COMMITTEE ON THE
STATUS OF ENDANGERED
WILDLIFE IN CANADA

OTTAWA, ONT. K1A 0H3
(819) 997-4991

COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA

OTTAWA (ONT.) K1A 0H3
(819) 997-4991

STATUS REPORT ON THE GOAT'S-RUE *TEPHROSIA VIRGINIANA* IN CANADA

BY

JANE M. BOWLES

STATUS ASSIGNED IN 1996
THREATENED

REASON: HIGHLY LOCALIZED POPULATIONS SUBJECT TO HIGH SEED PREDATION AND HABITAT DETERIORATION.

OCCURRENCE: ONTARIO

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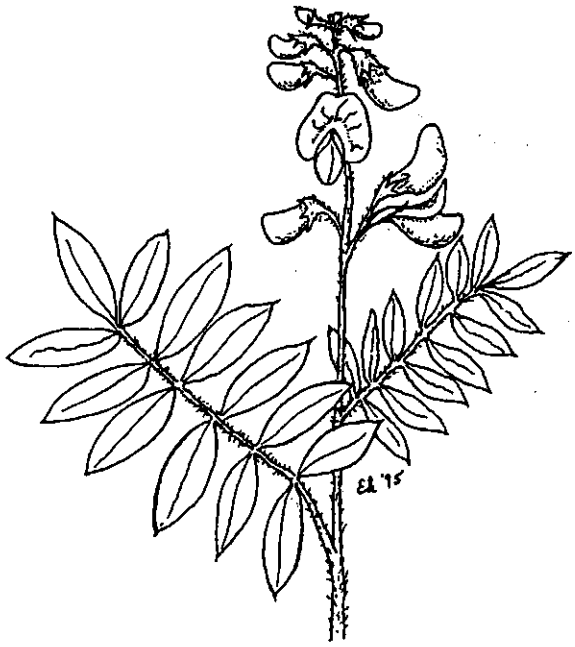
STATUS REPORT ON ENDANGERED WILDLIFE IN CANADA

Goat's-rue



COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA

COSEWIC

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JUNE 1994

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DEFINITIONS

SPECIES:	"Species" means an indigenous species, subspecies, variety or geographically defined population of wild fauna and flora.
VULNERABLE: (V)	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
THREATENED: (T)	A species likely to become endangered if limiting factors are not reversed.
ENDANGERED: (E)	A species facing imminent extirpation or extinction.
EXTIRPATED: (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
EXTINCT: (X)	A species that no longer exists.
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STATUS REPORT ON THE GOAT'S-RUE
TEPHROSIA VIRGINIANA

IN CANADA

BY

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THREATENED

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ABSTRACT

Bowles, Jane, M. 1994. Status Report on Goat's-rue (*Tephrosia virginiana*) in Canada. Committee on the Status of Endangered Wildlife in Canada. ii + 15 pp.

Tephrosia virginiana (L.) Pers. (Leguminosae) or Goat's-rue is a perennial herb of sand barrens, oak and pine savannas, dunes and other dry, open, non-calcareous habitats in eastern North America. Its range stretches south to Florida and Texas, and north to New Hampshire, New York, southern Ontario, southern Michigan and southern Wisconsin. Over much of its distribution it is common where suitable habitat exists, but at the northern limit of its range it is much less abundant. In Ontario, its distribution is limited to a few populations around Turkey Point on the north shore of Lake Erie.

The largest cluster of populations is found in Turkey Point Provincial Park where a program of prescribed burns has been initiated to manage the oak savanna where Goat's-rue grows.

Tephrosia virginiana is recommended as a THREATENED species in Canada because it is represented by populations limited to a very restricted area.

ADDENDUM

Supplementary information obtained from the Ministry of Natural Resources and the Natural Heritage Information Centre, Ontario, indicate that the population sizes at the three sites in Ontario are approximately as follows: Turkey Point Provincial Park - 100 clumps in the west half of the park; St. Williams Forestry Station - 100 clumps; Vittoria - 50 clumps.

October, 1996
Erich Haber, Chairman, Subcommittee for Vascular Plants, Mosses and Lichens

I. SPECIES INFORMATION

1. CLASSIFICATION AND NOMENCLATURE

Scientific name: *Tephrosia virginiana* (L.) Pers.

Bibliographic citation: Syn. Pl. 2: 329. 1807

Type specimen: GH photograph of Type: *Galega*, Sheet 4, in Herb. L.

