$1,000	975,516	962,194	13,321	967,615	942,197	25,418
$250,000 to $499,999	farms	2,761	2,761	1,685	2,056	2,056	1,079
	$1,000	971,521	957,653	13,868	707,806	685,332	22,474
$500,000 to $999,999	farms	1,327	1,327	746	959	959	448
	$1,000	918,803	910,235	8,568	655,231	643,650	11,581
$1,000,000 or more	farms	947	947	443	514	514	201
	$1,000	2,447,961	2,440,152	7,809	1,443,500	1,436,534	6,966
$1,000,000 to $2,499,999	farms	727	727	360	376	376	166
	$1,000	1,084,782	1,079,192	5,590	554,740	549,265	5,476
$2,500,000 to $4,999,999	farms	151	151	69	83	83	22
	$1,000	501,690	499,958	1,732	281,937	281,163	775
$5,000,000 or more	farms	69	69	14	55	55	13
	$1,000	861,490	861,002	488	606,822	606,107	716

Table 4. **Farm Production Expenses: 2007 and 2002** - Con.

[For meaning of abbreviations and symbols, see introductory text]

Item	2007		2002 [1]	
	Farms	Expenses ($1,000)	Farms	Expenses ($1,000)
Total farm production expenses - Con.				
Livestock and poultry purchased or leased (see text) - Con.				
Other livestock and poultry purchased or leased (see text) - Con.				
Farms with expenses of- Con.				
$10,000 to $24,999	721	11,335	919	15,223
$25,000 to $49,999	545	19,290	655	24,361
$50,000 to $99,999	568	40,271	572	40,048
$100,000 to $249,999	529	84,743	397	61,044
$250,000 or more	425	236,941	181	114,135
$250,000 to $499,999	246	85,746	132	44,615
$500,000 to $999,999	143	94,299	29	19,715
$1,000,000 or more	36	56,895	20	49,806
Feed purchased ..... farms	32,576	(X)	36,011	(X)
$1,000	(X)	1,267,184	(X)	937,355
percent of total	(X)	25.8	(X)	25.9
Farms with expenses of-				
$1 to $999	8,301	3,794	13,129	5,288
$1,000 to $4,999	11,456	26,721	10,471	23,448
$5,000 to $9,999	3,072	20,716	2,595	17,581
$10,000 to $24,999	2,452	38,610	2,643	44,493
$25,000 to $49,999	2,152	77,743	3,133	110,245
$50,000 to $99,999	2,516	175,175	2,252	151,096
$100,000 or more	2,627	924,425	1,788	585,205
$100,000 to $249,999	1,588	239,871	1,157	178,786
$250,000 to $499,999	580	202,912	401	138,274
$500,000 to $999,999	351	240,435	152	101,549
$1,000,000 or more	108	241,207	78	166,595
Gasoline, fuels, and oils ..... farms	60,621	(X)	55,102	(X)
$1,000	(X)	245,604	(X)	126,126
percent of total	(X)	5.0	(X)	3.5
Farms with expenses of-				
$1 to $999	32,093	12,003	33,818	11,334
$1,000 to $4,999	18,256	41,664	15,939	35,282
$5,000 to $9,999	5,253	35,748	3,214	21,694
$10,000 to $24,999	3,565	52,971	1,595	23,762
$25,000 to $49,999	933	31,454	355	11,896
$50,000 or more	521	71,765	181	22,158
Utilities (see text) ..... farms	31,188	(X)	35,797	(X)
$1,000	(X)	148,033	(X)	120,745
percent of total	(X)	3.0	(X)	3.3
Farms with expenses of-				
$1 to $499	10,000	2,311	13,893	2,913
$500 to $999	5,096	3,443	5,804	3,960
$1,000 to $4,999	10,118	23,375	10,975	26,257
$5,000 to $9,999	3,476	24,052	3,063	20,896
$10,000 to $24,999	1,932	27,765	1,569	22,317
$25,000 or more	566	67,088	493	44,402
$25,000 to $49,999	310	10,449	290	9,832
$50,000 or more	256	56,639	203	34,570
Supplies, repairs, and maintenance ..... farms	55,090	(X)	52,591	(X)
$1,000	(X)	476,884	(X)	387,473
percent of total	(X)	9.7	(X)	10.7
Farms with expenses of-				
$1 to $999	21,583	8,476	19,772	7,473
$1,000 to $4,999	18,772	43,755	17,812	40,484
$5,000 to $9,999	5,956	41,002	6,093	43,043
$10,000 to $24,999	5,503	84,133	5,622	85,983
$25,000 to $49,999	2,020	67,685	2,198	74,895
$50,000 or more	1,256	231,833	1,094	135,596
$50,000 to $99,999	838	55,356	793	50,808
$100,000 or more	418	176,477	301	84,788
Hired farm labor ..... farms	11,722	(X)	13,512	(X)
$1,000	(X)	590,891	(X)	443,050
percent of total	(X)	12.0	(X)	12.3
Farms with expenses of-				
$1 to $999	2,702	1,143	3,793	1,510
$1,000 to $4,999	3,063	7,271	3,760	8,330
$5,000 to $9,999	1,238	8,543	1,329	9,209
$10,000 to $24,999	1,767	28,080	1,910	30,849
$25,000 to $49,999	1,255	42,926	1,168	40,681
$50,000 to $99,999	852	58,067	878	60,926
$100,000 or more	845	444,860	674	291,544
$100,000 to $249,999	515	77,684	441	64,938
$250,000 to $499,999	177	60,804	117	40,225
$500,000 or more	153	306,372	116	186,382
Contract labor ..... farms	2,532	(X)	3,115	(X)
$1,000	(X)	62,941	(X)	35,792
percent of total	(X)	1.3	(X)	1.0
Farms with expenses of-				
$1 to $999	852	386	1,361	535
$1,000 to $4,999	890	2,011	1,026	2,192
$5,000 to $9,999	274	1,878	298	2,017
$10,000 to $24,999	283	4,321	236	3,680
$25,000 to $49,999	109	3,744	73	2,480
$50,000 or more	124	50,601	121	24,888
$50,000 to $99,999	50	3,571	69	4,634
$100,000 or more	74	47,030	52	20,254

See footnote(s) at end of table.

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Farm Production Expenses and Returns

In 2007, farm production expenses exceeded $4.9 billion within the state an increase of 36 percent over 2002 expenses of $3.6 billion (USDA 2007). Using the 2007 acreage in active farm production (7,809,244 acres), the average cost per acre within the ROI in 2007 was $629.35 (USDA 2007). Using 2007 cropland, the cost per acre of agricultural chemicals inputs, including fertilizers and lime, was $40.60 (USDA 2007). Average net cash return per farm within the ROI was $18,567 in 2007 (USDA 2007). The average net cash receipts per acre within the ROI in 2007 were $150.17(USDA 2007). Tables 42 and 43 provide information on the average value of land and buildings and the average value of machinery and equipment per farm within the Commonwealth.

Average Farm Production Expense and Return per Dollar of Expenditure (USDA 2007)

Area of State Farmed	Average Size of Farm (acres)	Average Total Farm Production Expense	Average Cost Per Acre	Average Net Cash Return/Farm	Average Net Cash Return/Acre	Average Return/ $ Expenditure
7,809,244.0	123.5	$77,721.00	$629.35	$18,567.00	$150.17	$0.24

Table 4. **Farm Production Expenses: 2007 and 2002**

[For meaning of abbreviations and symbols, see introductory text]

Item	2007		2002 [1]	
	Farms	Expenses ($1,000)	Farms	Expenses ($1,000)
Total farm production expenses ..... farms	63,163	(X)	58,144	(X)
$1,000	(X)	4,909,109	(X)	3,614,072
Average per farm ..... dollars	(X)	77,721	(X)	62,157
Farms with expenses of-				
$1 to $4,999	17,953	48,794	16,978	44,489
$5,000 to $9,999	12,826	92,376	11,492	82,636
$10,000 to $24,999	13,322	209,489	11,375	180,552
$25,000 to $49,999	6,014	211,468	5,509	198,796
$50,000 to $99,999	4,390	314,145	5,476	398,423
$100,000 to $249,999	4,987	777,419	4,716	709,422
$250,000 to $499,999	1,979	685,678	1,578	542,203
$500,000 or more	1,692	2,569,740	1,020	1,457,552
$500,000 to $999,999	1,011	696,849	644	434,676
$1,000,000 to $2,499,999	529	786,226	275	407,985
$2,500,000 or more	152	1,086,665	101	614,891
Fertilizer, lime, and soil conditioners purchased ..... farms	33,575	(X)	33,528	(X)
$1,000	(X)	205,463	(X)	135,921
percent of total	(X)	4.2	(X)	3.8
Farms with expenses of-				
$1 to $499	8,738	1,933	10,024	2,288
$500 to $999	5,042	3,421	5,592	3,863
$1,000 to $4,999	11,468	26,812	12,310	27,961
$5,000 to $9,999	3,785	25,892	3,142	20,793
$10,000 to $24,999	2,822	42,473	1,776	26,679
$25,000 to $49,999	1,012	34,311	440	14,809
$50,000 to $99,999	501	33,731	173	11,977
$100,000 or more	207	36,889	71	27,561
Chemicals purchased ..... farms	25,980	(X)	26,444	(X)
$1,000	(X)	111,666	(X)	77,774
percent of total	(X)	2.3	(X)	2.2

Table 5. Net Cash Farm Income of Operations and Operators: 2007 and 2002

[For meaning of abbreviations and symbols, see introductory text]

