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# Threats to the Robert B. Gordon Area for Environmental Studies (GNA)

West Chester University of Pennsylvania

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## **Threats to the Robert B. Gordon Area for Environmental Studies (GNA)**

November 13, 2008

### **1. Loss of educational assets**

Disturbances of the contiguous forest in the GNA are causing a decline and local extinction of plant and animal species. Invasive non-native plants and earthworms, deer, and trail bikers are causing losses of plant and animal species and changing the diverse natural landscape into a simplified one. Too much storm water has degraded the organisms living in the East Branch of Plum Run. These impacts, if left unchecked, will lessen the opportunities for teaching and research.

### **2. Losses in environmental stewardship**

West Chester University (WCU) should develop in its students a high degree of social, economic and environmental responsibility. Dedicating resources to properly steward the GNA would set an example for our students and assist them in realizing a sense of environmental and social concern. This represents an opportunity for “real-world” learning. WCU has the opportunity to highlight the large role our land and biological resources play in sustaining the environmental and recreational quality of the wider community and in preserving one of the best remaining genetic-linkages to Penn’s Woods in the area. Management resources were provided for the first time in October 2006 and are in place until July 2009. We are hoping for permanent funding at that time.

### **3. Fragmentation/Roads**

Fragmentation is second only to outright conversion of forestland to other uses as a cause of degradation of ecosystem function, habitat quality, and biodiversity. Forest fragmentation results in the local extinction of species and can lead to far lower overall species diversity than would occur if the same total area of forest were to remain as a single contiguous block. Minimum-area requirements vary greatly among species. Many plants as well as animals are forest-interior specialists, unable to utilize the outermost zone of forest near the edge as habitat. They need at least 300 ft. of buffer from the closest edge. The area inside a forest, but near its edge, is vulnerable to a host of detrimental outside influences, including increased wind, light and heat, decreased humidity, and the influx of seeds of invasive non-native species. In general, fragmentation favors invasive non-native species and works against native species.

In this part of Chester County, fragmentation has been severe. A road was put through the GNA in 1972 for graduation and football games (Stadium Rd). The tree crowns have closed over that road so that the total area is behaving as an interior forest habitat (300ft in from developed border). Opening a wider public road over the existing road would break the contiguous forest in two parts resulting in no more interior forest habitat. Significant time and energy was put into stopping the public road in 2004/5. The good news for the GNA is that rather than being fragmented by WCU it might be added to.

#### **4. Invasive non-native plant species**

The destructive impact of invasive non-native plants on native biodiversity is exceeded only by habitat conversion (forest or field to a mall) and fragmentation. An invasive non-native species is one that rapidly spreads and out competes native species. By displacing native vegetation, invasives homogenize and greatly simplify the structural and food resources of a site, reducing its habitat value for native fauna, particularly native insects and migratory songbirds. Historically, trees/forests were removed for fuel, wood products and clearing for agriculture. Those activities coupled with the more recent residential and commercial development have effectively removed most of the native vegetation near the GNA. Forest edges are highly favorable to the entry and proliferation of invasives. In 2004 the Department of Biology was funded by the USDA Forest Service to identify the plant species that are invading the GNA. At least 20 invasive plant species are well established in the GNA and more than 40 other introduced non-native species also are common. Norway maple, tree-of-heaven, Japanese stilt grass, garlic mustard, oriental bittersweet, and Japanese and Amur honeysuckles are the main culprits. A more comprehensive survey was conducted in 2007

#### **5. Deer**

Forest fragmentation, killing off of large predators, and conflicts over hunting have resulted in the proliferation of the white-tailed deer to unprecedented population densities. This has resulted in the reduction of plant species diversity in the forest understory and the lack of tree reproduction in many Pennsylvania forests. Deer have moved the deer tick with its disease causing organism(s) over large areas. The impact to the GNA is significant. The deer density has been so high for so long that many species of tree seedlings are virtually absent from the forest floor. Baby native oaks, which are highly preferred food for deer, can no longer be found. Although there is regeneration of a few species (American beech and white ash) less preferred by deer, the number of seedlings is barely adequate to sustain a forest into the future. Deer move from the GNA and feed in the urban landscape doing much damage in residential properties. They also cause accidents while crossing Tigue, New and probably High Streets. Ironically, man (by hunting or building fences) is the only species left in the area capable of maintaining the population density of white-tailed deer low enough to keep them impacting the biodiversity in the GNA. This would only work if done over a large area. The DCNR has funded a project in 2007 to evaluate the combined impacts of deer and invasive plants on the ecosystem. USDA APHIS has just completed a deer population study (Fall 2008)

