



INTRODUCTION

Five barrens habitats are identified in Pennsylvania, central Appalachian scrub oak-pitch pine, ridgetop acidic, serpentine, Appalachian shale, and mesic till barrens, distinguished by the specific soils on which they occur. A common theme among most barrens habitats is their location on ridge tops where soils are well drained, sandy and acidic. Despite their name, barrens are quite diverse. For example, the pitch pine-scrub oak habitat type includes thirty-one plant associates. Such diversity makes barrens invaluable to wildlife at local and landscape scales. Due to changes in disturbance regimen, barrens habitats are disappearing in Pennsylvania; however, with a keen eye and the right tools, managers can restore and maintain these key habitats.

HABITAT CHARACTERISTICS

A common theme among barrens is their location on ridge tops with well-drained, often sandy and acidic soils. Frequent disturbance (especially fire) and thin soils can limit tree growth on these sites. Healthy barrens have early successional structure with abundant ground cover, shrubs, herbaceous pockets, and scattered trees. An array of wildlife food and cover are provided by hard pines, scrub oak, blueberry, huckleberry, blackberry, and herbaceous plants.

Fire plays an integral role. Barrens were maintained for thousands of years by lightning-induced and native-set fires that promoted berries and improved hunting grounds. More recently, fires were lit by settlers and sparks from locomotives that carried coal and timber. Fire suppression was initiated in the early 1900s to stem the uncontrolled wildfires burning across the clearcut Commonwealth. Though necessary, statewide suppression ended fire's long standing influence on barrens and other important habitats. In the absence of fire, trees that were minor components in healthy barrens expanded and changed habitat structure from early successional to closed canopy forest. Without fire, understory diversity was lost to the shading effect of trees and overly dense



shrubs. Barrens are not necessarily treeless. Scattered oaks and hard pines (pitch or table mountain pine) are desirable; however, beyond about 15 trees per acre (BA 10ft²) barrens become savannas or woodlands, the topic of another chapter (See Oak Habitats).

Barrens habitats often occur as 'ridgetop barrens complexes' that may include perched wetlands, pine-oak forest and oak savannas. Each site has a unique mix determined by soil, slope, and aspect. Even where a fire regimen is allowed, unburned wetland and riparian habitats occur where streams intersect the thin-soiled barrens. The barrens themselves often have a ground cover of moss and herbaceous vegetation that supports diverse species. Such natural interspersion makes barrens complexes critical and unique wherever they occur.

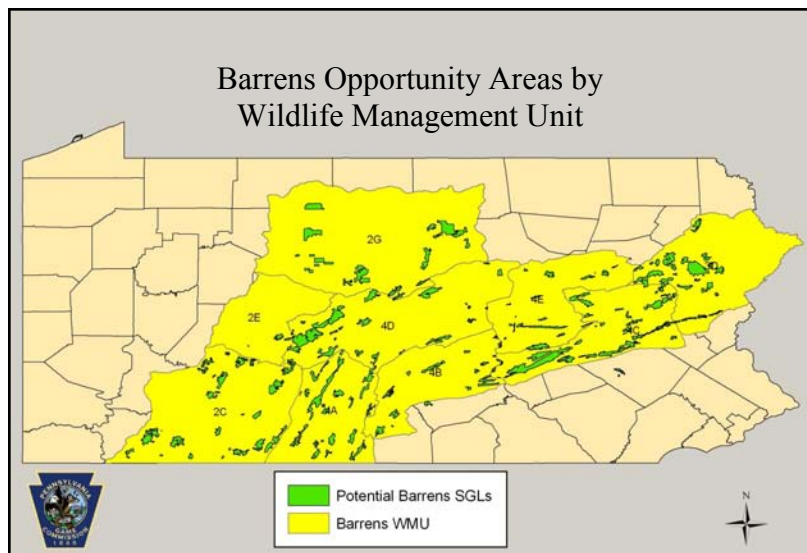


WILDLIFE COMMUNITIES

Stories from old-time hunters reveal abundant game in 'red brush', the name given to scrub oak flats maintained by locomotive-induced fires. Photographic accounts from the era reveal ideal early successional habitat, complete with interspersed herbaceous openings and scattered pines. Ruffed grouse, white-tailed deer, black bear, snowshoe hare, whip-poor-wills, golden-winged warblers, and American woodcock found barrens inviting then and now.