Item	2007		2002 [1]	
	Farms	Income ($1,000)	Farms	Income ($1,000)
Net cash farm income of the operations (see text)	63,163	1,172,716	58,144	863,628
Average per farm ... dollars	(X)	18,567	(X)	14,853
Farms with net gains [2]	26,920	1,604,090	23,619	1,267,027
Average per farm ... dollars	(X)	59,587	(X)	53,644
Farms with gains of-				
less than $1,000	2,685	1,274	2,820	1,291
$1,000 to $4,999	5,298	14,214	4,579	12,257
$5,000 to $9,999	3,081	22,136	2,438	17,738
$10,000 to $24,999	4,366	70,537	3,810	64,425
$25,000 to $49,999	3,156	113,335	3,853	139,910
$50,000 or more	8,332	1,382,594	6,119	1,031,406
Farms with net losses	36,243	431,374	34,525	403,399
Average per farm ... dollars	(X)	11,902	(X)	11,684
Farms with losses of-				
less than $1,000	3,919	2,001	3,916	1,852
$1,000 to $4,999	14,120	39,638	13,530	37,667
$5,000 to $9,999	8,302	59,895	7,557	53,273
$10,000 to $24,999	6,717	102,814	5,836	89,731
$25,000 to $49,999	2,046	70,118	2,386	84,309
$50,000 or more	1,139	156,908	1,300	136,568
Net cash farm income of operators (see text)	63,163	1,030,531	58,144	753,646
Average per farm ... dollars	(X)	16,315	(X)	12,962
Farm operators reporting net gains [2]	26,744	1,468,593	23,992	1,162,117
Average per farm ... dollars	(X)	54,913	(X)	48,438
Farms with gains of-				
less than $1,000	2,689	1,275	2,924	1,318
$1,000 to $4,999	5,301	14,241	4,879	13,073
$5,000 to $9,999	3,105	22,272	2,502	18,222
$10,000 to $24,999	4,434	71,928	3,948	66,851
$25,000 to $49,999	3,221	115,883	3,972	145,370
$50,000 or more	7,994	1,242,994	5,767	917,284
Farm operators reporting net losses	36,419	438,062	34,152	408,472
Average per farm ... dollars	(X)	12,028	(X)	11,960
Farms with losses of-				
less than $1,000	3,925	2,004	3,807	1,786
$1,000 to $4,999	14,136	39,649	13,304	37,201
$5,000 to $9,999	8,352	60,264	7,524	52,947
$10,000 to $24,999	6,748	103,350	5,813	89,279
$25,000 to $49,999	2,075	71,280	2,367	83,370
$50,000 or more	1,183	161,515	1,337	143,889

[1] 2002 data are based on a sample of farms.
[2] Farms with total production expenses equal to total of market value of agricultural products sold, government payments, and farm-related income are included as farms with gains of less than $1,000.

Table 42. Value of Land and Buildings: 2007 and 2002

[For meaning of abbreviations and symbols, see introductory text]

Value of land and buildings	2007		2002 [1]	
	Farms	Value ($1,000)	Farms	Value ($1,000)
Estimated market value of land and buildings ... farms	63,163	(X)	58,144	(X)
$1,000	(X)	37,289,908	(X)	26,331,894
Average per farm ... dollars	(X)	590,376	(X)	452,874
Average per acre ... dollars	(X)	4,775	(X)	3,419
Farms by value group:				
$1 to $49,999	3,990	95,472	5,441	122,655
$50,000 to $99,999	4,256	306,695	5,972	430,977
$100,000 to $199,999	10,143	1,452,524	12,866	1,839,980
$200,000 to $499,999	21,090	6,645,981	18,957	5,795,206
$500,000 to $999,999	14,343	9,809,859	8,967	5,950,044
$1,000,000 to $1,999,999	6,496	8,511,368	3,950	5,309,407
$2,000,000 to $4,999,999	2,419	7,000,742	1,731	4,948,140
$5,000,000 to $9,999,999	351	2,277,746	233	1,542,200
$10,000,000 or more	85	1,189,521	27	393,285

[1] 2002 data are based on a sample of farms.

Table 43. **Value of Machinery and Equipment on Operation: 2007 and 2002**

[For meaning of abbreviations and symbols, see introductory text]

Value of machinery and equipment	2007		2002 [1]	
	Farms	Value ($1,000)	Farms	Value ($1,000)
Estimated market value of machinery and equipment	63,158	4,609,776	54,830	3,289,501
Average per farm ..... dollars	(X)	72,988	(X)	59,995
By value group:				
$1 to $4,999	5,497	14,682	7,172	15,869
$5,000 to $9,999	6,328	43,633	6,303	43,218
$10,000 to $19,999	9,603	130,833	9,753	131,955
$20,000 to $29,999	7,846	183,324	6,899	159,757
$30,000 to $49,999	9,269	345,405	7,081	263,517
$50,000 to $69,999	6,672	373,411	4,653	261,680
$70,000 to $99,999	4,982	402,894	3,679	301,206
$100,000 to $199,999	7,377	965,529	5,518	737,901
$200,000 to $499,999	4,473	1,254,365	3,191	924,845
$500,000 to $999,999	881	550,591	508	331,866
$1,000,000 or more	230	345,109	73	117,687

[1] 2002 data are based on a sample of farms.

2007 CENSUS OF AGRICULTURE - STATE DATA

USDA, National Agricultural Statistics Service

Table 53. **Spanish, Hispanic, or Latino Origin Operators - Selected Operator Characteristics: 2007 and 2002**

[For meaning of abbreviations and symbols, see introductory text]

Characteristics	All operators [1]		Principal operator		Characteristics	All operators [1]		Principal operator	
	2007	2002	2007	2002		2007	2002	2007	2002
Operators ..... number	526	550	332	349	Age group - Con.				
Sex of operator:					35 to 44 years	91	119	46	75
Male	351	407	272	313	45 to 54 years	158	121	101	71
Female	175	143	60	36	55 to 64 years	118	109	94	85
Primary occupation:					65 to 74 years	64	50	45	40
Farming	243	320	160	214	75 years and over	33	59	24	47
Other	283	230	172	135	Average age of -				
Place of residence:					All operators	51.8	50.7	(X)	(X)
On farm operated	443	462	287	309	Principal operator	(X)	(X)	54.9	54.3
Not on farm operated	83	88	45	40	Second operator	48.9	46.5	(X)	(X)
Days worked off farm:					Third operator	34.4	39.8	(X)	(X)
None	170	272	120	165	Spanish, Hispanic, or Latino origin (see text)	526	550	332	349
Any	356	278	212	184					
1 to 49 days	68	49	33	35	Race:				
50 to 99 days	25	24	18	14	American Indian or Alaska Native	3	11	1	6
100 to 199 days	44	34	21	15	Asian	3	7	2	5
200 days or more	219	171	140	120	Black or African American	4	11	3	7
Years on present farm:					Native Hawaiian or Other Pacific Islander	5	-	3	-
2 years or less	43	37	21	11	White	508	520	321	331
3 or 4 years	54	53	25	25	More than one race reported	3	1	2	-
5 to 9 years	124	133	81	86					
10 years or more	305	327	205	227	Number of persons living in household of-				
Age group:					Principal operator	(X)	(X)	1,055	1,181
Under 25 years	24	26	5	2	Second operator	166	185	(X)	(X)
25 to 34 years	38	66	17	29	Third operator	32	96	(X)	(X)

[1] Data were collected for a maximum of three operators per farm.

Current Agricultural Land Use Conditions

In 2007, 7.8 million acres of land within the ROI were actively used for agricultural purposes including cropland, hay land, and pastureland (USDA 2007). Table 3.7-4 lists the acreage for different agricultural land uses in 1992 and 1997 and the percent change during the period. In 1992, 12,562 acres within the ROI were enrolled in either the CRP or Wetlands Reserve Program (WRP) (USDA 1999). In 1997, 18,720 acres were enrolled (USDA 1999). As of December 2010, CRP enrollment was 220,356 acres within the ROI, accounting for approximately 2.5 percent of the 1997 active agricultural land (USDA 2011, SUMMARY OF ACTIVE CONTRACTS BY PROGRAM YEAR BY STATE CRP - MONTHLY CONTRACTS REPORT).

Recreational Values

While the number of hunters and anglers has been declining across the country for several decades, the number of people involved in watchable wildlife activities like bird feeding and wildlife photography has exploded. Birdwatching is the fastest-growing outdoor pastime in the country, growing 232 percent between 1983 and 2001, according to the latest National Survey on Recreation and the Environment. This national trend is echoed in Pennsylvania. Pennsylvanians rank first in the nation in time spent hunting and third in time spent wildlife watching. In 2001 (the most recent year for which data exists), about 1 million Pennsylvanians hunted, more than 1.2 million fished, and 3.7 million participated in non-consumptive wildlife recreation, such as viewing, feeding, and photographing wildlife. More than one in four Pennsylvanians actively participates in watchable wildlife recreation. When the numbers of resident and visiting participants are combined, those who enjoy wildlife viewing in Pennsylvania outnumber the combined populations of Maine and West Virginia! A recreation participation survey conducted in 1990 revealed that Pennsylvanians spent more time birdwatching and wildlife watching (23.9 activity days per capita) than any other outdoor recreation activity except walking and jogging. In addition, hiking/nature walks showed a greater increase in activity days per participant and a greater increase in activity days per capita over the past 20 years than all other outdoor activities (Pennsylvania's Wildlife Action Plan Version 1.0a).

Additional Recreation Facts

• More than one Pennsylvanian in four actively participates in watchable wildlife recreation, such as viewing, feeding, and photographing wildlife. The state ranks third nationally, behind only California and New York, in the number of people participating in watchable wildlife recreation.
• Those who enjoy wildlife viewing in Pennsylvania, including residents and visitors, number more than the combined populations of Maine and West Virginia.
• A live webcam showing a peregrine falcon nest on the Rachel Carson Office Building in Harrisburg registered 54 million hits in 2001, making it one of the most popular nature sites on the World Wide Web.
(Southwick Associates, Inc.)