Common names: Goat's-rue, Cat-gut, Devil's-shoestring, Dolly Varden, Rabbit's-pea.
The roots, which are many, long, slender and very tough account for the popular names "Cat-gut" and "Devil's-shoestring". The name "Dolly Varden" applied to this plant in Georgia (Mellinger, 1984) may refer to the bicoloured dress/petticoat worn by Dolly Varden in Charles Dickens' "**Barneby Rudge**" (Patrick, pers. comm.).

Family name: Leguminosae
Fabaceae, Sub-family Papilionaceae

Synonyms:
Cracca virginiana L. Sp. Pl. 2:753. 1753.
Galega virginiana L. Syst. Nat. ed. 10(2):1172. 1759.
Galega virginica J.F. Gmel. Syst. Nat. 1552 (index). 1791.
Tephrosia virginica (L.) Bigel. Fl. Bost. ed 2:278. 1824.
Tephrosia holosericea Nutt. Jour. Acad. Phila. &:105. 1834.
Tephrosia virginiana var. *holosericea* (Nutt.) T. & G. Fl. N. Amer. 1:296. 1838.
Tephrosia virginiana ssp. *glabra* (Nutt.) T.& G. Fl. N. Amer. 1:296. 1838
Cracca virginiana holosericea (Nutt.) Vail, Bull. Torr. Cl. 22:27. 1895.
Cracca holosericea (Nutt.) Britt. & Bak. Jour. Bot. 3:16. 1900.
Cracca latidens Small. Fl. Southeastern U.S. 609, 1331. 1903.
Cracca leucosericea Rydb. N. Amer. Fl. 24:163. 1923.
Tephrosia latidens (Small) Standl. Field Mus. Publ. Bot. 11: 161. 1936.
Tephrosia leucosericea (Rydb.) Cory. Rhodora 38:406. 1936.
Cracca mohrii Rybd. N. Amer. Fl. 24: 163. 1923.

Wood (1949) gives a detailed historic account of the confused history of *Tephrosia* as a genus which accounts for the number of binomial combinations. The following note regarding nomenclature of *T. virginiana* is taken from his work.

> "The typification of the species was fully discussed by Britten and Baker (1900), who concluded that the name *Cracca virginiana* L., based on a mixture of two species, was properly applied to *Tephrosia spicata* (Walt.) T.& G., while the plant known for 150 years as *Tephrosia virginiana* (L.) Pers. then took the oldest name, *T. holosericea* Nutt., the basis of the combination *Cracca holosericea* (Nutt.) Britten & Bak. Robinson subsequently pointed out (Britten and Baker, 1900a), however, that since Walter (1788, p.188) in describing *Galega spicata* had clearly removed the confusing element, while retaining the Linnaean name for the plant figured by Plukenat, there was no cause for the change in typification. Walter has been followed consistently by everyone, including Britten and Baker who, after Robinson's note, recanted. Under the provisions of Article 52, International Rules of Botanical Nomenclature, ed 3, Walter's restriction of the name is fully justified. In addition, the specimen in the Linnaean Herbarium (*Galega*, Sheet 4), annotated by Linnaeus, is this species as usually understood. Fasset (1939, p. 59) has also discussed the fixation of the Type, and has concluded that the concept of Torrey and Gray in Flora of North America 1:296. 1838, which is consistent with the Linnaean specimen, had best be retained. The typical form is the common eastern plant with the upper surfaces of the leaves glabrous."

2. DESCRIPTION

Field characteristics:

A perennial herb with one to several stems from a branched woody crown, and long, slender, tough woody roots. Stems, branches and petioles are densely hirsute with fine whitish hairs. The leaves are compound (5-15 cm long) with petioles less than 1 cm, or slightly longer on the lower leaves. Leaflets usually 15-25 (9-31), 11-31 mm long, 2-10 mm wide, 2 times as long as broad, elliptic or linear-oblong with the base and apex rounded to acute, slightly mucronate, dull, bluish to greyish or yellowish green, glabrous or densely hirsutulous above, densely hirsute to white wooly or silky below. Stipules linear to subulate, turning brown and somewhat deciduous.