Though rarely discussed in context of barrens, early successional habitat conservation is a habitat challenge in Pennsylvania. While barrens are widely recognized for their importance to rare plants and invertebrates, their value to early successional wildlife is often overlooked .

The occurrence of barrens in habitat complexes is part of what makes them so valuable to wildlife. In wet areas that intersect the thin, sandy soils, one can find American woodcock and other species associated with moister habitats. In the grassy areas of many barrens, northern harriers can forage from nests constructed in nearby scrub wetlands. Some barrens adjoin rocky outcrops with value for species not ordinarily considered barrens associates, such as Allegheny woodrat and timber rattlesnake. Depending on geographic location, snowshoe hare are found in relatively high numbers in barrens. Considering the range of wildlife use from generalists to specialists, game to nongame, barrens conservation should be a priority on lands managed for wildlife .



OPPORTUNITY AREAS

The first step in habitat conservation is determining where important habitats could occur. Ridgetop barrens are found in the Northern Ridge and Valley, Allegheny Plateau, Pocono Plateau, Northern Great Valley, and Allegheny Deep Valley Ecoregions of Pennsylvania. The area encompasses 132 State Game Land tracts.



Relict pitch pine in mixed hardwoods.

Cover mapping is necessary to incorporate barrens into management plans. The Game Commission's *Manual of Procedure for State Game Lands Cover Mapping* includes cover types that address barrens habitats in various conditions.

Upon realizing an area falls within the potential barrens landscape, managers must put boots on the ground to delineate barrens sites. Sometimes, large areas of decadent scrub oak and/or pitch pine make identification easy. Often, the signs are more subtle such as scattered pitch pine among hardwoods or small remnant patches of scrub oak. Even when obvious

patches are discovered, the search for more subtle signs should be expanded to surrounding areas.

Cover mapping is necessary to incorporate barrens into management plans.

Cover type and code for habitat types associated with barrens in Pennsylvania.

Cover type

Code

Pitch Pine – Scrub Oak Woodland	JP
Pitch Pine – Heath Woodland	JF
Virginia Pine – Mixed Hardwood Shale Woodland	JV
Dry Oak – Heath Woodland	JA
Pitch Pine – Rhodora – Scrub Oak Woodland	JR
Scrub Oak Shrubland	KA
Pitch Pine – Mixed Oak Forest	EO
Dry Oak – Heath Forest	AH
Rhodora – Mixed Heath Scrub Oak Shrubland	KO
Serpentine Pitch Pine - Oak Forest	MX
Serpentine Virginia Pine - Oak Forest	MX

MANAGEMENT STRATEGIES

Past management efforts used rotational mowing as a fire surrogate to knock back tree growth. When brush and trees were mowed, the resulting mulch added organic matter to soils, accelerating further tree establishment and growth. The process, termed 'mesification', actually hastened habitat loss by deepening naturally thin barrens soils. The same process occurs in unmowed barrens where fire is excluded, albeit over a longer time scale. As a result, barrens have nearly disappeared with remaining pockets in poor condition. Although mowing and other mechanical treatments are useful, they must be used in conjunction with prescribed fire. Reintroducing fire to barrens is central to management of this important habitat type.

Barrens management falls into two phases, restoration and maintenance.

Restoration

Restoration focuses on whittling away at undesirable vegetation that has taken over a barrens. This may be large hardwoods, decadent scrub oak, over-abundant mountain laurel, or exotic invasives. The accumulation of these plants over decades of fire exclusion has led to extremely high fuel loads and potentially dangerous wildfire conditions. This material must be removed

one layer at a time so fire can be safely introduced back into the barrens. The analogy of 'peeling an onion' has been used to describe the process.

The first step in restoration may include mechanical treatment with a large rotary or mulching head machine. This is helpful in knocking down tall vegetation (i.e., fuel) near firebreaks. The lower the height of adjacent fuels, the narrower firebreaks can be, thus minimizing soil



Mowing near firebreaks lowers fuel loads, improving safety of prescribed burn operations.

impact from dozer work. Mowed vegetation should be burned after it cures which can be as soon as 45 days or as long as two years following treatment.



It is not necessary to mow entire barrens during restoration. The deciding factor is the ability to safely use prescribed fire. If interiors can be burned safely without mechanical treatment, this is preferred.