Wildlife Recreational Economic Values

With nearly six million Pennsylvanians (nearly 50 percent of the adult population) using and enjoying the outdoors, this activity makes a significant contribution to the Commonwealth's economy. Wildlife-related recreation is an economic heavyweight in Pennsylvania – hunting, fishing, and wildlife watching combined generates nearly $6 billion in total economic impact each year. In 2001, economic activity associated with hunting and fishing totaled more than $2.2 billion and $1.6 billion respectively, while non-consumptive wildlife recreation (viewing, feeding, and photographing wildlife) generated nearly $2billion in economic activity. Altogether, wildlife-associated recreation supported more than 50,000 jobs and contributed $190 million to the Commonwealth's General Fund via state sales and income tax.

Pennsylvania's wildlife viewers purchase varied equipment to enjoy their pursuits, including: bird seed, feeders, field guides, binoculars, boats, gas, lodging and meals. In fact, the total economic impact of watchable wildlife recreation in Pennsylvania is $1.98 billion - more than the annual value of dairy products, the state's top agricultural commodity. Total economic effect of non-consumptive bird and waterfowl recreation alone is estimated at more than $450 million per year in

Pennsylvania. Like other forms of outdoor recreation, non-consumptive wildlife recreation creates significant benefits for communities surrounding the recreation site. As an example, more than 50,000 birdwatchers visit Hawk Mountain Sanctuary in Berks county each year and spend roughly $3 million in surrounding communities. These bird watching expenditures are an important source of revenue for more than 200 local motels, bed and breakfasts, campgrounds, restaurants, gas stations, and gift shops.

• In 2001, watchable wildlife recreation generated twice the value of all cattle and beef produced by Pennsylvania's farms, and three times the total spent nationally by moviegoers to see 2001's top-grossing film, "Harry Potter and the Sorcerer's Stone."
• Watchable wildlife generated $70 million in state sales and income taxes, $87 million in federal taxes, and $962 million in retail sales, (including $96 million for bird seed and $16 million for food, travel and lodging) in 2001.
• Watchable wildlife recreation supports almost 19,000 full- and part-time jobs with wages of more than $509 million. It supports more workers in Pennsylvania than are employed nationally by Sunoco, a PA-based Fortune 500 company.
• Wildlife viewing expenditures in 2001 in Pennsylvania were nearly a third greater than all of the money spent nationally on skiing and snow-boarding equipment.
• Watchable wildlife recreation overwhelmingly benefits rural communities, often at times of the year when other income sources are low. (Southwick Associates, Inc.)

3.7 ENVIRONMENTAL JUSTICE

Definition of Resource
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires a Federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high human health or environmental effects of its programs, policies, and activities on minority populations and low income populations." A minority population can be defined by race, by ethnicity, or by a combination of the two classifications.

According to CEQ, a minority population can be described as being composed of the following groups: American Indian or Alaska Native, Asian or Pacific Islander, Black, not of Hispanic origin, or Hispanic, and exceeding 50 percent of the population in an area or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population (CEQ 1997). The U.S. Census Bureau (USCB) defines ethnicity as either being of Hispanic origin or not being of Hispanic origin. Hispanic origin is further defined as "a person of Cuban, Mexican, Puerto Rican, South or Central America, or other Spanish culture or origin regardless of race" (USCB 2001).

Each year the USCB defines the national poverty thresholds, which are measured in terms of household income and are dependent upon the number of persons within the household. Individuals falling below the poverty threshold are considered low-income individuals. USCB census tracts where at least 20 percent of the residents are considered poor are known as poverty areas (USCB 1995). When the percentage of residents considered poor is greater than 40 percent, the census tract is considered an extreme poverty area.

Region of Influence

The ROI for analysis of impacts on environmental justice is those counties where lands eligible for VPA-HIP enrollment are located which is statewide with minimum acreages of enrolled properties at 50 acres.

Affected Environment in Pennsylvania

POVERTY AND PARTICIPATION IN GOVERNMENT PROGRAMS: In 2006-2008, 12 percent of people were in poverty. Sixteen percent of related children under 18 were below the poverty level, compared with 9 percent of people 65 years old and over. Eight percent of all families and 27 percent of families with a female householder and no husband present had incomes below the poverty level.

For people reporting one race alone, 84 percent was White; 10 percent was Black or African American; less than 0.5 percent was American Indian and Alaska Native; 2 percent was Asian; less than 0.5 percent was Native Hawaiian and Other Pacific Islander and 2 percent was some other race. One percent reported two or more races. Five percent of the people in Pennsylvania were Hispanic. Eighty-two percent of the people in Pennsylvania were White non-Hispanic. People of Hispanic origin may be of any race. (2007 US Census Bureau Information)

CHAPTER 4 - ENVIRONMENTAL CONSEQUENCES

4.1 Cumulative Impacts and Irreversible and Irretrievable Commitment of Resources

Cumulative Impacts

CEQ regulations stipulate that the cumulative impacts analysis within an EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Recent CEQ guidance in considering cumulative impacts involves defining the scope of the other actions and their interrelationship with the Proposed Action. The scope must consider geographical and temporal overlaps among the Proposed Action and other actions. It must also evaluate the nature of interactions among these actions. Cumulative impacts are most likely to arise when a relationship or synergism exists between the Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. (Utah PEA 2011)

In this PEA, the affected environment for cumulative impacts includes all of the State of Pennsylvania since the public access programs are available statewide; therefore, the proposed habitat improvement projects could occur anywhere in the state on private land enrolled in one of the three public access programs. In addition to VPA-HIP, several other Federal and state programs in Pennsylvania focus on conservation. Federal programs include the Conservation Reserve Program, Wildlife Habitat Incentives Program, Environmental Quality Incentives Program, and the Wetlands Reserve Program. Wildlife conservation in the state of Pennsylvania is a multi-agency coordinated effort. Separate agencies include the Pennsylvania Game Commission and the Pennsylvania Fish and Boat Commission. The Department of Environmental Protection is involved in certain habitat management programs such as CREP with multi federal level agency implementation involving the USDA and NRCS in addition to the FSA.

The potential long-term impacts from habitat improvement projects under the VPA-HIP in combination with other wildlife habitat conservation strategies would have overall long-term, beneficial impacts to the wildlife populations and habitat in Pennsylvania. Increasing public awareness of the presence of important wildlife and game species and minor activities they can do to improve habitat on their land would create an environment to support a sustained wildlife population. Therefore, cumulative impacts are expected to be beneficial to the natural environment.

Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitments are related to the use of nonrenewable resources and the effect that the use of these resources has on future generations. Irreversible effects primarily result from the use or destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. Under the Proposed Action, long-term beneficial impacts are expected to wildlife populations, big game species, and their habitats. There would be no irreversible or irretrievable commitment of resources. (Utah PEA 2011)

4.2 Biological Resources

4.2.1 No Action Alternative

Under the No Action Alternative the proposed VPA-HIP would not be implemented. Lands that would have been enrolled in public access and habitat improved for wildlife would remain in their current use. No wildlife habitat improvements would be implemented. The exclusion of recreational use would reduce the ability to manage and control wildlife populations, and could result in economic losses to the landowner or their neighbors. The continued use of land for agriculture or the conversion of land to another type of agricultural production would increase susceptibility to invasion by exotic species. The runoff of agricultural chemicals, animal wastes, and sediment would continue to degrade water quality and therefore habitat for native plants and animals.

4.2.2 Alternative A, Preferred, the Action Alternative

Implementation of Alternative A would result in beneficial impacts to biological resources in the proposed VPA-HIP coverage area and the waters downstream from the area. The agricultural and forested land eligible for enrollment in the proposed VPA-HIP consists of previously disturbed and extensively managed landscapes. Vegetation; wildlife; and threatened, endangered, and sensitive species and critical habitats have been displaced from years of crop production and timber production activities on these lands.

Vegetation

Several activities that are proposed for implementation under the VPA-HIP would contribute to vegetation diversity in the proposed area. In particular, establishment of permanent native grasses, permanent wildlife habitat, creation of early successional habitat and invasive weed control, would benefit vegetation. The native forest types are generally associated with riparian areas and the adjacent uplands. Increased hunter access would result in better harvest distribution of deer and other generalist game animals, improving vegetation diversity and vigor, especially in forested habitats. Establishment of native plant communities would help to reduce occurrences of exotic plant species and would provide habitat for a wide variety of wildlife. Establishment of vegetation will act as a buffer to agricultural, timber harvest and other runoff, improving water quality and benefiting aquatic species. See Section 4.4 for a discussion of impacts to water resources.

Wildlife

Associated with improved habitat conditions, wildlife diversity would increase from implementation of VPA-HIP statewide. In comparison to the existing conditions on most of the eligible cropland and forestland, wildlife habitat and wildlife diversity would thrive after establishment of each habitat improvement. Grassland birds, generally absent from croplands, would benefit primarily from establishment of native grasses and deferred mowing and grazing of introduced grasses. Nongame and game wildlife would benefit primarily from establishment of permanent wildlife habitat, wildlife food plots, and marginal pastureland wildlife habitat buffers. In addition, establishment of native wildlife populations would displace some of the exotic wildlife species in the area. Stocking pheasants would augment wild populations in areas that otherwise would not have pheasant numbers high enough to provide a significant recreational activity. Increases in wildlife populations would have negligible impacts on the habitat. Whitetail deer populations could increase in the short term, however, allowing public access to hunters will

provide an appropriate wildlife management practice to keep populations in balance. The Pennsylvania Game Commission would provide wildlife biologists to assist with the implementation of VPA-HIP in addition to the existing regional staff that currently conduct field activities to assist public access cooperators. This technical support would evaluate habitats and recommend and help implement procedures to ensure that wildlife populations remain stable and healthy.

