CHAPTER FOUR: ACTION PLAN

A. ISSUES OF CONCERN

A1. Forested Riparian Buffers

Forested riparian buffers are essential to the health of the Brodhead Watershed. Forested buffers provide water quality enhancement, stream bank stabilization, stormwater and floodwater control. They regulate water temperature, influence stream contours, and supply nutrients in the form of leaf and twig litter to stream organisms. Forested buffers can remove pollutants from stormwater or groundwater, effectively remove sediment, nutrients and bacteria from stormwater runoff and septic system effluent, and provide wildlife habitat and recreation.

Japanese knotweed invasion reduces species richness and the abundance of native understory herbs, shrubs, and juvenile trees. This introduced plant forms dense, impassable thickets of stalks up to 12 feet tall. It inhibits riparian tree establishment and prevents the growth of riparian forests, which in turn affects the quality, distribution, and movement of water throughout the watershed. Disruption of bank stability, micro-habitat conditions and nutrient loading all negatively impact the aquatic organisms in the Brodhead creek and its tributaries.

One of the services of riparian buffers is the denitrification of surface runoff from agriculture, residential lawn fertilization and on-site sewage systems. However, invasive barberries are nitrogen fixing plants, adding nitrogen to the soil. In addition to the inhibition of reforestation by native tree species riparian zones that are dominated by barberry have the potential to increase the nitrogen load to the streams rather than reduce it.

Stiltgrass, garlic mustard, and bush honeysuckle all have the potential to crowd out native species in riparian buffers, reducing biodiversity and the overall health of the watershed.

A2. Wetlands
Wetlands maintain water quality in the watershed. They capture runoff from the land and remove pollutants before they reach the Brodhead and its tributaries. Wetlands may remove up to 90% of the nitrogen entering them, and 45% of the phosphorus. Wetlands decompose organic matter and oxidize compounds such as sulfides, reducing the biological oxygen demand (BOD) on surface waters, sometimes by nearly 100%. High BOD can lead to aquatic life mortality. Wetlands typically trap more than 80% of the sediment from surface runoff, preventing downstream turbidity, and depending on the metal and type of wetland, may remove 20% – 100% of metals such as lead. Pathogens are trapped by wetland vegetation where they are degraded by sunlight, low pH, and lack of their host organisms. More than one-third of the United States’ threatened and endangered species live only in wetlands, even though wetlands now represent approximately 3.5 % of U.S. land area. Wetlands protect downstream and adjacent properties from flood damage, especially urban areas with their large proportion of impervious surfaces. Wetlands are reservoirs for the watershed, storing water from storms and then releasing it into neighboring streams and groundwater.

The Tannersville Cranberry Bog is being invaded by barberry and stiltgrass. The replacement of native wetland plants with aggressive invasives limits the Bog’s biodiversity and speeds the succession of the bog to dryer ecosystems, removing these important wetland services. Other wetlands in the Brodhead Watershed are home to the bog turtle, listed as endangered in Pennsylvania, mostly due to habitat destruction. As common reed, or phragmites, and Japanese knotweed extend their reach into wetlands they grow in very thick clumps. These clumps can be impenetrable, restricting the bog turtle movements, threatening their existence even further.

A3. Homeowner and Commercial Landscaping

One of the primary causes of the spread of invasive plants in a developing watershed such as the Brodhead is homeowner and commercial landscaping. Homeowners are anxious to find plants that are “deer resistance” and most invasive plants are. Commercial developers seek plants that are hardy and will withstand the effects of snow removal and ice control. Thus nurseries carry the plants and landcapers
are happy to use them. As we have seen, invasive plants are extremely opportunistic and are spread by a number of vectors. Thus a major target audience for the following actions are landscapers, nurseries and municipal leaders, who can control the types of plants used in commercial applications.

I. Public Awareness

Goal: Raise awareness of the harmful impacts of invasive plants on water quality, ecosystem services, natural communities, and recreation and management options for invasive plant control.

