In open areas of white-cedar swamps, such as this one, occur curly-grass fern, orchids such as rose pogonia, pitcher-plant, sundews, and other interesting herbaceous plants. This open area was probably created by removing "turf" for stabilizing slopes of dams, road cuts or fills.

Reprinted from New Jersey Outdoors

The state of the stat

# of the pine barrens

and their niche requirements

photographs by the author



A portion of the area shown in the top photo. Note the orchid in bloom, and the thread-leaf sundews in the foreground.

## By Silas Little

Principal Silviculturist Northeastern Forest Experiment Station

The Pine Barrens of southern New Jersey have long aroused the interest of professional botanists and others interested in relatively rare plants. In the Barrens occursuch plants as Conrad's crowberry or broom-crowberry, found also in New York's Shawangunk Mountains, on Cape Cod, and northward along the coast; curly-grass fern. which also grows in Nova Scotia and Newfoundland and has recently been found in rare spots on the eastern end of Long Island; sand-myrtle, the typical species of which is found only in the Jersey Barrens; about 20 species of the orchid family; three species of sundew; and one of pitcherplant. Stone reported in 1911 that 565 species of ferns and flowering plants, exclusive of introduced weeds, occurred in the Barrens. McCormick recently estimated that the present-day vascular flora comprises 800 species, variities, and forms, but his increased number over Stone's is largely due to subdivisions of species into varieties and

My observations have drawn my attention to the niches some of these plants require, and the various land practices or disturbances that have provided these niches.

### The Disturbances

The forests of the Barrens have been shaped not only by the soils, but also by extensive wildfires and heavy cutting. Ever since colonial times, large and devastating wildfires have been common. The area has long been subject to heavy cutting because it was settled early, was situated between New York and Philadelphia, and was handy to water transportation. In the heyday of wood fuel, upland stands near water transportation were clearcut about every 25 years; less accessible upland forests were clearcut about every 40 years. By 1900 most swamp forests of Atlantic white-cedar had been clearcut three or four times. Cutting pressures have declined in recent years; but still the markets for white-cedar and pine have been so good that few stands reach an age of 70 years.

Locally there have been even more severe disturbances than those wrought by cutting and ordinary wildfire. Occasionally a wildfire during extreme drought has burned deep into the organic soil of a swamp and created, when precipitation returned to normal, an open bog. Other such bogs were created long ago by mining of bog ore.

#### Relation of Barren Plants to Disturbances

One of the relatively rare plants, curly-grass fern, seems to be closely associated with past severe disturbances. I have found this plant in open swamps, some of them results of deep-burning wildfires that left old cedar stumps jutting above open water. Until spagnum moss builds up and creates hummocks around these stumps, the damp old wood just above standing water provides suitable niches for curly-grass fern.

Various species of orchids are eagerly sought by wild-flower enthusiasts. Many of these species occur primarily in open bogs or other openings caused by past disturbances: wildfires, bog-ore mining, logging, removal of 'turf', construction and subsequent abandonment of

logging roads, and so on.

The climax vegetation on the swamp sites includes few herbs. The overstory is a mixture of hardwoods, mostly red maple, blackgum and sweetbay. Shrubs form a dense understory. In contrast, white-cedar stands—unless thinned several years earlier—had in our study a relatively sparse understory of shrubs, more light near the ground, and 14 species of herbs.

Minor disturbances may favor certain herbaceous plants over shrubs or tree reproduction in the understory of swamp stands. For example, application of herbicides in narrow strips along roads has increased the number of

ferns, star-flowers, and other herbaceous plants.

Cutting of white-cedar stands has not usually created severe enough disturbances to favor such plants as curly-grass fern; but between piles of slash many other herbaceous plants have developed. These include sundews, pitcher-plant, meadow-beauty, milkworts, orchids and several species of sedge, spike-rush, beak-rush, and cotton-grass.

On imperfectly to very poorly drained soils between the uplands and the swamps are stands of pitch pine that have a dense shrubby understory. We've frequently tallied 18 species of shrubs on these sites. Two shrubs that occur

more frequently on these flats than elsewhere are dwarf huckleberry and sand-myrtle. The latter occurs mostly on the upland edges of the shrubby understories, but also frequently grows in the middle of sand roads that traverse these sites. It also grows in the Plains.

In spots of the pine flats where turf was removed many years ago, colonies of sundews may still be common. On abandoned haul roads once used to remove cedar, milkworts are common and flower profusely—in marked contrast to adjoining shrub thickets, where they are absent or rare. Pine-barren gentian and turkeybeard may occur in mixture with shrubs, but periodic fires seem to be necessary to retain them in the mixture.

Golden-heather or pine-barren hudsonia is a characteristic plant of open, sandy spots on upland sites—forming mats of yellow blooms in late spring. Numerous seedlings of this species start in burned, bare spots of the Plains. Golden-heather also invades sandy borrow pits and unstabilized edges of roads on sandy sites.

Somewhat associated with golden-heather in the Plains, but more characteristic of rather stabilized bare spots, are pyxie or flowering-moss and arbutus or mayflower. Pyxie also grows on bare, moist sands and on other bare upland sands in open spots, while mayflower occurs on upland sites in various parts of the Barrens.

On many upland sites the characteristic shrubs are low-bush blueberries and huckleberries. Herbs are

relatively sparse and inconspicuous.

However, on sites that are frequently prescribe-burned in the winter, and especially in openings on the better soils, a wide variety of showy herbs become conspicuous in the summer flora. Because prescribed fires do not appreciably injure overstory trees, and hence do not reduce overstory shade, these herbs usually dominate only along road edges and under thinned or otherwise cut stands—sites where sufficient light is available to favor the development of herbs. There patches of any or several of these and other herbs may develop: hoary pea, false indigo, blazing-star, false foxglove, pink geradia, sensitive plant, bush-clovers, goldenrods, asters, lupine, and butterflyweed. Mingled with the herbs will be sedges, beardgrass, and panic-grasses. In some places the fire sedge will dominate-especially after killing fires or other disturbances followed by clearcutting.

### Conclusions

Many of the interesting flowering plants of the New Jersey Pine barrens have niches determined not only by soil and moisture, but also by the amount of overhead light and, in some cases, the type of forest floor. Certain kinds of disturbances, sometimes severe ones, are needed to provide the light and forest-floor conditions that these plants require. While further ecological studies are necessary to determine what the proper conditions are for each of these interesting plants, it is apparent that exclusion of fires (wild or prescribed), cessation of timber cutting, and prevention of other disturbances associated with moderate use of the Barrens would favor shade-tolerant shrubs and not the herbs and subshrubs (such as golden-heather) that have aroused so much interest in the Pine Barren flora.