Where barrens have progressed to forest, tree cutting is necessary. Commercial operations are preferred because harvested trees are removed from the site, aiding in fuel reduction. Early successional structure can be restored with residual basal area up to 10 ft² (10-15 trees/acre) in oak and hard pines. Greater residual basal area will result in savanna or woodland habitats that are also valuable parts of the barrens complex.



Mixed oak stand with remnant pitch pine, scrub oak, and blueberry. The stand could be cut heavily to convert to barrens, or thinned to convert to a savanna or woodland. Either way, prescribed fire will be part of the plan.

Felling trees and leaving them lay may be an option where commercial sales are not viable. Heavy fuel loading from down trees is a concern. Keep in mind that returning a fire regimen will cause some tree mortality, the extent depending on fire frequency and intensity; therefore, some areas can be thinned with fire alone. Regardless of mowing or cutting treatments, it will be necessary to use prescribed fire during restoration.



Hand felled trees and mowed scrub oak and laurel awaiting prescribed fire.

Restoration may be complete following one burn or could still be in progress after many burns, depending on condition at the outset (i.e., how many layers were on the onion). The current condition of barrens came about over more than fifty years of fire exclusion; therefore, managers shouldn't expect to restore them overnight. Patience, reasonable expectations, and thoughtful monitoring are keys to success.



George Gress Photo

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Barrens management moves from restoration to maintenance when desirable early successional conditions are observed. Well interspersed

vegetation with scattered trees, native shrubs, herbaceous plants, and bare ground are good indicators. The pieces often come together naturally without supplemental seeding or planting. When fire intolerant plants like gray birch and honeysuckle are burned, scrub oak and huckleberry regain their rightful position on the barrens. Seemingly vanished plants often appear from reserves buried in the seed bank. With the appearance of good habitat indicators, managers are challenged with maintaining these conditions.



Pat McElhenny Photo

Healthy barrens with interspersed pine, scrub oak, shrubs, and blueberry.

Maintenance

Fire return interval, or burn rotation, is *generally* longer (8-15 years) during the maintenance phase compared to the restoration phase(3-5 years). However, these are only general guidelines. The decision to conduct a maintenance burn is based on habitat condition. Thoughtful monitoring and observations are necessary, and several triggers will indicate management need.

<u>Management Trigger</u>	<u>Management Tools</u>
• Presence of fire intolerant trees such as maples, birch.	-Prescribed fire late spring or early fall.
• Loss of herbaceous component.	-Prescribed fire fall, and shorter burn rotation.
• Fuel load increased to dangerous level.	-Mow, targeting firebreaks, followed by prescribed fire. Shorten rotation to prevent recurrence.
• Appearance of invasive shrubs.	-Prescribed fire spring, followed by spot herbicide in fall if re-sprouting occurs. -Prescribed fire fall, followed by spot herbicide in late spring if re-sprouting occurs.

Burning during the growing season (late spring, summer, early autumn) reduces ability of woody plants to replenish reserves. This inhibits growth and increases mortality of fire intolerants like maples, honeysuckle, birch, and buckthorn, while not affecting the fire tolerants such as oaks, scrub oak, and pitch pine. Frequent growing season burning (3-5 years) generally



George Gress Photo

Growing season prescribed fire backing through scrub oak. Most oaks re-sprout vigorously after fire.

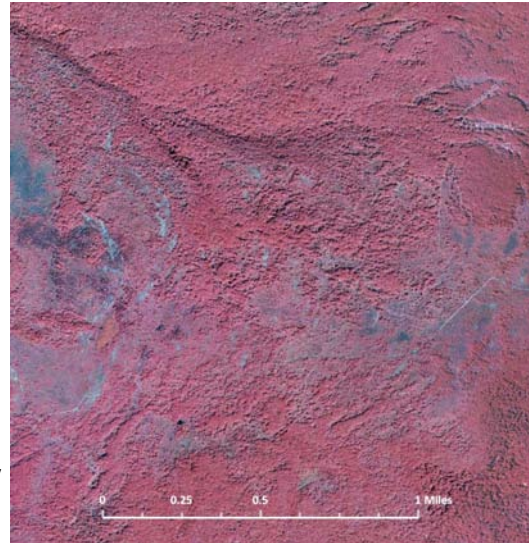
leads to a greater proportion of herbaceous cover that fills gaps left by woody trees and shrubs. Prescribed fire frequency is fine-tuned on each barrens site depending on desired habitat condition.