Aquatic biodiversity would benefit slightly as a result of small reductions in levels of nutrient and sediment loading to surface waters as a result of wildlife habitat improvements funded by VPA-HIP. In particular, native grass establishment, tree and shrub plantings and invasive control would enhance aquatic biodiversity in the VPA-HIP project area and downstream. See Section 4.3 for a discussion of impacts to surface water quality.

Threatened, Endangered, and Sensitive Species and Critical Habitat
Implementation of VPA-HIP would have positive impacts on threatened, endangered, and sensitive species and critical habitat. Benefits to aquatic species in this category would be realized after implementation of wildlife habitat improvements and would increase in the long term. Benefits to threatened, endangered, and sensitive species and critical habitat in terrestrial environments would be small, but positive in the short term, and increasing as improved vegetative communities developed. The majority of these positive effects would be for state sensitive grassland species, and not likely to effect either positively or negatively federally threatened or endangered species.

4.3 Cultural And Tribal Resources

4.3.1 No Action Alternative

Under the No Action Alternative, existing farming and forestry practices would continue statewide without change and public access would not increase. Though the continuation of farming in previously disturbed areas is not expected to impact cultural resources, a change in farming practices that would disturb previously undisturbed areas could result in impacts to known or unknown archaeological, architectural or traditional cultural resources.

4.3.2 Alternative A, Preferred, the Action Alternative

Archaeological Resources
Due to the rich cultural history of the Commonwealth of Pennsylvania, the potential for encountering archaeological resources during implementation of VPA-HIP is considered high. However, no wildlife habitat improvement activities are anticipated that are ground disturbing beyond what is normally disturbed from agricultural plowing, and therefore would not have the potential to impact known and yet unknown archaeological resources. Such practices include surface disturbance for firebreaks, using planting bars or tree planters for shrubs and trees, and no-till seeders for planting native grasses. In order to determine whether proposed ground disturbing practices would impact archaeological resources listed in, or eligible for listing in the NRHP, appropriate archaeological review will be completed prior to implementation of each contract that would include ground disturbing activities as part of an environmental evaluation. Results and recommendations from the survey should be submitted for review to the Pennsylvania SHPO prior to project implementation.

Architectural Resources
The Commonwealth of Pennsylvania contains a rich architectural history related to early settlement and agricultural and forestry related themes of Pennsylvania's history. Should proposed projects include the removal or modification of historic architectural resources included in or eligible for the NRHP, a historic architectural resources survey (Pennsylvania Historic Resource Inventory) would be required in order to determine whether such resources are present. Results and recommendations from the survey should be submitted for review to the Pennsylvania SHPO prior to project implementation.

Traditional Cultural Properties
Because the specific areas of potential effect of VPA-HIP actions are not yet defined, no Native American sacred sites or TCPs have been identified. Once these areas have been defined, consultation with Native American tribes that have traditional ties to the lands may be needed to determine whether such properties exist on affected lands. Federally recognized tribes to be contacted may include the Shawnee Tribe, Delaware Nation, and Seneca Nation (Federal Register 2002).

4.4 Water Resources

4.4.1 No Action Alternative

Under the No Action Alternative, the wildlife habitat improvements and public access hunting described in Section 2.1 would not be implemented. The use of land for agriculture and forestry or conversion of lands to other types of agricultural production or forest use could result in the continued degradation of water quality from runoff of agricultural chemicals, animal waste, and sediment.

4.4.2 Alternative A, Preferred, the Action Alternative

Surface Water
Implementation of the proposed VPA-HIP would have long term positive effects on surface water quality. The wildlife habitat and public access related activities listed in Section 2.1 would improve water quality. Establishing vegetation, whether introduced grasses and legumes, or native vegetation such as hardwood trees and shrubs or native grasses, would stabilize soils and reduce soil erosion and the runoff of nutrients and chemicals associated with agriculture and forestry activities. The establishment of filter strips and riparian buffers installed adjacent to watercourses would stabilize stream banks and provide areas for the retention of sediment and nutrient runoff from adjacent lands. Additionally, a reduction in the use of agricultural pesticides and other chemicals is expected to occur as a result of the proposed VPA-HIP wildlife habitat improvements, resulting in reduced runoff. Reductions in nitrogen, phosphorous, and sediment EOS loading are expected to occur as a result of the proposed action. Activities such as vegetation clearing and soil disturbance may occur during the installation of wildlife habitat. These activities could result in temporary and minor negative impacts to surface water quality resulting from runoff associated with these activities. Use of filter fencing or similar practices would reduce these impacts.

Groundwater
Implementation of the proposed VPA-HIP practices would result in positive effects on groundwater. The proposed wildlife habitat improvements would establish permanent vegetative cover where

none currently exists. This vegetation will slow the rate of rainwater flow over the land, allowing for greater rates of aquifer recharge. In addition, the improvement in surface water quality discussed above would result in improved quality of groundwater recharged by these surface waters. There are no sole source aquifers in the VPA-HIP area.

Wetlands
Implementation of the proposed habitat improvements is expected to only minimally increase the acreages of wetlands and riparian habitat, probably less than 100 acres. The positive impacts of restoring wildlife habitat and riparian areas on wildlife and aquatic species is discussed in Section 4.2, biological resources.

Floodplains
Minor improvements in floodplains are expected to occur as a result of the implementation of the proposed VPA-HIP wildlife habitat improvements that occur in existing floodplains. The establishment of vegetation including wetlands in these areas is expected to decrease erosion in these areas and improve the function of floodplains. Dikes, levees, dams, or other structures for the regulation of water flow, and hence floodplain the impacts of floods within and outside 100-year floodplains, will not be constructed under the proposed action.

4.5 Soils

4.5.1 No Action Alternative
Under the No Action Alternative, the activities described in Section 2.1 would not be implemented and continued activities would be expected to occur, no soil conservation practices would be implemented and no wildlife habitat would be created, causing further alteration of topography and loss of soils.

4.5.2 Alternative A, Preferred, the Action Alternative
Under the Action Alternative, potential long term positive impacts to earth resources are expected to occur. Implementation of the proposed habitat improvements would result in localized stabilization of soils and topography as a result of reduced erosion and runoff. Establishing permanent vegetation on former croplands would reduce erosion by wind and water. Short term disturbance to soils during implementation of wildlife habitat could include tilling, no-till planting, tree and shrub planting, or installation of various structures such as bird boxes or fences. These activities may result in temporary minor increases in soil erosion.

4.6 Air Quality

Any impacts to air quality in attainment areas would be considered significant if pollutant emissions associated with the proposed action caused, or contributed to a violation of any national, state, or local ambient air quality standard; exposed sensitive receptors to substantially increase pollutant concentrations; or exceeded any significance criteria established by the State Implementation Plan (SIP).

Impacts to air quality in nonattainment areas would be considered significant if the net change in proposed pollutant emissions caused or contributed to a violation of any national, state, or local

ambient air quality standard; increased the frequency or severity of a violation of any ambient air quality standard; or delayed the attainment of any standard or other milestone contained in the SIP.

4.6.1 No Action Alternative
Implementation of the No Action Alternative would not change existing air quality conditions. The conservation practices described in Section 2.0 and 2.1 would not be implemented.

4.6.2 Alternative A – Preferred, the Action Alternative
Implementation of Alternative A would result in establishment of conservation practices as described in Section 2.0 and 2.1 within 100,000 acres of farmland statewide. Preparing the lands for conservation practices would include activities such as tilling, burning, and installation of various structures in water or on land. These activities would have a localized, temporary, minor impact to air quality. It is not expected that any of these practices would change the current attainment status or violate standards in the SIP. Implementing erosion control measures, such as vegetation planting, would reduce the amount of exposed soil. Reducing exposed soil would have long term positive impacts to the local air quality.

Land disturbing activities, such as those used to remove existing vegetation or to install conservation practices may result in temporary minor impacts to air quality. Tilling would temporarily increase the PM10 concentrations in the immediate area; however, this increase is not expected to be significant. Watering exposed soil during and after tilling would reduce the amount of PM10 released into the air.

The amount of open burning that would take place is not known, however, it is not expected this would have a significant impact on the local air quality. Open burning would require a permit from DEP prior to the activity. Open burning would release toxic pollutants into the environment such as particulates PM10, CO, hydrocarbons, and nitrous oxide (EPA 1992). The quantity and distribution of these pollutants would depend on the type of vegetation that is being burned, the configuration of the burned material (material heaped or organized in rows), and the weather at the time of burning. The method of burning the vegetation material would also determine how much of the pollutants are released to the environment. One method for reducing emissions would be the use of an air curtain incinerator which consists of a burn pit and a device to blow air across and into the pit thus decreasing the amount of time required to burn the material (EPA 2001).

Installing various structures such as roads, firebreaks, and fences could require the use of heavy duty diesel construction vehicles. Primary emissions from construction vehicles are CO and PM10 concentrations. Best management practices would be used during construction activities to reduce the amount of emissions.

4.7 Recreational Resources

4.7.1 No Action Alternative
No change from current land-based recreational opportunities is expected; however, continued water quality degradation may negatively affect game fish and aquatic species or other water related recreation. Under the No Action Alternative, conservation practices described in Chapter 2.0 and 2.1 would not be implemented and the watershed focused improvements to water, biological, and recreational resources described in Chapter 2 would not occur.

