Jug Bay Wetlands Sanctuary:

Sand and Pine Barren Habitat Management Plan

Managing for Uncommon, Rare and Threatened Species

Last time updated: January, 2016

BACKGROUND

The Sanctuary includes two sand barren or microdesert areas. The habitat is characterized by well drained, sandy, loamy soils of the Galestown-Evesboro-Rumford series. According to Curry 1992, evidence from Native American archaeological sites buried by blowing sands indicate that this habitat type was created during the Hypsithermal period 4000 - 6000 years ago. Many areas of this uncommon habitat type have been lost to development and natural succession. Today it persists in largely neglected lands associated with power lines, roadsides, old sand and gravel mines, and a few protected conservation lands.

In the Sanctuary these areas occur in the Parris N. Glendening Nature Preserve (Figure 1); the “Sand Barrens” cover a one-hectare area, the “Pine Barrens” cover an 8-hectare area. The dominant tree species are Pinus virginiana (Virginia Pine), Juniperus virginiana (Eastern Red Cedar), Liquidambar styraciflua, (Sweetgum), and Quercus falcata (Southern Red Oak). These areas have been studied for their suitability to: ground-dwelling bees by Sam Droege, USGS Patuxent Wildlife Research Center and tiger beetles by Jonathan Mawdsley, Smithsonian National Museum of Natural History. Their work, along with Charlie Davis and William Steiner's, was summarized in the 2006 report The Lost Micro-Deserts of the Patuxent River: Using Landscape History, Insect and Plant Specimens, and Field Work to Detect and Define a Unique Community.

Under natural conditions and over time, open areas undergo a change in vegetation so that a landscape originally dominated by grasses and herbs will be colonized by woody plants and become a forest. Active management is required to maintain meadows and to halt the natural process of plant community succession. Natural succession may alter the Sanctuary’s sand barrens to a point the species mentioned in the subsequent pages can no longer use them.

As part of the Sanctuary’s mission to conserve the ecosystem of the Jug Bay area, we would like to take a hands-on management approach to maintain the open, sandy characteristics of these habitats. The purpose of this guidance plan is to describe the ecological objectives for managing the sand barrens as well as to propose management actions that can be used to maintain this uncommon habitat type.
BARRENS AND HABITAT CHARACTERIZATION
A general characterization of Sanctuary’s barren habitat is given below regarding their geology and the different species found in this habitat, including some species of concern, particularly bees and beetles.

Geology
The Jug Bay area is part of the Coastal Plain physiographic province. The areas of interest within the Glendening Preserve are part of a level terrace 9 – 15 meters above the eastern shore of the Patuxent River. Fluvial deposits during the Pleistocene Epoch (between 11,500 and 1.8 million years ago) of sand, gravel, and silt clay flank the river.

Heather Quinn, a Geologist with the Maryland Geological Survey provided information on the surrounding geologic units that may influence what is deposited locally in the younger terrace deposits along the valley of the Patuxent River as it cut its way down from the Patuxent Wildlife Research Center to Jug Bay. Geologic sediments deposited during the Cretaceous period range from 65 – 145 million years ago. The Lower Cretaceous Potomac Group is interpreted as sands,
gravels, clays and silts formed via river floodplain-back swamp deposits. Upper Cretaceous deposits are interpreted as marine, continental shelf deposits. Most of the Tertiary-aged units (65 – 1.8 million years ago) in this area are also of marine origin but represent several different transgressions/regressions of the sea. In most of the area between PWRC and Jug Bay there is little or none of the younger Brandywine Formation (also referred to as “Upland deposits” on many maps), which is common in southern Maryland.

**Species of Concern**
Species of concern found and dependent on Sanctuary’s barren habitats can be separated in three main groups (1) bees, (2) tiger beetles, and (3) plants. A list of main species for each particular group is given below

**Bees**
Bee species currently associated with Patuxent microdeserts are in the family of mining bees (Andreninae) and sweat bees (Halictidae). State records are indicated with an asterisk (Sam Droege, USGS Patuxent Wildlife Research Center.)