The inflorescence is terminal on the main branches, with some flowers terminating axillary branches. Peduncles are very short, the lower ones sometimes with leaves. Nodes 7 to more than 20, 2(3) flowers at a node with anthesis proceeding centrifugally. Inflorescence elongates in fruit. Corolla bicoloured, 15-20 mm long, greenish in bud, keels yellow and pink striped, wings pink. Legume oblong, flat 3-5.5 cm long about 4-5 mm wide, straight or curved slightly downward, villous to glabrate. *T. virginiana* is easily separated from its congeners by its clumped, monopodial habit and dense racemes of large, bicoloured flowers (Isely, 1990).

The species is somewhat variable, particularly with respect to the type, length, arrangement and density of the hairs, and there is a general, but not consistent, tendency (with many exceptions) for increasing length of hairs from south to north. The calyx and leaflet length and shape have been used as specific and varietal characters, but Wood (1949) could find no consistent segregation of any type.

Wood (1949) notes that two forms occur, one with glabrous and one with hairy upper leaflet surfaces. Both forms can be found in a single colony. There is no clear geographical separation between the forms, but more glabrous plants appear to be represented in the southeast, while most plants in the northwest are hairy.

Illustrations:

A line drawing of *Tephrosia virginiana* is given in Gleason (1952), p. 413. More detailed drawings of parts of the plants, made from field sketches by the author, are presented in Figure 1. A colour photograph of the plant is given in Duncan and Foote (1975). Colour slides are in the personal slide library of the author and colour photocopies of slides are on file with the original report at COSEWIC.

3. BIOLOGICAL AND ECONOMIC SIGNIFICANCE

The genus *Tephrosia* contains several hundred species of plants distributed through warm temperate and tropical regions.

The taxonomy of *Tephrosia* was for many years in considerable confusion, with no workable sub-generic divisions, and many misidentified herbarium specimens. As well there is confusion in the anthropological, entomological and chemical literature (Wood, 1949).

The New World species of *Tephrosia* fall into two natural groups. One group has glabrous styles and the other, larger group, to which *T. virginiana* belongs, has bearded or barbate styles. In the New World, this group occurs principally in North America, with two representative extending into South America. Amidst the taxonomic confusion and nomenclatural combinations, Wood (1949) found, in the barbistylate group, 45 endemic species, two naturalized exotics and 2 "apparent waifs".

Tephrosia virginiana grows well under cultivation in light, sandy soil and the leaves and stem are non-toxic and have some value as hay. Like other Leguminose plants, the roots harbour nitrogen-fixing bacteria. In tropical countries *Tephrosia* species are also utilized as green manures, cover crops, soil-binders and contour hedges.

Many species of *Tephrosia* produce rotenone, deguelin and related compounds, so the group has economic importance as a potential source of insecticides which are non-poisonous to mammals. The level of the active compounds are, however considerably lower than in *Derris* and *Lonchocarpus*, the main commercial sources of rotenone. *T. virginiana* was the only species of *Tephrosia* tested by the US Department of Agriculture which showed any potential as a commercial species (Sievers *et al.*, 1938). The species contains about 4% rotenone and deguelin, compared to 10% or more in *Derris* (Roark (1937) in Wood (1949). In 1934 and 1935 extensive testing was carried out in the United States to determine the feasibility of cultivation of *Tephrosia virginiana* as a commercial source. A high geographic variability in rotenone content was found, including large areas with rotenone-free plants. In transplant and breeding experiments, the controlling factors were found to be genetic. In high-yielding plants, rotenone is present in the xylem of the root.

The genus as a whole has ethnological interest because of its use in poisoning fish by aboriginals in widely different parts of the world. Various species of *Tephrosia* have long been used for fish poisoning in North and South America, Africa, Asia and Australia.

The Indians of eastern North American also apparently used the roots of *Tephrosia virginiana* as a vermifuge (Griffith, 1847; Rafinesque, 1830).

Tephrosia virginiana was one of 107 Leguminosae species evaluated by Roth *et al.* (1984) for their potential as energy producing crops. It was found to be one of 11 species with high ratings. Samples of whole *Tephrosia* plants contained 12.4% protein, 16.5% polyphenol. 2.3% oil and 0.6% hydrocarbon.

4. DISTRIBUTION

Summary:

Tephrosia virginiana is the most widely distributed species of the genus in North America, with populations north to New Hampshire, New York, southern Ontario, southern Michigan and southern Wisconsin and south to Florida and western Texas (Figure 2). Wood (1939) suggests that edaphic factors are important in determining distribution throughout its range. The species is restricted by habitat to open areas and well drained, non-calcareous sandy soils. At the northern end of its range the species is absent from heavily glaciated landscapes dominated by deposits of calcareous till.