## **6. Uses that Impact the GNA**

### **a. Walking/hiking on trails**

From a purely natural resource perspective, trails and roads have detrimental effects on the forest, both ecologically (creating migration barriers and “killing fields” for certain organisms) and environmental (forming channels for stormwater). In addition, human users of trails can unknowingly carry seeds of invasive plants into areas where they do not occur. However, given that recreational use is common, trails are the best way to direct that use. The main concerns with walking trails are (1) limiting the number of trails to minimize soil exposure, (2) properly routing trails to direct pedestrians through and to where they should go and away from where they should not go, and (3) minimizing soil erosion potential through proper construction and maintenance. The major trails in the GNA were created long before the University owned the property and parts of these trails need rerouting. Trails bikers have created too many new trails. A trail inventory will be completed in 2007. Trail closure (steep and eroded portion of main trail system) and rerouting began in 2007 as a result of an Eagle Scout project.

### **b. Trail bikes**

Bicycles can be relatively benign in natural areas under certain conditions (large area, low frequency); however, they are problematic if the activity is concentrated and in multiple use situations. Repeated use of trails can accelerate trail erosion by funneling stormwater into narrow, continuous channels. Off-trail exploration, common in the GNA, disturbs understory plants and wildlife. Most importantly, bikes threaten both the safety and recreational enjoyment of pedestrians. The current type and level of use has created conflicts with walkers, degraded trails, and disturbed off-trail vegetation. WCU should continue to prohibit bikes in the GNA. More enforcement is needed

### **c. Dog walking**

People walking leashed dogs are compatible use of the GNA if it is limited to the established trail system and the owners clean up after their pets. Unleashed dogs are not a compatible use given the higher academic and ecological priorities for the GNA. Unleashed dogs threaten the safety and recreational enjoyment of other users. In June 2005 a student in a class in the GNA had his clothes ripped by an unleashed dog. WCU has established a pet policy that protects users and natural resources and inform the community through appropriate signage. If visitors refuse to comply with the policy, WCU should consider revoking this privilege.

## **7. Material and equipment storage and disposal**

Several locations joining the GNA are being used for the storage and disposal of various recycling and landscaping materials. The most significant of these is in the SE corner of the GNA near the 202 bypass entrance. The open ground is used as a dumping ground for wood generated by the removal of plant material from the university grounds. This

practice can pose a real threat to the health of the forest. Most materials are foreign to the forest ecosystem and behave very differently from forest litter-fall or tree-fall debris. They may have non-forest seeds, insects, fungi, bacteria, and chemical properties, some of which can cause harm to native forest species. They are invariably placed in piles or thick layers and take much longer to decompose than the thin veneers of litter that are laid down naturally by forest vegetation. These piles severely inhibit the establishment of native forest-floor plant species from seed, including tree seedlings, but they typically do provide favorable conditions for many introduced invasive species. We encourage the University to consider another site but understand that there is no alternative. We have no scientific evidence that any of the above mentioned concerns have been realized

As one turns east on Stadium Rd from New Street a University recycling site is immediately on the right hand side (south side) of the road. Besides the new trees planted (in 2004) as a screen of trees was planted in 2004 to make a more pleasant view for those about to enter and use the GNA. By 2008 they are big enough to their job. It will also be more aesthetically pleasing for those attending football games and graduation

## **8. Paintball games**

Even though the paint used in this activity is, in some cases, environmentally benign, paintball games cause damage to understory vegetation, harass wildlife and, in the end, leave an unsightly mess. In mixed-use situations paintball games can be hazardous and disturbing to other users. This activity is inappropriate for the GNA and should be listed on signage as not permissible. There was evidence of this activity in the summer of 2004.

## **9. Fires**

Fire was a force that greatly influenced the development of most of southeastern Pennsylvania's forests and, if employed judiciously and under the strictest safety procedures, it would no doubt be ecologically beneficial to certain parts of the GNA. However, fire also has the potential to be highly destructive, particularly in an urban setting. Because the GNA is in an urban setting, fire will not be used as a management tool

## **10. Construction of a public road**

As determined by the Brandywine Conservancy in its 2003/4 Environmental Assessment of the GNA, our current private road (Stadium Rd) does not negatively impact the ecological integrity of the GNA. This is partly because our private road is so narrow (a single lane without shoulders) that it does not produce a gap or opening in the forest canopy and partly because of the low traffic speed and volume.

In contrast, a wider public road would result in significant harm to the GNA. Undesirable ecological impacts would include: (1) increased wildlife mortality from higher and faster

traffic volume, (2) habitat fragmentation caused by opening the forest canopy, which will result in an increased invasion by unwanted exotic plants and a subsequent loss of some native species, (3) increased number of visitors (which will increase the amount of off-trail hiking and biking, collecting of plants and animals, and dumping of litter and trash), (4) increased problems associated with more impervious surface area (run-off of gas, oil, salt, and other pollutants into the GNA and more storm water run-off into the watershed), and (5) damage from construction that will impact a much larger area of the GNA than the final footprint of the road.