4.7.2 Alternative A – Preferred, the Action Alternative

Implementation of Alternative A would have a positive long term impact on recreational resources across the state. Establishing the proposed conservation practices would increase the availability and quality of habitat for and abundance of game bird and mammal species (see Section 4.2, Biological Resources). Improving the water quality in the anticipated 100,000 new acres of improved farm area would have beneficial impacts in the immediate CREP areas as well as downstream (see Section 4.4, Water Resources). The improved water quality would be able to support an increase in fish populations and provide for additional fishing opportunities. The increase in game and fish populations could increase funds spent on hunting and fishing licenses and improve socioeconomic conditions in the area (see Section 4.8, Socioeconomics). In addition to hunting and fishing, the proposed conservation practices would increase the desirability of land to be used for hiking or camping by improving the aesthetics. A short term negative impact to recreational activities may occur during the installation of the proposed conservation practices due to construction activities or displacement of game species.

The addition of 1,000,000 new privately-owned acres open to hunting and other wildlife recreation across the Commonwealth by over 6,000 new cooperators would increase hunting and fishing opportunities with a cascading effect on local and state economies. New recreational opportunities will occur as demonstrated in surveys conducted by Responsive Management, Inc for the Pennsylvania Game Commission regarding the Hunter Survey and the Cooperator Survey. Hunters expressed an interest in new areas to hunt and that lack of nearby places to hunt was a restricting factor in participation in the sport (PGC 2003-2006).

Positive long term effects on recreational resources are expected. The proposed conservation practices and wildlife habitat improvements are expected to increase habitat for game and non-game species. Water quality improvements would result in better recreational fishing and other water-related recreation.

4.8 Socioeconomics

4.8.1 No Action Alternative

Under the No Action Alternative, the conservation practices and habitat improvements would not be implemented across the Commonwealth. Socioeconomic conditions would continue to follow the trends associated with Pennsylvania and the larger northeastern United States region. Farmland would continue to be sold for development rights given the previously mentioned differences in rental rates per acre ($35) and average annual return on agricultural use an acre ($150). Unique and prime farmland areas would continue to be targeted for the purchase of conservation easements; however, the small percentage of farmland placed in conservation easements (1.61 percent of 1997 totals) would not contribute significantly to slowing farmland conversion. Opportunities for hunters to find nearby places to hunt on private lands would continue to diminish, further reducing local business and economy funding. In addition these hunters may give up the sport, further reducing state and federal funding from license fees and associated grant dollars (Pittman-Robertson funding currently valued at over $17.00 per hunting license purchased in Pennsylvania under federal apportionment) (PGC- 2010).

The Pennsylvania Department of Conservation and Natural Resources (DCNR) estimates that approximately 350 acres per day of wildlife habitat is being lost to development or conversion, while approximately 170 acres per day is being conserved through state or private initiatives (DCNR 2004). This loss of wildlife habitat would adversely impact wildlife-related recreational opportunities in Pennsylvania annually contributing approximately $3.0 billion to the statewide economy. The continued loss of wildlife habitat could force wildlife enthusiasts to spend more of their activity dollars in adjacent states with similar opportunities and forego the remaining available wildlife-related recreation opportunities.

4.8.2 Alternative A – Preferred, the Action Alternative

Implementing the proposed action would result in no positive net present values for land rentals into the CREP programs within the ROI statewide, however, one-time incentive payments to enroll in CP2 will increase the per acre payment over the life of the contract by approximately $50/acre, or $90,000 total for the ROI. Under the proposed action, no additional acres would be conserved or restored, but they will be conserved at a higher ecological benefit level for wildlife. Habitat improvements independent of other programs and changing the land use from agriculture to wildlife habitat would total an additional 1,800 acres. This action would cause the loss of approximately 15 farm worker positions, at an estimated cost of $55,000 per year (Appendix B). The loss of these positions would account for less than 0.03 percent (0.0003) of the farm workers positions available in 1997. Additionally, the loss of production on 1,800 acres would reduce the amount of total farm expenditures for seed, agricultural chemicals, and petroleum products by $97,000 per year or 0.03 percent of the total 1997 farm expenditures.

Additional non-market benefits associated with the implementation of the conservation practices and increased enrolled private lands of 1,000,000 new acres would include an estimated $35.44 per acre of consumer surplus associated with wildlife viewing in the northeast, $2.36 per acre of consumer surplus associated with pheasant hunting in the northeast, and $2.45 per acre of consumer surplus associated with freshwater recreation activities in the northeast for a total consumer surplus per acre of $40.25 (Feather, Hellerstein, and Hansen 1999), or a $40,250,000 total consumer surplus value in Pennsylvania. Total consumer surplus per acre for the United States equated to $13.65 or approximately 195 percent less value than the consumer surplus generated by wildlife habitat activities in the northeast (Feather, Hellerstein, and Hansen 1999). Additionally, the PGC anticipates that conservation practices and wildlife improvements on over 100,000 additional acres would improve wildlife habitat for game species (e.g., eastern cottontail rabbit and ring-necked pheasant) and non-game species (e.g., eastern meadowlark and grasshopper sparrow). This improved and expanded wildlife habitat acreage would be likely to increase wildlife-related recreation opportunities within the ROI which is statewide. This increased/improved habitat would also be likely to improve wildlife-recreation generated economic activity within the Commonwealth.

Overall, increased land values and a minimal loss of farm labor jobs and expenditures are expected to result from the proposed action implementation.

4.9 Environmental Justice

4.9.1 No Action Alternative

Under the No Action Alternative, the VPA-HIP would not be implemented in Pennsylvania (Statewide ROI). There would be no ROI (statewide) impacts due to environmental justice. Improved economic and environmental resources and situations associated with VPA-HIP would not be presented to private landowners and the population taking advantage of such improved situations. Current trends in Environmental Justice would continue.

4.9.2 Alternative A – Preferred, the Action Alternative

There would be little ROI (statewide) impact due to environmental justice issues. Improved economic and environmental resources and situations associated with VPA-HIP presented to private landowners and the population taking advantage of such improved situations would only improve local economic conditions by stimulating local economies in those rural areas where agriculture and the available land base size allows for wildlife hunting and recreational wildlife uses. These areas are not associated with inner-city areas that traditionally include Environmental Justice populations. Current trends in Environmental Justice issues would continue.

Since VPA-HIP operational areas within Pennsylvania would not be considered areas of concentrated minority population or poverty areas, there would be little if any noticeable impacts from selecting the action alternative.

CHAPTER 5 – ENVIRONMENTAL ASSESSMENT PREPARERS AND AGENCIES CONTACTED

5.0 Environmental Assessment Preparers

Gary R. Camus, Chief- Federal Aid and Grant Coordination Section, Habitat Planning Division

Michael T. Pruss, Chief- Private Lands Section, Habitat Planning Division

5.1 Preparer Qualifications

Gary R. Camus

Education:

Bachelor of Science, Environmental Resource Management, Emphasis in water pollution control – 1979
The Pennsylvania State University, University Park, PA
Graduate studies in Water Resources Engineering – 1980-81 -Villanova University, Villanova, PA
Invented and developed device to secure water samples in reservoirs/lakes at various determined depths.
Continuing Education - 1985 to Present- Including environmental, carbon emissions, management, regulatory issues and policy.

MAJOR ACCOMPLISHMENTS

Developed the Pennsylvania Game Commission's first Geographic Information System based mapping project for the Cooperative Public Access program and the first-ever Cooperator Survey with 100% funding acquired from national not-for-profit trade association foundation in its largest grant award to any state, resulting in information sharing online with over 1.5 million hunters and wildlife enthusiasts.

Manage all Commission federal grant programs with current annual budgets of over $27 Million and tripled federal funding to the agency over a four-year period.

Developed the first approved state monitoring plan for bats that allowed for maximum limestone mining removal utilizing modified blasting plans with no negative impacts to the bats or environment. Resulted in additional limestone recovery valued at $3 Million and provided for future industry analysis platform.

Diligently represent the Commission on the Governor's Pesticide Advisory Board and Pennsylvania Invasive Species Council, and as the Pennsylvania Game Commission's Climate Change Coordinator resulting in savings and additional non-agency funding of several million dollars for completion of agency objectives.

Authored White Paper for agency carbon credit trading scenario. Determine, evaluate, and participate in policy formulation at the state and federal level regarding green and fossil fuel energy development practices and impacts on agency environmental and fiscal operations.

Currently participating in oil and gas resource extraction policy development at the federal level regarding Pittman-Robertson Act funded programs and state wildlife, land and fiscal impacts.

PROFESSIONAL EXPERIENCE:

2002-Present - Chief, Federal Aid and Grant Coordination Section, **Pennsylvania Game Commission**, Harrisburg, PA
Planned and implemented the Agency's first statewide shooting range safety evaluations and lead reclamation and remediation program and procedures utilizing State-of-Art Treatment Technology on 47 Commission operated law enforcement and public shooting ranges. Negotiated and developed plans

with contractor for a comparable industry savings of $2 Million. Coordinated range facility upgrades and reconstructions providing for increased downrange safety drop zones on private lands and elimination of any safety hazards.

Monitor all Bureau/Agency activities of over 350 staff to ensure compliance with US Fish and Wildlife Service and Department of Interior regulatory requirements. Successfully managed the Commission's first two Agency-wide federal program audits of an eight-year period resulting in no loss of Federal funding, and developed corrective action plans with resolution and implementation actions. Manage NEPA program for the agency relative to all federal funding programs and actions ranging from land acquisitions to environmental management procedures and actions. Include SHPO Coordination actions for the PGC relative to federal funded programs.

Managed and modified the Agency's Cooperative Public Access Programs resulting in increased access to over 5 million acres of private, federal and state property open to the public for wildlife management and hunting. Develop policy and standard operating procedures.

Managed Bureau reorganization efforts associated with the Divisions of Federal/State Agency Coordination, Game Lands Planning and Development, Federal Aid and Public Access and Engineering. Developed standard operating procedures and Bureau annual budget formulation for two consecutive fiscal years that resulted in significant savings and increased productivity with a 7 percent reduction in workforce.