Soper (1962) lists *T. virginiana* as a southern species in Canada, in Ontario it is restricted to a few scattered locations on the Norfolk Sand Plain around Turkey Point in the Regional Municipality of Haldimand-Norfolk.

Locality citations:

Precise locality information is on file with COSEWIC.

Historic populations:

Sutherland (1987) reported that, prior to a Natural Areas Inventory of Haldimand-Norfolk, (Gartshore *et al.*, 1987) the species was known from five locations in Ontario. It was first collected from Turkey Point in 1885. At Normandale, it was first collected in 1885, but has not been reported there since 1971. The Normandale and other collections lack precise location information and are difficult to pin down to

a precise location, but all are in the Turkey Point area.

Extant populations currently verified:
The largest population is located within Turkey Point Provincial Park, with scattered patches in the immediately surrounding areas (Figure 3).

Kirk (1986) observed several small populations in Spooky Hollow Area of Natural and Scientific Interest (ANSI), in the Anderson Tract in Charlotteville Township, but he did not collect from there. In 1991, when he revisited the site with the author, one of the populations could not be relocated. It appeared that pine plantations and regenerating oaks in the area had grown up and may have out-shaded the plants.

In 1985 Mary Gartshore (85-302) collected the species from a small dune ridge near Vittoria. This small population appears to be expanding over the edge of a sandy road cutting.

5. GENERAL ENVIRONMENTAL AND HABITAT CHARACTERISTICS

Climate:
The Ontario populations of *Tephrosia* are near the northern limit of the species range. Because of their southern location, and influence of the surrounding water, the Lake Erie spits (including Turkey Point), experience the most temperate climates in mainland Ontario. Mean annual temperature in the Turkey Point area is about 8°C, with a summer mean of 19°C and a winter mean of -4°C, and about 165 frost-free days (Brown *et al.*, 1980). Mean annual precipitation is about 830 mm.

Physiographic and edaphic factors:
Over its range, the general habitat for *Tephrosia virginiana* is well-drained, circum-neutral to acid, non-calcareous soils in open oak and pine woods on ridges, sand prairies and open sand dunes. It is also found on roadsides, abandoned fields and other ruderal sites. The species can grow in shifting dunes, but is more abundant in partially stabilized areas. It appears to favour direct sunlight.

In Minnisota, where *Tephrosia* has an official status of "special concern" (Minnesota Department of Natural Resources, 1986), the species has apparently declined since European settlement and has become very rare. It is restricted to sand dunes, barrens and gravelly hills in the "driftless area". The species appears to have difficultly persisting in degraded habitats and rarely recolonizes an area such as abandoned farmland.

Biological factors:
Tephrosia virginiana grows best in open areas where it is not shaded out by surrounding vegetation. In oak savannas and pine barrens it tends to grow in openings. Associated species in Ontario have a strong prairie element and include Little Blue-stem (*Schizachyrium scoparium*) and Big Blue-stem (*Andropogon gerardii*). In the oak openings at Turkey Point it is also strongly associated with Poison Ivy (*Rhus radicans*).

Management concerns about the oak savannas in Turkey Point Provincial Park, led, in the spring of 1994, to a prescribed burn of certain sections. Although formal post-burn assessment of the vegetation was not carried out during 1994, the following observations were made for this study.

Although some of the accumulated duff layer was burnt, a considerable amount (over 15 cm in some spots) remains. Some understorey shrubs were burnt, but other individuals, particularly planted White Pine (*Pinus strobus*), were not yet dead, although most were senescent. The oak canopy remains quite closed in much of the burnt area, except for some blow-down during a storm in the summer of 1994.

Tephrosia plants in both burnt and unburnt areas appeared to be equally vigorous, occurring as scattered individuals and in small patches. The major differences noted between *Tephrosia* plants in the burnt and control areas was exhibited in the fruit and is discussed in more detail in the next section. Pods in the burnt locations were uniform in size, still green and immature at the end of September, and plump and full with developed seeds. No insects were found in any of the pods, and all missing or un-filled seeds had aborted. In the unburnt areas, the legumes were more mature, and some had already shed their seeds and fallen. The remaining pods were mixed, both mature and green, and some were small and obviously empty of seeds. Several of the pods were found to contain small insect larvae and many of the missing seeds had been predated rather than aborted.

