NEBRASKA'S

Threatened and Endangered Species

Blowout Penstemon

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Blowout Penstemon – An endangered species

Status

Blowout penstemon (*Penstemon haydenii*), the rarest plant species native to the Great Plains, grows only in the Nebraska Sandhills and is the only endangered plant in the state. Now growing only in the open, sandy habitat of blowouts — the rounded, wind-excavated depressions in dune tops — natural populations presently are restricted to Box Butte, Cherry, Garden, Morrill and Thomas counties. It was classified as endangered in 1987.

Blowout penstemon was once common in the Sandhills. In his 1913 description of the Sandhills flora, University of Nebraska Professor Raymond Pool frequently mentioned the species, but by the 1940s it was thought to be extinct. It was rediscovered in 1968. Today, 3,000 to 5,000 plants, their number varying yearly depending on climatic conditions, remain at 13 sites. More than 80 percent of the sites are within an area less than 50 miles in diameter, making them highly susceptible to localized drought or other threats.

Description

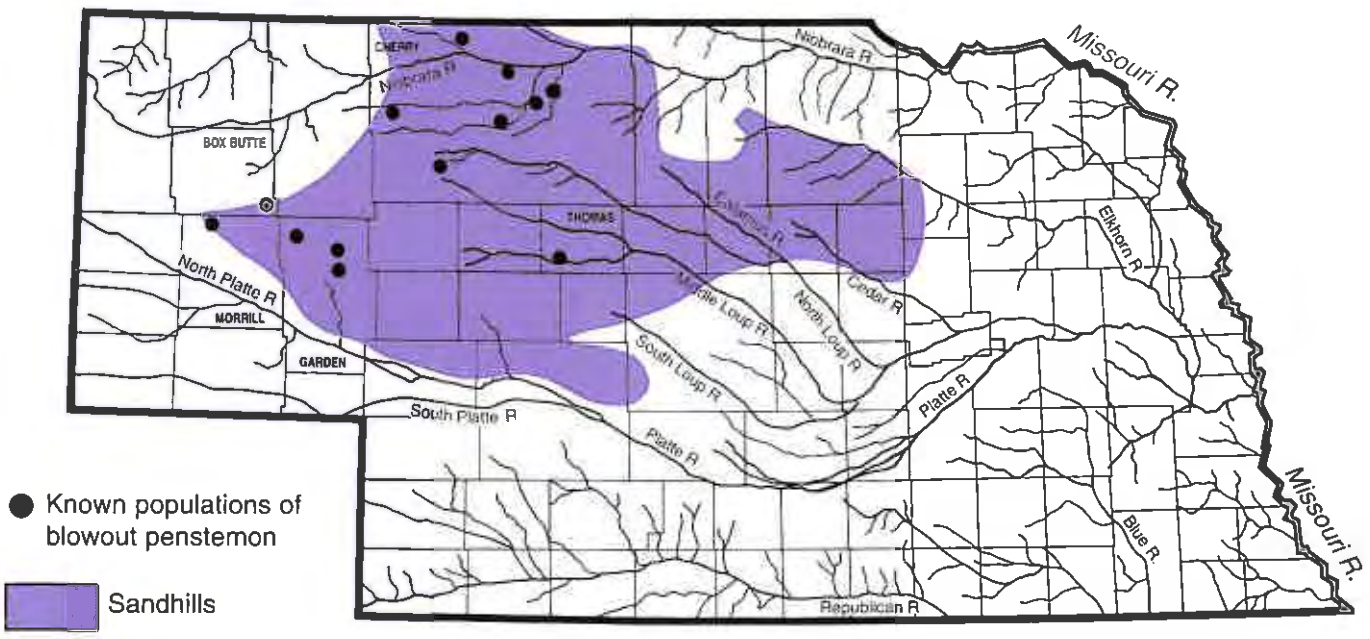
Blowout penstemon can be readily identified in the field. It is most common in the bare sand in the bowl of blowouts or in colonies of blowout-grass (*Redfieldia flexuosa*) and lemon scurfpea (*Psoralea lanceolata*). It also can be found around the rims of blowouts where sand is deposited. In May and June, when it is in bloom, its large lavender flower heads stand out in the scant vegetation in and around blowouts.

A short-lived perennial, it frequently occurs in large, multi-stemmed clumps. Stems are of two types, flowering and vegetative. Vegetative stems are commonly one foot tall or shorter, but can reach nearly two feet. They are lax and curved upward from the base. Plants often root from the stem nodes if the nodes are buried in sand. The lax, linear leaves, one to eight inches long and one-quarter to one inch wide, grow opposite each other and have no petiole, but are attached directly to the stem. They have parallel veins and smooth edges. They are greenish-blue, waxy in appearance and have no pubescence (hairs).