2003-Present - Environmental Consultant, **Pennsylvania Friends of Wildlife**, Venetia, PA
Co-Founded Pennsylvania Friends of Wildlife, a 501(c) (3) nonprofit organization established to assist the Pennsylvania Game Commission in program implementation, funding and providing wildlife-related education to the public. Currently developing federal income tax code charitable tax deduction programs for public access cooperators and carbon credit trading potential for the Commission; developed white paper for such action. Potential for income generation of $80-120 Million for the Commission.

2003-2009 - Deputy Wildlife Conservation Officer, **Pennsylvania Game Commission** Adams County, PA, District 4-01-1.
Conducted law enforcement activities throughout the year; responsible for almost half of the citations issued in the District for a 5-year period with a 100% conviction rate. Outstanding Deputy Wildlife Conservation Officer for Adams County, PA in each of years 2005-2008. Assisted in Hunter Trapper Education program instruction. Provided guidance and assistance to the Safety Zone Cooperator Program management in the district.

1999-2002 - Wildlife Impact Review Coordinator**. Pennsylvania Game Commission**, Harrisburg, PA
Responsible for National Environmental Policy Act evaluations, Threatened and Endangered Species reviews and critical habitat protection for planned development activities related to the mining industry, oil and gas transmission pipelines, regional electricity transmission lines and FERC licensed hydro-electric production facilities on private and public lands, including State Game Lands. Evaluated and developed species and habitat mitigation plans for likely and observed impacts from planned and past mining practices on species and critical habitat conditions. Allowed for most activities to occur following impact minimization and mitigation plan implementation by industry resulting in significant time and cost savings and maximized resource recovery valued at over $100 Million.

1991-1999 - Mining Engineer **PA Department of Environmental Protection**, McMurray, PA
Conducted engineering and environmental permit reviews of underground and surface coal and industrial mineral production facilities, forestry/environmental reclamation issues, and wildlife/fisheries issues including streams and wetlands impacted by mining operations. Coordinated and developed mitigation activities associated with wildlife and fisheries habitat impacts, stream and wetland

reconstructions, slope-stability issues, and chemical and passive acid-mine-drainage treatment systems. Co-authored "Engineering Manual for Mining Operations", a handbook dealing with all engineering aspects of mining in Pennsylvania and the environmental issues requiring attention for use by mining engineers. Managed office Right-to-Know program for employee safety implementation plan.

1984-1991 - Mining Specialist **PA Department of Environmental Protection**, Knox / McMurray, PA
Performed engineering and environmental permit reviews of surface coal and industrial mineral production sites and wildlife/fisheries issues including stream and wetlands impacted by mining operations. Reviewed and developed/approved mitigation activities associated with streams and wetlands, erosion and sedimentation control plans, and stream and wetland encroachment permits. Designed and implemented geophysical studies utilizing electrical resistivity/conductivity and magnetometer methodologies to detect/verify subsurface conditions consistent with mine subsidence and bedrock fractures relative to surface structure and stream channel damage. Evaluated and developed plans for likely mitigation of damaged areas from past mining practices. Balanced additional surface and underground coal mining of reserves with permitting cost-effective reclamation of problematic environmental conditions with streams and wetlands.

1982-1984 - Co-Manager, **Cool Springs, Inc**. Bethel Park, PA
Managed multiple-site outdoor recreational facilities including golfing driving ranges, pro shops, swimming, outdoor skating, miniature golfing, softball and hardball batting cages, indoor and outdoor restaurant areas, dance hall and outdoor natural areas. Involved in all facets of operational management, scheduling, planning and contracting. Facilities employed over 75 full and part-time staff. Policy and strategic planning development resulted in 20 percent revenue increase over 2 years. Developed internship college training program with local colleges for summer program staffing issue resolution.

Michael T. Pruss

Education:

Bachelor of Science: Wildlife and Fisheries Science, Pennsylvania State University, University Park, PA May 1989
Master of Science: Wildlife Ecology, University of New Hampshire, Durham, NH - December 1991

PROFESSIONAL EXPERIENCE:

FARM OWNER and FARM OPERATOR

Ewe-Win Farm, Lewistown, PA, August 2002 – current
Own and operate a family-run forage based grazing operation primarily focused on Registered Katahdin meat sheep. Have participated in the CREP, DCP, EQIP and GRP programs on the farm, as well as many related state-based programs. Participate in county and youth fairs, and coordinate, implement and host the annual Mid-Atlantic Hair Sheep breeders auction. Have developed a thorough understanding of the standard farming practices and activities utilized in Pennsylvania and the northeastern United States, as well as the social and economic influences on program participation.

PRIVATE LANDS SECTION CHIEF - **PA Game Commission**, Harrisburg, PA, November 2004 – current.
Administer and supervise all PA Game Commission involvement in the development and statewide implementation of Farm Bill and other private lands habitat enhancement programs throughout the state.

Develop and set quantitative habitat enhancement and conservation goals for private lands within the commonwealth. Represent the Game Commission on the USDA State Technical Committee. Develop training programs and conduct training for PGC staff on Farm Bill and private lands habitat enhancement opportunities. Serve as Game Commission and bureau liaison with federal Farm Bill implementing agencies (e.g. NRCS, FSA) and collaborating state agencies (e.g. DEP, PDA, DCNR, PFBC). Cooperatively work with private conservation partners (e.g. WPC, CBF, DU, PF, NWTF) in developing proposals to implement Farm Bill and private lands habitat enhancement programs within the state. Administered the NRCS/PGC Contribution Agreement for the implementation of CREP. Supervise, direct and monitor activities of 8 field-level habitat biologists in implementing Farm Bill and private lands habitat initiatives. Developed and supervises a monitoring program to assess implementation success and management effects related to Farm Bill and private lands initiatives. Represents the Game Commission on the Association of Fish and Wildlife Agencies' Agricultural Conservation Committee and Farm Bill Working Group. Administer and supervise the statewide Public Access Programs to provide recreational use opportunities to hunters and trappers on 3,000,000 acres of private lands through 13,800 individual contracts with private landowners. Hold the Public Agricultural Herbicide Applicator license for our agency's herbicide application operations on over 80,000 acres of non-forested lands. Have Power-of-Attorney signature authority for our agency for all USDA Conservation and Commodity programs. Manage all habitat based agency agreements with local, state and federal agencies. Represent the Game Commission on the PA Prescribed Fire Council and serves as statewide lead on prescribed fire issues.

REGIONAL WILDLIFE BIOLOGIST - **Pheasants Forever, Inc.,** April 2000 – November 2004
Develop membership programs and local chapters of volunteers in new states and new counties within states in the northeastern U.S. Support, assist, and supervise local chapter volunteers in 29 chapters in 5 states with agency coordination, youth program development, fundraising, legislative activities, equipment acquisition, project prioritization, and habitat planning. Respond to members' wildlife and habitat issues. Develop merchandising, fundraising, and funding programs for the organization in the northeastern U.S. Collect and summarize fundraising and habitat data, and create an annual report for each. Direct the food plot seed program for the northeastern U.S. Coordinate all budgeting procedures for the organization's regional budget. Coordinate with federal and state wildlife and resource agencies on small game season and bag limits issues, public lands habitat development, private lands access, youth program development, and Federal and State wildlife habitat initiatives. Lobby for and advocate Farm Bill programs at the state and federal level, assist with program implementation at the State Technical Committee level, state office level (FSA and NRCS), county office level (Conservation Districts, FSA, NRCS), and on the ground implementation (private contractors, chapter volunteers). Write grants geared toward improving wildlife habitat or acquiring wildlife habitat. Evaluate habitat for current and potential wildlife, assist volunteers and landowners with habitat planning, including writing habitat plans.

HABITAT SPECIALIST - **Arizona Game and Fish Department**, Pinetop, AZ, December 1999 – March 2000
Coordinate with intra-agency departments and programs to incorporate habitat planning and evaluation in field activities. Coordinate with state and federal wildlife and resource agencies to ensure compliance with state wildlife habitat rules and laws. Evaluate federal, state and private project proposals to ensure compliance with applicable habitat and wildlife laws and rules. Recommend, and when necessary, require project changes to minimize impacts to wildlife and wildlife habitat. Train department personnel on habitat related issues. Represent the department on inter-agency teams, committees and working groups. Manage sensitive species location data and disseminate location information at appropriate scales for mitigation of proposed projects. Provide wildlife habitat related comments on proposed projects and plans, including timber harvests, grazing plans, U.S. Forest Service forest plans, municipal and private development plans,

road development and improvement, and projects involving navigable waterways. Present information on department programs, policies, opportunities and ongoing and proposed activities to other agencies, municipalities, and the public, including sportsmen's groups, conservation groups, environmental groups, and homeowners associations. Design studies, and collect wildlife and wildlife habitat data to respond to information needs of the program.

NONGAME SPECIALIST - **Arizona Game and Fish Department**, Tucson, AZ, August 1995 – December 1999
Duties: Plan and manage Nongame wildlife project budgets. Develop external funding sources and write and submit grant proposals for internal and external funding sources for wildlife research and monitoring. Supervise up to 3 field biologists, up to 6 summer interns and numerous volunteers on a variety of projects, including Jaguar Management, Mount Graham red squirrel Management, Sonoran Tiger Salamander Survey and Monitoring, and Cactus Ferruginous Pygmy-owl Survey and Management. Coordinate surveys and monitoring of Nongame (primarily federally threatened and endangered) species in southeast Arizona. Survey and monitor wildlife as necessary when projects and subordinates can't meet the demands of customers. Collect and analyze wildlife and habitat data. Develop work plans and annual implementation plans for wildlife species management. Write final project reports, annual performance reports, and federal aid reports for the Department on all Regional Nongame activities. Assist other agencies, University staff, and private researchers in the development of grant proposals to study Nongame species. Review grant proposals and final reports for internal and external grants. Serve on committees and work groups for Nongame species, such as Mexican Spotted-owl Recovery Team, Mount Graham Red Squirrel Study Committee, Sonoran Tiger Salamander Participation Team, Tarahumara Frog Recovery Team, Ramsey Canyon Leopard Frog Conservation Team, and Jaguar Conservation Team. Develop and implement plans for Nongame habitat restoration and monitoring. Serve as Department lead on re-introductions, such as San Pedro River Beaver re-introduction. Review draft Commission Orders and Rules and identify needs for changes in current Rules and Orders. Respond to internal and external requests for information on wildlife. Provide information and interviews to the print and news media. Present wildlife and habitat information to civic groups, educational institutions, conservation groups and sportsmen groups. Plan and implement internal and external training on wildlife survey and monitoring techniques. Develop innovative wildlife techniques to accomplish species survey and monitoring. Represent the Department at public meetings and agency coordination meetings on Nongame issues.