*Andrena fulvipennis* Smith  
*Andrena rudbeckiae* Robertson*  
*Agapostemon splendens* Lepeletier  
*Colletes americanus* Cresson  
*Dialictus vierecki* Crawford  
*Dieunonemia heteropoda* Say  
*Epeolus howardi* Mitchell*  
*Megachile addenda* Cresson*  
*Nomada texana* Cresson  
*Perdita boltoniae* Robertson  
*Perdita octomaculata* Say  
*Pseudopanurgus solidaginis* Robertson  
*Sphecodes johnsonii* Lovell*  
*Triepeolus remigatus* Fabricius

*Andrena rudbeckiae* (Photo: Sam Droege, USGS)

**Tiger Beetles**
The following beetle species were observed in the sand barrens area of the Parris Glendening Nature Preserve. Declining species are indicated with an asterisk (Jonathan Mawdsley, Smithsonian National Museum of Natural History).
Megacephala virginica Linnaeus (Virginia Big-headed Tiger Beetle)
Cicindela punctulata punctulata Olivier (Punctured Tiger Beetle)
Cicindela repanda repanda Dejean (Bronzed Tiger Beetle)
Cicindela scutellaris rugifrons Dejean* (Festive Tiger Beetle)
Cicindela sexguttata Fabricius (Six-spotted Tiger Beetle)
Cicindela tranquebarica tranquebarica Herbst* (Oblique-lined Tiger Beetle)
Cicindela unipunctata Fabricius (One-spotted Tiger Beetle)
Cicindela rufiventris rufiventris Dejean (Eastern Red-bellied Tiger Beetle), not observed in 2004-2005, but was collected at the site in 1973.

Cicindela tranquebarica tranquebarica (Photo: Denis A. Doucet)

Other Potentially Occurring Species:

Tenebrionid Beetles
Darkling beetles of the Tenebrionidae family are a diverse group of insects that includes many sand “specialists” and so serve as indicators of microdesert type habitats. The following have been found in association with the dry sand deposits along the Patuxent River, and a few additional psammophile species, known elsewhere in the state, could be found to occur here through additional searches. Of the seven species listed, five are flightless. As reported by Warren Steiner, Smithsonian National Museum of Natural History.

Alaetrinus minimus Beauvois
Bapstinus metallicus Fabricius
Blapstinus moestus Melsheimer
Bothrotes canaliculatus Say, winged
Hymenorus sobrinus Casey
Paratenetus fuscus LeConte
Polylepurus perforatus Germar, lives in dry rotten fallen wood
Plants

Table 1. List of rare plant species reported from dry, sandy habitats within the Bowie, Bristol Odenton USGS quadrangles. Source: Maryland Natural Heritage Program, 2005.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Habitat description from Gleason &amp; Cronquist (1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agalinis fasciculata</td>
<td>Fascicled gerardia</td>
<td>“Dry sandy soil, often weedy”</td>
</tr>
<tr>
<td>Aristida curtissii</td>
<td>Curtiss’ three-awn</td>
<td>“Dry, often sandy soil”</td>
</tr>
<tr>
<td>Aristida lanosa</td>
<td>Woolly three-awn</td>
<td>“Dry sandy soil on the coastal plain”</td>
</tr>
<tr>
<td>Desmodium humifusum</td>
<td>Trailing tick-trefoil</td>
<td>“Dry sandy woods”</td>
</tr>
<tr>
<td>Desmodium strictum*</td>
<td>Stiff tick-trefoil</td>
<td>“Pine barrens on the coastal plain”</td>
</tr>
<tr>
<td>Galactia volubilis*</td>
<td>Downy milk pea</td>
<td>“Dry upland woods and barrens”</td>
</tr>
<tr>
<td>Galium hispidulum</td>
<td>Coast bedstraw</td>
<td>“Sandy soil, especially pine-land on the coastal plain”</td>
</tr>
<tr>
<td>Helianthemum bicknellii</td>
<td>Hoary frostweed</td>
<td>“Dry, usually sandy soil.”</td>
</tr>
<tr>
<td>Lespedeza stuevei*</td>
<td>Downy bushclover</td>
<td>“Dry upland woods and barrens”</td>
</tr>
<tr>
<td>Matelea carolinensis*</td>
<td>Anglepod</td>
<td>“Rich thickets”</td>
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<tr>
<td>Monotropsis odorata</td>
<td>Sweet pinesap</td>
<td>“Dry woods”</td>
</tr>
<tr>
<td>Pyrola virens</td>
<td>Greenish-flowered pyrola</td>
<td>“Dry woods”</td>
</tr>
<tr>
<td>Rhynchosia tomentosa*</td>
<td>Hairy snoutbean</td>
<td>“Dry sandy woods and barrens, chiefly on coastal plain”</td>
</tr>
<tr>
<td>Schwalbea americana</td>
<td>Chaffseed</td>
<td>“Moist sandy soil”</td>
</tr>
<tr>
<td>Solidago speciosa</td>
<td>Showy goldenrod</td>
<td>“Open woods, fields, prairies, plains”</td>
</tr>
<tr>
<td>Vitis rupestris</td>
<td>Sand grape</td>
<td>“Dry hills and rocks”</td>
</tr>
</tbody>
</table>

Occurs on very dry soil at Jug Bay.