The flowering stems, up to about one-half inch in diameter, are stout and usually six to 18 inches tall. Leaves on the flowering stems are up to three inches wide, lance-shaped and stiff. The flowering head is cylindrical with 16 to 80 flowers arranged in several whorls. Each whorl is located directly above a pair of stiff, overlapping, leaf-like bracts. The bracts are longer than they are wide with heart-shaped bases. The one- to one-and-a-half-inch, tube-shaped corolla (the petals) is milky blue to milky lavender or, rarely, white or pink. The upper lip of the corolla has two lobes and the lower lip has three lobes. Distinct magenta lines inside the corolla guide insects to the nectar. The brown, disk-shaped seeds are one-tenth to one-fifteenth inch in diameter. They form in sharp-pointed capsules from about one-half inch to about one inch long.

Blowout penstemon often is confused with shell-leaf penstemon (*Penstemon grandiflorus*) and narrow penstemon (*Penstemon angustifolius*),

Blowout Penstemon Distribution in Nebraska



which also grow in the Sandhills. The flowers of narrow penstemon are similar in color to those of blowout penstemon, but are less than one inch long. Shell-leaf penstemon often has flowers similar in size and color to blowout penstemon, but its leaves are egg- or spatula-shaped with the broadest part above the middle. Both species are common along roadsides in the Sandhills and usually grow in denser vegetation than does blowout penstemon. The blowout penstemon is not found along roadsides or in Sandhills prairie vegetation. Its lavender or vanilla-like fragrance is a distinguishing characteristic. It is the only penstemon in Nebraska with fragrant flowers, and it is one of only two fragrant species of the 300 penstemons in the world.

Life History

Growth begins in late March or early April from buds on the lower stems formed the previous year. Some stems near the soil surface can remain green through the winter. By early May, flowering shoots can be distinguished from vegetative shoots by the developing broad bracts of the inflorescence. The plants bloom from late May to late June. Though it is uncommon, a few plants sometimes bloom in August or September. Individual flowers bloom for five to nine days.

Blooming begins at the base of the inflorescence and proceeds upward, and an individual plant is usually in bloom for three to four weeks. Not all plants bloom every year. Cross-pollination is most common, but self-pollination also occurs. Flowers are pollinated by many insects, including wasps, ants, bees, beetles, butterflies and flies.

The fruit, a capsule containing 25 to 35 seeds, begins to form soon after the flowers drop and continues to develop through the summer. An average of 1,500 seeds are produced by each plant. By late August the mature

Flowering and vegetative stems of the blowout penstemon are connected by a rhizomatous-like root.

fruits have turned brown, and in early September they split open and the seeds fall to the ground. The seeds are relished by many small mammals, such as kangaroo rats, and by birds, such as prairie grouse.

The few seeds that remain uneaten are blown along the soil surface until they are covered, a thick seed-coat protecting them from the abrasive sand. Buried seeds can remain viable for 20 years and can germinate if sand movement eventually brings them close to the surface. For seeds to germinate and for the roots of seedlings to reach a depth where moisture is constantly available, blowout sand must remain damp for at least two weeks, conditions that usually occur only in one of eight or 10 years, limiting seedling establishment. Seedlings are rare even where adult plants are present and seeds are abundant.

Habitat

The Sandhills is the largest area of sand dunes in the Western Hemisphere, occupying more than 12 million acres in north-central Nebraska. The dunes range in height from a few feet to more than 300 feet. Major periods of dune movement occurred 8,000 to 5,000 years ago, with more recent periods of lesser dune reactivation. In the most recent centuries, climatic conditions have been wet enough for the dunes to support sufficient vegetation to keep them stable. Nevertheless, dune soils are poorly developed because of the constant erosion and deposition of sand. Annual rainfall varies from 17 inches in the western Sandhills to 23 inches in the east. Cattle ranching is the primary land use in the region.

Most of the upland dunes support Sandhills prairie dominated by tall grasses, including sand bluestem (*Andropogon hallii*) and prairie sandreed (*Calamovilfa longifolia*), and midgrasses, including little bluestem (*Schizachyrium scoparium*) and junegrass (*Koeleria macrantha*). Forbs (wildflowers) also are common in the Sandhills.

Blowouts form in the dune tops when their protective vegetative cover is reduced and wind erosion eventually forms craters, depositing the excavated sand on the downwind side. Most blowouts are less than one acre in size. Blowout penstemon is one of the first species to invade blowouts along with winged pigweed (*Cycloloma atriplicifolium*) and clammy ground-cherry (*Physalis heterophylla*). Eventually, blowouts can heal, reverting to Sandhills prairie.

Limiting Factors

Ecologists are not sure what caused the sudden decline in blowout penstemon in the first half of the 20th century, but several factors, including the Great Drought of the 1930s, might have contributed. Blowout penstemon requires abundant soil moisture, and in dry years, moisture is not adequate even in sparsely vegetated blowouts.