In addition to the ecological impacts, a wider public road would also seriously degrade the educational value of the GNA by (1) reducing access by classes (we currently can park vans along the side of our private road for easy access to any part of the GNA), (2) compromising student safety (there are two major trail crossings along our private road), and (3) by disturbing student and faculty teaching and research sites.

Trees will be planted and protected along University Road in 2007 in order to assure a closed canopy in the future

## **11. Suburban land-use impacts to water quality**

Sediment is generated by storm runoff and associated soil erosion construction sites, roadways, parking lots, lawn areas, and eroding stream banks. Excessive sediment in streams can affect small fish reproduction, and can harm other aquatic life, particularly bottom-dwelling species. The chronic erosion and sedimentation problems facing the Plum Run Watershed can be attributed to its high residential/university/commercial development with too many systems for retaining and recharging stormwater. Phosphorus is often contained in runoff from lawns and gardens using chemical fertilizers and can be found in household and commercial detergents, which enter the creek through wastewater systems. Phosphorus is the main nutrient responsible for eutrophication (nutrient enrichment, which causes algae blooms) in waterways. As algae decompose, they consume dissolved oxygen and diminish the ability of the creek to support healthy populations of fish and other aquatic life. Additional threats to the quality of both surface water and ground water resources include:

- Chemical or oil spills on roads, with direct drainage to the tributaries or the main stem of Plum Run, particularly on the 202 exit area for the West Chester bypass where tanker truck accidents are a possibility.
- Chemical or oil spills, leaks or dumping
- Sewage treatment plant malfunctions or overflows, with the potential to release large amounts of disease-causing bacteria, nutrients, and heavy metals. This occurred from WCU's pumping station on south campus during the summer of 2005

A macro-invertebrate study was done in 2005/6 that indicated poor water quality for the East Branch of Plum Run

## **12. Suburban land-use impacts to water quantity**

The agricultural, suburban, and urban land-use pattern of the region, including the Plum Run watershed, has altered the natural balance of ground- and surface water that defined the forested landscape prior to William Penn's arrival in 1682. Almost the entire watershed has been cleared of forest, plowed and grazed for agriculture, bulldozed for development, planted in lawns, or paved. Each of these actions generates unnatural rates and amounts of stormwater runoff, particularly in the wettest periods of the year. Water that once infiltrated soil and recharged aquifers to gradually feed wetlands and streams during periods of drought is now lost downstream to the Delaware Bay and Atlantic Ocean. As a result, the frequency and extent of flooding is artificially high, and the water table that allows groundwater to feed wetlands and supply the base flow of streams is artificially reduced to unnaturally low levels during the driest periods of late summer. The quality and quantity of surface and groundwater and the ecological integrity of the GNA are closely interrelated. Increased surface runoff generated by poorly planned development results in increased flooding and erosion, diminished groundwater levels, increased pollution of ground- and surface water, increased concentration of pollutants, and reduced diversity of native plants and wildlife.

## **13. Erosion and compaction**

The soils of the GNA tend towards instability and are subject to serious sheet and gully erosion, especially in areas without vegetative cover. The GNA experiences the effects of increased runoff and flooding through erosion and sedimentation in the main stem of Plum Run and its tributaries, particularly where unnaturally large sediment deposits form sandbars or islands, and where severe bank erosion and gully erosion is evident. Effects of this trend on vegetation and wildlife in the GNA can include premature mortality of trees undermined by eroding stream banks and decreased diversity of stream-dwelling organisms. Trails are essential for proper management and recreational enjoyment of natural areas, but if poorly designed or misused they can become stormwater channels that cut into hillsides and remove organic and inorganic soil components. In severe cases, gully erosion can lower the water table and stress established vegetation. The trail system that has evolved in the GNA effectively serves the management and recreational needs. There are areas where trails are a threat to soil resources, mainly due to poor (or nonexistent) design. In these areas trails run more or less directly down the slope because it is the most direct route between two points. Users (hikers, mountain bikers) of the GNA continue to create trails as the need or inspiration arises. This not only results in the formation of potential erosion channels, but tramples understory vegetation and expands the amount of compacted soil within the GNA. Compacted soil results in lower water percolation and soil gas exchange — both detriments to forest trees and shrubs. In some areas invasives are adding to the potential for soil erosion. Invasive trees, particularly Norway maple, create such a dense shade that the soil surface is essentially devoid of shrubs and herbaceous plants, leaving little soil protection and none at all where part of the canopy is removed by wind-throw.