“Moist to dry pinelands, oak-woods or clearings” (Fernald 1950). “Dry sandy soil on knobs and sandstone plateau margins” (Braun 1937).

MANAGEMENT OF BARREN HABITAT

Main Goal and Objectives
One of the goals of the Sanctuary is “to maintain the long-term integrity and diversity of Jug Bay natural habitats…” By managing our barren habitat and limiting the establishment and spread of woody plants, we increase the health and overall diversity of these habitats for the benefit of the species described in the previous sections and many others.

Management History
During the fall/winter of 2012/2013, Jug Bay staff with the support of trained volunteers conducted a series of management actions to create more barren habitat. Some of the activities included the hand pulling of Virginia pine seedlings and saplings and the cutting and/or girdling of larger trees. Small fires and some small scale chipping was done to dispose of cut tree material, however, much of the cuttings were piled and stored along the edge of the forest (Figure 2).
Once the work was completed, the total acreage of pine and sand barrens available as suitable wildlife habitat increased; it is now our main goal to maintain the existing habitat through active management. An example of barren habitat is shown in Figure 3.
Proposed Management Actions to Preserve Barren Habitat

The main objective of management actions proposed in this section is to maintain and/or improve the existing barren habitat. If active management is not implemented soon there is a high probability of losing what was accomplished during the 2012/2013 habitat maintenance effort.

Management actions proposed below are the result of field visits and consultations between Jug Bay staff, longtime volunteer Mike Quinlan, and professional biologists from the U.S. Geological Survey’s Patuxent Wildlife Research Center: Sam Droegge and Danny Bystrak; both familiar with Jug Bay and experienced in the ecology and management of barren habitat.

Some of the following proposed actions are already taking place while others need to be implemented and may require specialized equipment.

I. Mowing (ongoing):

Mowing of access roads and existing barren and meadow habitats is an ongoing activity and represents our main and most cost-effective management tool for the maintenance of these habitats. The intensity and timing of the mowing applied depend on the purpose as follows:

1. Main entrance roads to barrens and meadow habitat are mowed periodically (about four times a year) to facilitate vehicle access for maintenance, stewardship and research activities, etc. The area mowed comprises an area wide enough for a vehicle to move comfortably through the road (section A, Figure 4).

2. The shoulder area of main entrance roads (section B, Figure 4), however, may only be mowed once a year (between the end of February and the beginning of March) to allow native plants to establish and provide food and shelter to wildlife. If this area, however, is showing signs of invasion by woody plants, mowing frequency will be increased as needed.

Figure 4. Main access road to barren/meadow habitats.
3. Mowing of main barren and meadow habitat: Mowing is the main management technique used for maintaining and improving barren and meadow habitat, but when necessary herbicide application or biological control using goats may be considered (according to County regulations) to maintain the correct mixture of desired plant species or to reduce unwanted (invasive) species.

Mowing is conducted once each year during early spring, between early-mid February and mid March. Limited mowing is cost effective and provides significant ecological benefits:

- Maximizes the number of months that meadow and barren habitat provides valuable wildlife habitat.
- Seeds and berries persist as long as possible on erect, dried plant stalks, thus providing maximum food for birds and other wildlife.
- Mowing is scheduled to avoid bird and turtle nesting seasons and to avoid the season when turtle hatchlings emerge from underground nests (mid-March through early November).
- Reduces disturbance of grassland birds during nesting season (May to August).
- Limited mowing reduces the accidental mortality to wildlife that occurs when mower blades strike turtles, snakes, birds and small mammals.

To control the growth and expansion of invasive species in barren/meadow habitat a combination of additional mowing and/or spot mowing will be considered as the preferable management option. If this practice fails, biological control and/or herbicide applications may be considered as a next step.

The need to conduct spot mowing and/or additional mowing will be determined on a case-by-case basis for each of the meadow/barren habitats. Depending on the severity or invasion level (low/moderate or severe), two different options for implementing spot and/or additional mowing will be considered (the level of invasion will be determined based on staff knowledge and experience):

- **Low to moderate invasion:** In addition to the spring mowing conduct targeted spot mowing in affected areas. Spot mowing will be done once a year during the summer (mid July). However, if needed, a second spot mowing can be done between mid November and December.

- **Severe invasion:** Conduct two full mowings during the year, one during the spring (regular mowing) and an additional one during the summer (mid July). Repeat this for at least two years or until a noticeable control of invasives is achieved. The second mowing in July will still provide sufficient time to establish winter cover for wildlife.

If biological control or application of herbicides is to be implemented to control invasive species, we will follow established Anne Arundel County procedures and regulations.