Scott Bearer Photo

MANAGEMENT PLANNING

Maintaining habitat diversity of entire barrens complexes is a management goal. Recall that barrens' value to wildlife is bolstered by their occurrence among multiple habitat types. Therefore, a landscape-scale management approach is most appropriate. Barrens have been shaped over thousands of years by disturbances that acted over large areas (i.e., ice storms, tornadoes, and wildfires affected hundreds of acres at a time). Thus barrens should be maintained on a large scale, wherever possible. Although it makes sense to begin restoration on smaller blocks to reduce fuel loads and create safety buffers, the ultimate goal is to achieve management on the order of several hundred, even thousands of acres. At such a scale, habitat management can have a notable impact on wildlife populations.



Barrens complex including scrub oak, wetlands, oak woodlands, and deciduous forest.



Fire behavior is influenced by natural features, creating diverse habitats. Note the interspersion of burned and unburned areas and the existing roads that served as perimeter firebreaks.

points. From there, dozer lines can fill the gaps and secure large areas for burning operations. Because of soil conditions and cost, dozer lines should only be used to supplement natural breaks.

Landscape-scale planning is paramount to barrens management. Restoring natural disturbance regimen over large areas will be necessary to return population levels of many early successional-dependant species.

Of the natural processes that created barrens, fire can be used to manipulate habitat at a landscape scale. When prescribed fire is applied over large areas, natural changes in vegetation, soils, topography, aspect and slope influence fire and the resultant habitats. Fire behavior in response to natural features can maintain and even expand barrens complexes. The result is intermingling vegetation communities shaped by natural forces.

Managers should identify and take advantage of existing firebreaks where possible. Features like streams, wetlands, existing roads, and trails can be excellent anchor



Dozed firebreak around the perimeter of a large barrens complex.

SUMMARY

- Barrens are important early successional habitats in Pennsylvania, and are cited as key habitats in the State Wildlife Action Plan.
- Barrens depend on frequent disturbance (especially fire) to maintain their unique habitat structure.
- Fire exclusion has drastically reduced both the quantity and quality of barrens habitats in the Commonwealth.
- Barrens management occurs in two stages, restoration and maintenance, with initial stages intended to peel back built up vegetation layers and latter phases to maintain early successional structure.
- Landscape scale management of entire barrens complexes is necessary to restore wildlife populations that depend on this habitat type.
- The Pennsylvania Game Commission and partners are committed to conserving barrens habitats for wildlife.



Fawn in barrens blueberry patch.

ADDITIONAL INFORMATION

[Managing Fuels in Northeastern Barrens](#) (over 40 publications)

Includes sample management plans, invasives and fuels management, historical publications.
<http://www.umass.edu/nebarrensfuels/publications/index.html>

[Management Guidelines for Barrens Communities in Pennsylvania](#)

Detailed descriptions including condition, threats, and management needs for PA barrens.



Scotia Barrens in the 1940s and today. Locomotive-ignited fires prior to the mid-1920's maintained ideal scrub oak pitch pine habitat. Today, the barrens is dominated by maturing forest and exotic shrubs. The Game Commission is in the restoration phase of managing this 1,000+ acre barrens.

GAME ANIMALS ASSOCIATED WITH PENNSYLVANIA BARRENS

White-Tailed Deer (<i>Odocoileus virginianus</i>) Utilize barrens for protective cover, fawning cover, herbaceous forage, woody browse, hard and soft mast, especially scrub oak acorns.
Black Bear (<i>Ursus Americana</i>) Protective cover, herbaceous forage, hard/soft mast, blueberry, huckleberry, scrub oak acorns.
Ruffed Grouse (<i>Bonasa umbellus</i>) Protective cover, hard/soft mast, especially scrub oak acorns, blueberries, and huckleberries.
American Woodcock (<i>Scolopax minor</i>) Open, herbaceous singing grounds adjacent to cover, interspersed wetlands for foraging.
Northern Bobwhite Quail (<i>Colinus virginianus</i>) Interspersion of protective cover, bare ground, and various food sources in close proximity.
Appalachian Cottontail (<i>Sylvilagus obscurus</i>) Protective cover, herbaceous forage, and woody browse.
Snowshoe Hare (<i>Lepus americanus</i>) Protective cover herbaceous forage, and woody browse.
Bobcat (<i>Lynx rufus</i>) Small mammal food source, remote habitats, adjacent rocky outcrops for denning.