WILDLIFE SPECIALIST - **Arizona Game and Fish Department**, Tucson, AZ, February 1992 – August 1995
Duties: Survey game, Nongame and endangered species, including birds, mammals, reptiles and amphibians using helicopters, fixed-wing airplanes, boats, optics, spotlights, mist nets, seines, traps, snares, bionic ears, night vision scopes and goggles, infrared camera devices, various conventional traps, snares, scat analysis, hair traps, tracking, and tape call back/response. Coordinate Regional Heritage Database Management System reporting. Write annual performance reports, including Federal Aid, Nongame, USFWS, and WAFWA reports. Write biological evaluations of sensitive habitats for land acquisition. Take lead on special projects, such as wildlife transplants, following complex procedures, including NEPA process and organizing and hosting public scoping meetings. Coordinate wildlife water checks, maintenance, re-development and development, including cooperative agreements with the BLM, USFS, and State Land Department. Enter, summarize and analyze wildlife survey data. Monitor wildlife capture drug and equipment distribution and use, and write annual drug reports. Provide computer, statistical, and software assistance. Assist on wildlife captures and ongoing research studies, including bighorn sheep, javelina, mountain lion, bobcat and coyote. Respond to nuisance wildlife calls, including manual and chemical restraint of animals and developing positive public and media contacts.

GRADUATE RESEARCH ASSISTANT - **University of New Hampshire**, Durham, NH, August 1989 – December 1991
Coordinated with the USFS and New Hampshire Fish and Game Department to develop a joint moose-deer interaction study. Supervised, trained and coordinated 12 field assistants in data collection and data entry. Mapped deer wintering areas from topographic maps and aerial photos, and analyzed study areas using non-photographic remotely sensed data and ERDAS in conjunction with ARC/INFO. Collected deer and moose density data and browse use data. Analyzed seasonal use of browse biomass by deer and moose relative to pellet group frequency using MINITAB. Frequently used four-wheel drive pick-ups, ATV's and snowmobiles to access study areas. Wrote interim reports, final report, Master's Thesis, and peer-reviewed scientific article on the project.

5.2 Governmental Agency Contacts

The following state or federal agencies have been provided a copy of this Environmental Assessment for review and/ or have been contacted for information relative to implementation of the activities proposed in the Pennsylvania VPA-HIP agreement.

Pennsylvania Department of Agriculture

Pennsylvania Department of Environmental Resources

Pennsylvania Department of Natural Resources- Pennsylvania Natural Diversity Inventory

Pennsylvania Fish and Boat Commission

Pennsylvania Historical and Museum Commission

Pennsylvania Invasive Species Council

USDA Farm Service Agency- Pennsylvania State Office

USDA Natural Resources Conservation Service- Pennsylvania State Office

5.3 Non-Governmental Organization Contacts

National Wild Turkey Federation- State Biologist

Pennsylvania Association of Conservation Districts

Pennsylvania Federation of Sportsmen's Clubs

Pennsylvania Forestry Association

Pheasants Forever

The Nature Conservancy

CHAPTER 6 - ENVIRONMENTAL ASSESSMENT REFERENCES

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APPENDIX A

PENNSYLVANIA GAME COMMISSION

PUBLIC ACCESS PROGRAM
COOPERATIVE AGREEMENT

Form PGC-PAP 04-2007

FARM GAME COOPERATOR ☐ SAFETY ZONE COOPERATOR ☐ FOREST GAME COOPERATOR ☐	Project No. _____ Farm No. _____ Property No. _____ Acres _____ District No. _____	Restrictions on Species Open To Public Hunting. If Yes, Detail in Item 1 Below. YES ☐ NO ☐	Owner _____ New Owner _____ Tenant _____ Previous Identifier # or Code _____

THIS AGREEMENT made this _____ day of _____, 20___, between _____,
residing at _____,
telephone #_____, his, her or their heirs, executors, administrators and assigns, hereinafter called the Cooperator,
and the COMMONWEALTH OF PENNSYLVANIA, by the PENNSYLVANIA GAME COMMISSION, hereinafter called the Commission;

WHEREAS, under provisions of 34 Pa. C.S. Sections 101-2965, the Commission is authorized to cooperate with private land owners who desire to aid in the conservation of game and other wildlife including hunting and trapping.

NOW, THEREFORE, this Agreement witnesseth that the Cooperator in consideration of the conditions herein set forth and the mutual advantages derived therefrom, does hereby grant to the Commission for a period of ___ years (not less than five years) from the date hereof, all the hunting rights, in, to and upon all that certain tract of land situated in the Township of _____, County of _____ Commonwealth of Pennsylvania, containing **_____ acres**, more or less, and with an address listed on the attached form if different from the above listed residence address, and described as listed, or as revised in future addendums made a part hereof and approved under established commission guidelines.

IT IS MUTUALLY AGREED THAT:

1. Public Hunting. Any part or parts of said land not set apart as Safety Zones shall remain open to hunting by the public in accordance with all established annual seasons and bag limits, and laws of the Commonwealth. This right subject to species hunting restrictions as requested by the Cooperator herein.

RESTRICTIONS: Deer _____ Small Game _____ Turkey _____ Trapping _____

2. Right of Entry. The Commission may, with the consent and approval of the Cooperator, develop or enhance wildlife food and habitat conditions on the area, (provided such improvements shall not interfere with normal operations of the tract).

3. Protection. The Commission shall furnish such protection as lies within its powers and abilities, to the lands, fences, livestock and other property of the Cooperator.

4. Food and Cover Seedlings. If suitable planting sites are available, the Commission may furnish food and cover seedlings beneficial to wildlife as agency funding permits.

5. Woodland Border and Hedgerow Cuttings. If the Cooperator is willing, the Commission may perform wildlife habitat enhancement projects, that may include cutting woodland borders and hedgerows to enhance food and cover for wildlife.

6. Game News. The Commission may supply Cooperator with a subscription to the Game News as agency funding permits.

7. Access. A Cooperator may reasonably limit the number of users on the property in addition to the type of vehicles (if any) permitted on the property. Access may be denied on an individual basis under such conditions or circumstances, which in the view of a reasonably prudent person, would result in undue likelihood of accident or damage to property. The cooperator agrees not to place or post any type of signage indicating "No Trespassing " or that hunting is prohibited other than restrictions listed in item number 1.

8. Identification. The cooperator agrees to post appropriate signage, as determined by the Commission, on the property identifying such property is enrolled in the Game Commission Public Access Program with a Commission generated identifying number on such signage. The cooperator also agrees to allow the Commission to provide property location information on such mapping as the Commission develops in the future and makes available to the public. No detailed cooperator name or mailing address information will be provided on such mapping.

9. DONATION. The Cooperator is donating the value of hunting access rights and the conservation of wildlife on private property to the Commission for the term of this agreement. The cooperator may further choose to enter into an agreement with third parties to provide wildlife management enhancements and benefits for the public good on this property, separate from or in conjunction with Commission activities listed above, to improve wildlife habitat conditions on the property. Therefore, the cooperator may be entitled to certain federal income tax deductions available under current or future Internal Revenue Service rules and regulations. The Commission agrees to provide documentation upon request of the cooperator that they are currently involved in its Public Access Program.

Cancellation. This agreement may be cancelled upon sixty (60) days written notice if the Cooperator becomes dissatisfied, or when in the judgment of the Commission, the use of the land is no longer needed or desired, or if the owner or owners desire to sell the property.

Renewal. It is further agreed that the Commission shall extend the period of this agreement indefinitely, on a year to year basis beyond the expiration date of this agreement, until either party shall give sixty (60) days previous notice in writing to the other of an intention to terminate the agreement.

IN WITNESS WHEREOF, the Cooperator and the Commission have caused this agreement to be duly executed.

COMMISSION WITNESS (TITLE):

_____

_____

COOPERATOR:

_____

_____

* Attach Sheet Listing Additional Required Signatories

Location Information: PGC Use Only
LATITUDE _____
LONGITUDE _____

ID # _____

_____

Director, Bureau of Wildlife Habitat Management
Pennsylvania Game Commission

APPENDIX B

Camus, Gary

From:	Young, Leroy
Sent:	Sunday, March 20, 2011 9:21 PM
To:	Camus, Gary
Cc:	Spotts, David
Subject:	FW: Environmental Assessment
Attachments:	Environmental Assessment.pdf

Gary,

Thank you for providing us the opportunity to review the Pennsylvania Game Commission's programmatic environmental assessment titled "The Voluntary Public Access and Habitat Incentive Program Agreement for Pennsylvania". The Pennsylvania Fish and Boat Commission compliments the Game Commission for taking the initiative of seeking available Federal monies in order to administer a program that will benefit both Pennsylvania wildlife and outdoor enthusiasts. By opening up public access to private lands and by working with the landowners towards the enhancement of wildlife habitat, we firmly believe that our constituents and trust species will also benefit from this program. Once implemented this program will create new fishing/boating opportunities, allow for fish habitat improvement work, enhance water quality, and improve habitat for fish, reptiles, and amphibians.