**II. Removal of single-tree line barrier:**
The removal of one or two short and thin lines of trees is recommended at the Glendening Nature Preserve to connect existing meadow/barren habitats (Figure 5a, 5b). These single-tree
lines do not provide much habitat benefits as it is, but their removal will link adjacent meadow habitats rendering a larger continuous area more attractive for habitat use by birds and other wildlife. It is important to note that this is a one-time effort, once completed maintenance of the cleared area will be done through regular mowing.

Figure 5 A-B. Photo and aerial imagery showing single-tree lines separating meadow A from meadow B and barren habitat at Glendening Nature Preserve.
III. Removal of “parent seeding trees” and young established trees:
In an effort to minimize and control the re-colonization of barren habitat by Virginia pines, cedar trees, or other tree species it is recommended to remove, as considered necessary, some parent seeding trees (Figure 6) from specific locations. In some areas the removal of a single parent seeding tree could make a significant difference controlling the spread of seeds and seedlings into existing barren habitat.

Figure 6. Photos showing examples of parent seeding trees.

Although initial steps to minimize and control the re-colonization of barren habitat by Virginia pines, cedar trees, or other trees is to (1) conduct regular mowing and do (2) spot-check removal of main parent seeding trees along the barren edges (as indicated above); there are some areas that are already showing signs of re-colonization (Figure 7). This is due to the lack or reduced active management during the past 5-7 years. As a result, some small sections throughout the barren habitat area are now covered by recently established young trees (Figure 7). Removing young trees requires less effort than mature trees, so there is an immediate need
to control these areas before it is too late and barren habitat is lost. The disposal of young trees being cleared could be done in two different ways:

   a) Chipping (preferable option): As the cutting take place, small trees will be processed with a chipper. Wood chips will then be disposed by using them within our gardens. This option, however, would only be feasible if the county can provide a chipper and an operator to conduct this task.

   b) Dispose of trees in the forest: The second option is to drag the small trees into the forest tree line, where they will then decompose with time.

We expect that the removal of young trees is a one-time effort as once these areas are cleared regular mowing will be implemented to keep the open habitat.

Figure 7. Photos showing barren areas re-colonized by young Virginia pines, cedar trees, or other species (see areas highlighted within the yellow lines).

IV. Disposal of old debris:
After the tree removal and clearing efforts conducted at the barren habitats during the fall/winter of 2012/2013, large quantities of debris were accumulated and piled up in some sections along the edge of the forest (Figure 8). Two feasible options to dispose of this debris were identified
including burning or leaving the debris on-site. Which of these options is to be implemented will depend on the cost, feasibility, effort, obtaining necessary permits, as well as the availability of the necessary equipment:

1. **Burning**: Burning is a feasible option, but a necessary permit and trained personal will be needed to complete the task.

2. **Leave the debris on-site**: The option of leaving the debris on-site is easy to implement, but may have some drawbacks as it may provide surface for the establishment of invasive vines. However, these wood piles if left on-site may also provide habitat for small mammals and birds. If this is to be the most feasible option, it is recommended to push the debris back somewhat into the forest (using a front-end loader) to help create more open space. Pushing the wood piles back into the forest is only feasible if a front-end loader and its operator could be supplied by the County to conduct the work.

![Figure 8. Photos showing existing piles of tree debris piled between the forest and barren habitat.](image)
V. Habitat enhancement:
As deemed necessary, actions will be taken to enhance degraded barren habitat. For example, by conducting plantings of native barren habitat plant species such as wild lupine, a state threatened species (Figure 9; http://www.dnr.state.md.us/wildlife/Plants_Wildlife/rte/rtewildlupine.asp) or other species that will benefit bees and other pollinators by providing habitat and food supply.

Figure 9. Wild Lupine (*Lupinus perennis*). Photo: Richard H. Wiegand.

PLAN IMPLEMENTATION

Who:
Once reviewed and approved by the County, the implementation of this proposed plan will be lead by Jug Bay staff (Jug Bay Superintendent and Stewardship Coordinator) with the support of other County departments as needed. Friends of Jug Bay volunteers will provide necessary support to Jug Bay and County staff to conduct the necessary field work.

When and How:
Considering that some areas within the barren habitat are already showing signs of re-colonization it is recommended to start the implementation of the various proposed actions as soon as possible. Some of the proposed actions, however, will require a permit and/or specialized equipment, which would have to be determined before any work starts. If necessary equipment is provided, most of the work could be done with minimal expenses, besides the hours invested by staff and volunteers.
ARTICLES AND REPORTS


Mawdsley, J.R. 2005. The tiger beetle fauna of an anthropogenic sand barrens site in central Maryland, USA.

Mawdsley, J.R. 2007. Tigers in Trouble: Jug Bay Provides Sanctuary for Rare Beetles, Marsh Notes Fall newsletter.