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<th>ACTION REQUIRED</th>
<th>ORGANIZATION/INDIVIDUALS RESPONSIBLE</th>
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<td>Prepare written information (brochures, fact sheets) on the impacts, prevention and management of invasive plants for distribution to libraries, municipal offices, fishing and garden clubs, and other organizations.</td>
<td>Brodhead Watershed Association</td>
<td>Short</td>
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<td>Offer workshops, seminars, and instructional walks dealing with the environmental and economic costs of invasive incursions, and the most effective means of control available, to local municipalities, to hunting, fishing and outdoor clubs, and to businesses and local residents. Develop programs on native plants and habitat restoration, and promote forested riparian buffers.</td>
<td>Brodhead Watershed Association, Monroe County Master Gardeners, East Stroudsburg University, Northampton Community College</td>
<td>Ongoing</td>
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<td>Offer individual consultation on invasive plant identification and control when requested.</td>
<td>Brodhead Watershed Association, Monroe County Master Gardeners, Monroe County Conservation District</td>
<td>Ongoing</td>
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<td>Develop programs for children to be presented at library reading programs, scout troops, and schools.</td>
<td>Monroe County Conservation District, Local school districts, Brodhead Watershed Association, East Stroudsburg University, Northampton Community College</td>
<td>Ongoing</td>
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<td>Staff tables at Community Days, Green Fairs, Festivals, etc. with Invasive Plant displays and games.</td>
<td>Brodhead Watershed Association, Monroe County Master Gardeners, Monroe County Conservation District</td>
<td>Ongoing</td>
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1 These organizations and individuals are intended to be representative, not limited merely to those listed.
Engage nurseries and landscapers in eliminating invasive plants and supplying native plants. Have a “green gardens” certificate for presentation to nurseries and landscapers who fulfill certain criteria about not selling invasive plants and supplying native plants.

| Present information about invasive and native plants at local garden shows and tours. | Brodhead Watershed Association  
Monroe County Master Gardeners  
Local gardening clubs | Development  
– short/medium  
Application - ongoing |
I. Public Awareness (Continued)

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| Spread information about future invasive/native plant workshops, seminars, workdays to stakeholders. | Brodhead Watershed Association  
Monroe County Conservation District  
Monroe County Master Gardeners  
Pocono Heritage Land Trust  
Local Garden Clubs  
East Stroudsburg University | Ongoing                                                |
| Encourage local naturalists to identify invasive plants to interested watershed residents. Arrange interpretive hikes about invasive plants and native communities. | Pocono Heritage Land Trust  
East Stroudsburg University  
Northampton Community College  
Brodhead Watershed Association | Early                                                  |
| Obtain funding to execute the actions above.                                    | Brodhead Watershed Association  
Pocono Heritage Land Trust  
East Stroudsburg University  
Northampton Community College | Short/medium                                           |

II. Management and Control
Goal: Work with landowners, developers and county and local agencies to control invasive plants.

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| Offer individual assistance to landowners on invasive plant identification and control methods | Brodhead Watershed Association  
Monroe County Conservation District  
Monroe County Master Gardeners  
Community Associations  
Fishing & Hunting Clubs  
East Stroudsburg University  
Northampton Community College | Ongoing                                                |
| Work with organized groups that offer certification programs for landowners such as National Wildlife Federation’s Certified Backyard Habitat and Audubon’s Bird Friendly Backyard and Birdtown | Monroe County Conservation District  
Community Associations  
East Stroudsburg University  
Northampton Community College  
East Stroudsburg University  
Brodhead Watershed Association | Ongoing                                                |
| Adopt municipal ordinances that restrict use of invasive plants in commercial landscaping and provide information on native alternatives | Monroe County municipalities  
Monroe County Planning Commission  
Brodhead Watershed Association  
Monroe County Conservation District | Early/ongoing                                         |
II. Management and Control (continued)

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| Continue to identify high-priority invasive plants and water quality of the Brodhead Watershed. | East Stroudsburg University  
Northampton Community College  
East Stroudsburg University  
Brodhead Watershed Association  
Monroe County Conservation District | Ongoing |
| Develop “Streamside Buffers” program that emphasize native plant restoration and present to landowners. | Brodhead Watershed Association  
Monroe County Conservation District  
Monroe County Master Gardeners  
Community Associations | Ongoing |
| Control invasive plant incursions:  
  • Organize invasive plant removal projects  
  • Train volunteers in removal methods best suited to the species targeted.  
  • Practice good stewardship by not leaving invasive plants parts to be spread downstream. | Brodhead Watershed Association  
Pocono Heritage Land Trust  
Monroe County Master Gardeners  
Municipalities, EACs  
Park Commissions  
Community Associations  
Fishing Clubs | Ongoing |
| Restore native communities by replacing invasive species with native plants. | Brodhead Watershed Association  
Pocono Heritage Land Trust  
Monroe County Master Gardeners  
Municipalities, EACs  
Park Commissions  
Community Associations  
Fishing Clubs  
East Stroudsburg University | Ongoing |
| Obtain funding to execute the actions above. | Brodhead Watershed Association  
Pocono Heritage Land Trust  
Municipalities  
Northampton Community College  
East Stroudsburg University | Ongoing |
III. Ecosystem Service Maintenance and Biodiversity Protection

Goal: Prevent loss of ecosystem services and biodiversity due to invasive species incursions in the Brodhead watershed.