The only concern we have with the program is the distribution of 2.5 gallons of the herbicide glyphosate to every cooperator in order to control noxious and invasive plants. By supplying the herbicide, we believe the responsibility for the actions of the landowner would seem to fall to the Program. Instructions on use of the herbicide would be prudent as there are potential negative consequences (e.g., spraying near aquatic habitats, killing beneficial and/or rare plants, etc.). We recommend that the Game Commission or its contractors be required to provide enrolled cooperators educational materials on the use of the glyphosate such as an instructional fact sheet, plant identification guides, and possibly a link to an on-line demonstration video.

In summary, the Pennsylvania Fish and Boat Commission fully supports the Pennsylvania Game Commission's implementation of this very important and exciting voluntary public access/habitat initiative program. The program addresses our mission and we offer our assistance in order to insure its success.

Leroy

Leroy M. Young, Jr., Director
Bureau of Fisheries
PA Fish and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
814-359-5177
leyoung@state.pa.us

11072-01

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

2001 ELMERTON AVENUE
HARRISBURG, PA 17110-9797

"To manage all wild birds, mammals and their habitats for current and future generations."

ADMINISTRATIVE BUREAUS:

ADMINISTRATION.....717-787-5670
HUMAN RESOURCES.....717-787-7836
FISCAL MANAGEMENT.....717-787-7314
CONTRACTS AND PROCUREMENT.....717-787-6594
LICENSING.....717-787-2084
OFFICE SERVICES.....717-787-2116
WILDLIFE MANAGEMENT.....717-787-5529
INFORMATION & EDUCATION.....717-787-6286
WILDLIFE PROTECTION.....717-783-6526
WILDLIFE HABITAT MANAGEMENT.....717-787-6818
REAL ESTATE DIVISION.....717-787-6568
AUTOMATED TECHNOLOGY SERVICES.....717-787-4076

www.pgc.state.pa.us

HABITAT PLANNING AND DEVELOPMENT DIVISION

717-787-9613

March 10, 2011

Mr. John Arway
Executive Director
PA Fish and Boat Commission
1601 Elmerton Avenue
PO Box 67000
Harrisburg, PA 17106

OFFICE OF EXECUTIVE DIRECTOR
Coordinate L.Young
Assist D. Sparts
Assist
MAR 14 2011
Due Date Mar. 21
Reply for Dir's Signature
Reply Direct
cc: J.Arway, T.Schaffer, L.Shapler

RE: Draft Environmental Assessment Review
VPA-HIP

Dear Mr. Arway:

The Pennsylvania Game Commission's Draft Programmatic Environmental Assessment for the Voluntary Public Access-Habitat Incentive Program (VPA-HIP) is now available for review on our website at www.pgc.state.pa.us, see the VPA-HIP link on the right side of the screen. This program will lead to increases in the availability of private lands for hunting and wildlife related recreation, while also providing additional acres of wildlife habitat improvements. The draft is provided in a chapter-by-chapter listing for you convenience. If you'd like to comment on this plan, comments must be received by March 21, 2011. Please send comments to vpahip@state.pa.us. Comments will be reviewed by Bureau of Wildlife Habitat Management staff before a Final Programmatic Environmental Assessment is submitted for final approval to the U.S. Department of Agriculture's Farm Service Agency.

Sincerely,

Gary R. Camus

Gary R. Camus, Chief
Federal Aid and Grant Coordination

Cc: Jones, Pruss, File

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MANAGEMENT.....717-787-6818
REAL ESTATE DIVISION.....717-787-6568
AUTOMATED TECHNOLOGY
SERVICES.....717-787-4076

www.pgc.state.pa.us

March 10, 2011

Ms. Sally Just
Director, Conservation Science
PA Department of Conservation and Natural Resources, PNHP
Rachel Carson State Office Building
400 Market Street
Harrisburg, PA 17101

RE: Draft Environmental
Assessment Review
VPA-HIP

Dear Ms. Just:

The Pennsylvania Game Commission's Draft Programmatic Environmental Assessment for the Voluntary Public Access-Habitat Incentive Program (VPA-HIP) is now available for review on our website at www.pgc.state.pa.us, see the VPA-HIP link on the right side of the screen. This program will lead to increases in the availability of private lands for hunting and wildlife related recreation, while also providing additional acres of wildlife habitat improvements. The draft is provided in a chapter-by-chapter listing for you convenience. If you'd like to comment on this plan, comments must be received by March 21, 2011. Please send comments to vpahip@state.pa.us. Comments will be reviewed by Bureau of Wildlife Habitat Management staff before a Final Programmatic Environmental Assessment is submitted for final approval to the U.S. Department of Agriculture's Farm Service Agency.

Sincerely,

Gary R. Camus, Chief
Federal Aid and Grant Coordination

Cc: Jones, Pruss, File

Camus, Gary

From: GM, vpahip
Sent: Wednesday, March 02, 2011 4:54 PM
To: Camus, Gary
Subject: FW: Landowner relations and access signups

From: BARRY SETH [mailto:bjseth@windstream.net]
Sent: Tuesday, February 22, 2011 11:01 PM
To: GM, vpahip
Subject: Landowner relations and access signups

I will list my comments in numerical fashion without importance relating to their numerical status.

1. Increase and mandate landowner contacts by field personal and instruct them as to the various aspects of the program, so all information related to landowners and farmers is correct and all recieve the same information.I saw a large farm game project (157) fall apart because the F&C crew gave incorrect information and the WCO does not take the time to just stop and talk and visit with the farmers.

2. I see that part of the program is to reinstate the Game News. When this was stopped several years ago many farmers and landowners had a sour taste in their mouth and many stated that it was something they enjoyed and was one of the few things they recieved. This would be one small positive step.

3. When you promise a landowner pheasants or seedlings or conduct bordercuts, make sure you can deliver what you promised. For years one of the best selling points was the promise to stock pheasants and for years the numbers fell and the stockings even thou mandated thru requests by landowners were next to nil. Five to ten birds per season is like giving them nothing. If you are going to promise birds reserve or mandate a certain number per acres of suitable habitat and make sure the indiviual sees or knows the stocking is taking place. these are put and take birds so the habitat need not be perfect. Instruct crews and WCO's to make contact when stocking and take the extra time so the landowner can observe, if desired.

4. I realize that all of this requires increase demands on personal,however with the new funding some should go to extra birds and time allotments necessary to make the landowner encouraged enough to sign up or continue in the program.

5. When a landowner has a law enforcement problem, such as driving in fields or property damage or gives a WCO timely information on violators. It should be mandated that they contact the owner and advise them of the outcome of the investigation or prosecution of the indiviuals. Landowners appreciate being advised of the outcome and that you cared enough to follow up on whatever the situation was.

Thank you for the opportunity to comment, I am fully aware of the time constraints and monetary constraints but if you are serious about getting these programs to work, I believe that these few suggestions will be an assest.

Barry J. Seth
Worthington Pa.

Camus, Gary

From: GM, vpahip
Sent: Wednesday, March 02, 2011 4:54 PM
To: Camus, Gary
Subject: FW: Programmatic Environmental Assessment (PEA) Voluntary Public Access -Habitat Incentive Program

---

From: PJ Piccirillo [mailto:pjp264@yahoo.com]
Sent: Wednesday, February 23, 2011 5:56 PM
To: GM, vpahip; Pruss, Michael
Subject: Programmatic Environmental Assessment (PEA) Voluntary Public Access -Habitat Incentive Program

Dear Sirs,

I am a resident of Pennsylvania and a licensed hunter. I have reviewed the subject PEA program. I believe that, in format, it is a well planned, thorough proposal. I believe that, in spirit, it is one of the most important intitiatives the PA Game Commission and other agencies can make.

From my perspective, the project addresses several important items. First, as a father of three young sons, I desire more opportunties for hunting. Habitat and access are the greatest obstacles I face. The program will benefit young hunters with increased opportunities to experience the health and conservation benefits of hunting.

Secondly, improving habitat and access opportunities helps protect public lands from overcrowding and overuse, as well as from all the attendant conflicts. This latently addresses that issue.

My last point is somewhat nebulous, but worth mentioning. This project will help the Game Commission improve relations and perception with private landowners in general. With more partners, the Game Commission will help erase the unfortunate stance of them/us that some private property owners have.

I offer my comments as encouragement and as support material if such is permissable and desired.

PJ Piccirillo
511 Whetstone Road
Brockport, PA 15823
814 265 2042

Camus, Gary

From: GM, vpahip
Sent: Wednesday, March 02, 2011 4:54 PM
To: Camus, Gary
Subject: FW: habitat incentive program

From: Jack Landis (CEF) [mailto:cefchester@verizon.net]
Sent: Wednesday, March 02, 2011 11:04 AM
To: GM, vpahip
Subject: habitat incentive program

I whole-heartedly support this program. I wish even more could be done for the landowners to open up private property to hunters. One suggestion would be regarding how to get access to these properties. In my experience with these types of programs, it seems very difficult if even possible at all to find out where the properties are. Then, if I did find a property, I usually found that the landowners were only allowing family and a few close neighbors to hunt. It wasn't really open to the public.

Another comment I wanted to make is regarding baiting for deer in what previously were legal areas to bait. In my experience baiting wasn't something that guaranteed shooting a deer every time you hunted, but it did help. I am confused at why, as I read in one of your news releases, you were cancelling it because you said it didn't make much difference, but at the same time allowing it again on the special DMAP areas and other programs like that. You say we still don't kill enough deer in special regulation areas, so why not allow every avenue available to the hunter? Just because it doesn't help as much as you thought it might, what would your reason be for not allowing it at all?

Jack Landis
Chester County
life-long 3rd generation hunter