In recent years, larvae of a pyralid moth have caused extensive damage to some populations of blowout penstemon, causing losses up to 75 percent. The moth larvae burrow into penstemon stems, causing tissue damage.

Blowout penstemon habitat has greatly decreased since the settlement of the Sandhills. Before settlement, lightning- and Indian-set prairie fires frequently burned extensive areas, especially if they occurred from late summer to early winter. Fires, along with bison grazing, exposed the sand to winter and spring winds. Early reports describe extensive areas of blowing sand, a contrast to today's stabilized, grass-covered dunes.

After settlement, prairie fires were less frequent and extensive. The vegetation cover thickened, and open, sandy areas declined. Blowout penstemon soon was restricted to blowouts, the last remaining areas of bare sand. Originally called Hayden's penstemon, honoring Ferdinand V. Hayden who first collected the plant in 1857, it was referred to as "blow-out" penstemon by Pool as early as 1913, suggesting that its habitat was already restricted by that time.

Range management in recent decades has further altered the vegetation of the Sandhills. Reduced grazing

Blowout penstemon is now found only in the open, sandy habitat of blowouts, the rounded, wind-excavated depressions in dune tops.

Blowout penstemon flowers typically are milky blue to milky lavender. Although rare, white flowers occasionally are found.

intensity and implementation of planned grazing systems have increased the total vegetative cover and led to a reduction in the number of blowouts. Grazing itself is seldom a problem for blowout penstemon. Cattle eat the plant only infrequently if other forage is available. Penstemon plants are sometimes eaten in pastures that receive heavy spring grazing, and heavy grazing for several consecutive years could reduce plant numbers. Since the 1920s many blowouts have been seeded and reshaped to improve range conditions; some penstemon habitat and probably some plants were lost in the process.

Blowout penstemon now remains only in a few sites where wind erosion has maintained active blowouts, a dynamic, relatively short-lived and now uncommon habitat. Further complicating the issue, most populations of blowout penstemon are now so isolated that there is little chance for seeds to migrate to new blowouts if they do form. Populations also are genetically isolated, and there is little chance for an influx of new genetic material into established populations through pollen from other populations. Habitat reduction, the plant's relatively short life span (six to eight years) and limited germination conditions all threaten the health of the blowout penstemon.

Management

The recovery plan for the blowout penstemon calls for research on the life history, minimum genetically viable population size and management criteria for the species. The recovery strategy also requires the monitoring of all known populations to gather information on population changes and the health of each population. An inventory of suitable habitat is being conducted to determine sites for reintroduction. The recovery effort is being conducted cooperatively by the Nebraska Department of Agriculture, the Nebraska Game and Parks Commission and the University of Nebraska-Lincoln.

Seedlings grown in greenhouses at the University of Nebraska-Lincoln with funds provided by the Nebraska Environmental Trust are being transplanted into suitable habitat to increase the total number of plants and the range of blowout penstemon to reduce the potentially devastating effect of a local drought or other disaster. The current goal is to have a minimum of 10,000 plants in five population groups before the species can be reclassified from endangered to threatened. When 15,000 plants occur in 10 population groups, the plant could be delisted.

Regulations

Blowout penstemon is protected by the federal government through the federal Endangered Species Act of 1973 and the state Nongame and Endangered Species Conservation Act of 1984. Federal law prohibits the removal or destruction of listed plants on any area under federal jurisdiction. Exporting and possession of the plant is prohibited by state law. Violations carry civil and criminal penalties of up to $25,000.

Pesticides may not be applied in the vicinity of blowout penstemon. The Nebraska Department of Agriculture is responsible for enforcing pesticide regulations in the state and can provide information about regulations governing pesticide application in the vicinity of blowout penstemon. Violation of the Nebraska Pesticide Act can result in administrative penalties of up to $5,000 and civil penalties of up to $15,000.

The beauty and rarity of blowout penstemon could attract unscrupulous collectors and wildflower enthusiasts. Removal of only one or two plants from a small population could seriously reduce its continued viability and survival. Therefore, the exact locations of blowout penstemon populations are not publicized, and collection or possession of blowout penstemon on public and private property without proper permits is a violation of federal and state laws.

Potential habitat for blowout penstemon is created when wind erosion forms blowouts in dunes and deposits the excavated sand on the downwind side.

The lavender flowers of blowout penstemon appear in May and June.

Suggested Reading

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Note: New data on the occurrence and distribution of this species are being collected constantly, and some of the information in this publication may be outdated. It should be used for a general understanding of the status of this species in Nebraska and not as the sole source of locational information for any report, project, regional/local planning or environmental impact assessment. For current information on this or other threatened and endangered species, or for additional copies of this publication, contact the Wildlife Division, Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503.

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