_Ecosystem services are the resources and processes that are supplied by natural ecosystems_. They include _clean air, wildlife, scenic beauty, water purification, erosion prevention, flood control, carbon sequestration_ (the removal of carbon dioxide from the atmosphere to either alleviate or defer global warming), and many others. _A healthy ecosystem also protects biodiversity_ – the diversity of plant and animal life in a particular habitat, or in the world as a whole. _These services are vital to human health and well being_. _Invasive species threaten the balance of native ecosystems and their ability to provide these resources and services in the intricate and multifaceted way they developed._

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| Establish, train and field a volunteer corps of hikers and outdoor enthusiasts to detect invasive plant incursions to add to baseline data. | The Nature Conservancy  
Pocono Heritage Land Trust  
Pocono Outdoor Club  
Brodhead Watershed Association  
East Stroudsburg University  
Northampton Community College | Early       |
| Monitor significant wetlands, such as the Cranberry Bog in Tannersville for invasive plants. | Tannersville Cranberry Bog Committee  
The Nature Conservancy  
Pocono Heritage Land Trust  
Brodhead Watershed Association | Ongoing    |
| Encourage local naturalists to positively identify invasive plants and other species and report observations to Monroe County Conservation District. | Monroe County Conservation District  
East Stroudsburg University  
Northampton Community College  
Pocono Heritage Land Trust  
Brodhead Watershed Association | Early       |
| Maintain a database of invasive plant incursions in the watershed based on the BWA survey data and add to it as data become available. | East Stroudsburg University  
Brodhead Watershed Association | Ongoing    |
| Establish baseline information on existing and historical native plant cover in riparian areas of the watershed. Create list of native species of concern. | The Nature Conservancy  
East Stroudsburg University  
Northampton Community College | Early       |
| Create restoration plans when invasive plant incursion is extensive or loss of native species is threatened. | The Nature Conservancy  
East Stroudsburg University  
Northampton Community College | Medium     |
| Establish, train and field a volunteer corps for rapid response to invasive plant incursions into vulnerable riparian areas and wetlands in public areas. | The Nature Conservancy  
Brodhead Watershed Association  
Pocono Heritage Land Trust  
East Stroudsburg University  
Northampton Community College | Early       |
| Control invasive plants through mechanical removal or well-tested biological controls. | The Nature Conservancy  
Pocono Heritage Land Trust  
Fishing Clubs, Community Organizations  
Landowners  
Schools  
Municipalities | Ongoing    |
III. Ecosystem Service Maintenance and Biodiversity Protection
(Continued)

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| Restore native plants after invasive plant removal when necessary. | Landowners, municipalities  
The Nature Conservancy  
Pocono Heritage Land Trust  
Fishing Clubs, Community Organizations | Ongoing |
| Obtain funding to execute the actions above. | Brodhead Watershed Association  
Pocono Heritage Land Trust  
Municipalities | Short/medium |

IV. Adaptive Management

Goal: Refine actions to reflect results and new information.

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| Continue monitoring the results of interventions on invasive plant incursions. | Landowners  
The Nature Conservancy  
Brodhead Watershed Association  
Pocono Heritage Land Trust | Ongoing |
| Adapt interventions to reflect the efficacy of control methods being used, keep up-to-date on new methods of control, and adjust controls accordingly. | The Nature Conservancy  
Brodhead Watershed Association  
Pocono Heritage Land Trust  
East Stroudsburg University  
Northampton Community College | Later |
| Monitor the introduction and spread of other invasive species of concern and on their impact on water quality, native species, and recreation in the Brodhead Watershed | The Nature Conservancy  
Brodhead Watershed Association  
Pocono Heritage Land Trust | Ongoing |
| Decide if controls should be applied to invasive species that have not been included previously. | The Nature Conservancy  
Brodhead Watershed Association  
Pocono Heritage Land Trust  
Monroe County Conservation District  
Municipalities | Later |