WILDLIFE ACTION PLAN PRIORITY SPECIES ASSOCIATED WITH PENNSYLVANIA BARRENS .

IMMEDIATE CONCERN
Allegheny Woodrat (<i>Neotoma magister</i>) Sandstone and/or limestone rock habitats in unfragmented oakhickory forest communities.
Northern Bobwhite Quail (<i>Colinus virginianus</i>) Scattered shrubs and briars interspersed with herbaceous or grassy vegetation.
Olive-Sided Flycatcher (<i>Contopus cooperi</i>) Clearings within old growth conifer forest, sphagnum bogs, burned over forest, swampy lake edges, and beaver meadows.
Spotted Turtle (<i>Clemmys guttata</i>) Soft-bottomed aquatic habitats, including small streams, marshes, swamps, and vernal pools w/ up-land forests or open habitats.
Timber Rattlesnake (<i>Crotalus horridus</i>) Sandstone and/or limestone rock habitats in unfragmented oak hickory forest communities.
Golden-winged Warbler (<i>Vermivora chrysoptera</i>) Mosaic of herbaceous patches and shrubby thickets along a forest edge, often at higher elevations; increasingly found in higher elevation bogs and forested wetlands.
HIGH LEVEL CONCERN
Appalachian Cottontail (<i>Sylvilagus obscurus</i>) High elevation flat ridgetops dominated by mountain laurel with interspersed grassy openings; small, recently planted pine plantations with significant grass and forb cover; young clearcuts; also low elevation beaver meadows w/ thickets.

Eastern Spotted Skunk (<i>Spilogale putorius</i>) Dry oak, Virginia pine, and pitch pine forested rocky ridges and ravines; reverting farmland.
Long-Eared Owl (<i>Asio otus</i>) Conifer (hemlock) woods intermingled with field and meadow.
Northern Harrier (<i>Circus cyaneus</i>) Large open grasslands; marshy meadows, wet lightly grazed pastures, open bogs wet lightly grazed pastures, open bogs Deciduous/mixed forests - moderate to steep hillsides with rocky cover and vegetation.
Northern Coal Skink (<i>Eumeces anthracinus anthracinus</i>) Open habitat (less than 50% canopy tree cover) where rocks and logs provide abundant cover.
PENNSYLVANIA VULNERABLE
Red Crossbill (<i>Loxia curvirostra</i>) Northern boreal forest; white pine, red pine, eastern hemlock, red spruce, and white spruce.
MAINTENANCE CONCERN
American Woodcock (<i>Scolopax minor</i>) Habitat mix, including small, scattered openings and dense stands of shrubs and young trees.
Brown Thrasher (<i>Toxostoma rufum</i>) Brushy mosaic habitats - hedgerows, thickets, overgrown fields, and forest edges prefer >1 acre overgrown fields with open foraging areas, brushy nesting areas, and abundant song perches.
Fowler's Toad (<i>Bufo fowleri</i>) River bottoms, lake edges, sandy places with dry gravelly and sandy alluvium deposits
Prairie Warbler (<i>Dendroica discolor</i>) Brushy second growth, dry scrub, low pine, pine barrens, and burned-over areas.
Snowshoe Hare (<i>Lepus americanus</i>) Dense thickets (>2-meter stem height); 5-15 years after clearcutting in northern hardwoods and mixed-oak forests; natural scrub oak barrens.
Whip-poor-will (<i>Caprimulgus vociferous</i>) Early to mid successional and open, forested habitats near clearings.
Willow Flycatcher (<i>Empidonax traillii</i>) Shrub swamp, wet meadow, and brushy habitat along streams, ponds and marshes.
Yellow-Breasted Chat (<i>Icteria virens</i>) Low, dense shrub habitats with an open or partially open tree canopy in regenerating clearcuts, forest edges, abandoned farmland, burned forest, and shrubby margins.



Barrens restoration underway on State Game Lands 48 in Bedford County

Justin Vreeland Photo