6. POPULATION ECOLOGY

Reproductive biology:

Tephrosia virginia appears to spread by both vegetative growth of short, woody rhizomes and by seed. Populations in Ontario consist of both large patches and individual scattered plants.

During field work in the fall of 1991, most mature pods inspected from Ontario populations had been invaded by weevils and most of the seeds had either aborted or been eaten. Seed production was counted in 75 pods, with a mean production of 0.99 mature seeds per pod. 55% of pods contained no viable seeds.

In 1994 a small sample of pods was examined from each of three populations of *Tephrosia virginiana*. The first population was in oak savanna at Turkey Point, the second population was in similar habitat which had been subjected to a prescribed burn in the spring of 1994, and the third sample was from an isolated population at Vittoria about 7 km away. Although sampling methodology was not rigorous an attempt was made at objective selection of pods. Eighteen, 14 and 14 pods respectively were examined from each population and the number of ovules and full, and therefore apparently viable, seeds were counted in each pod. The results are presented in Table 1.

The number of ovules per pod was highest at the isolated Vittoria site and significantly lower ($p = 0.05$) in the two Turkey Point sites. The number of viable seeds per pod was lowest in the unburnt population from Turkey Point. Since non-viability of seeds in this population was due to a mixture of abortion and predation (compared with abortion alone in the burnt population), it is reasonable to suppose that burning may have reduced the insect population and thereby caused an increase in percent seed set.

The germination potential of *Tephrosia virginiana* seeds was not tested during this study, but during a cytological study of *Tephrosia* species (Wood, 1949) found that fresh collected seeds had almost 100% germination. Although stored seeds of *Tephrosia virginiana* were not used in his study, high germination rates were found for related species after seeds had been stored in a herbarium for several years. Some seeds even germinated after 60 years in storage. This is consistent with other studies of seeds of Leguminosae which have been found resistant to aging.

7. LAND OWNERSHIP AND MANAGEMENT RESPONSIBILITY

The populations of *Tephrosia virginiana* in Turkey Point Provincial Park and St. Williams Forestry Station are owned and managed by the provincial government. Recent management of the oak savannas in Turkey Point Provincial Park has included prescribed burns, first done in 1994.

TABLE 1

Number of ovules and viable seeds per pod in *Tephrosia virginiana* plants in three populations in southern Ontario.

	VITTORIA		TURKEY PT. (BURNT)		TURKEY PT. (UNBURNT)	
	Mean	S.E.	Mean	S.E.	Mean	S.E.
Number of pods sampled	14		14		18	
Number of ovules	8.1	0.22	7.4	0.02	6.9	0.36
Number of viable seeds	4.6	0.58	5.1	0.49	2.4	0.58
Percent of seeds matured	56.6		64.0		35.2	

The portion of Spooky Hollow ANSI containing the populations of *Tephrosia virginiana* is privately owned. The Vittoria Dune Ridge is also privately owned, but is a designated a Significant Site in the Natural Areas Inventory of the Regional Municipality of Haldimand-Norfolk (Gartshore *et al.*, 1987).

8. MANAGEMENT PRACTICES AND EXPERIENCES

One of the major impediments to the long term health of *Tephrosia virginiana* populations in Ontario is considered to be overshading as a result of the closing in of canopy species (Allen, pers. comm.). In Spooky Hollow Conservation Area at least one outlying population in a plantation of White Pine appears to have been eliminated as the trees have grown up (Kirk, pers. comm.).

Prescribed burning as management for the oak savannas was begun in 1994. Burning as a management tool was not specifically aimed at *Tephrosia* management, although it is expected to be one of the species to benefit.

9. EVIDENCE OF THREATS TO SURVIVAL

Important threats to survival to populations of *Tephrosia virginia* in Ontario appear to be related to shading by planted pine and regenerating oak. This is especially evident in Spooky Hollow ANSI.

A campsite at Turkey Point Provincial Park lies very close to the main *Tephrosia* populations in the park, but trampling does not seem to be a problem at present. Abundant Poison Ivy (*Rhus radicans*) in the same area may deter off-trail traffic.

Some damage has occurred away from trails in Spooky Hollow ANSI as a result of all-terrain vehicle

traffic. At present the *Tephrosia* populations have not been affected although some plants are in openings near trails.

In Minnesota the species has declined as a result of loss of habitat and habitat degradation since European settlement, but there is no evidence that the species was ever anything other than rare and scattered in Ontario and the Turkey Point habitat should be quite well protected as a natural area.

10. PRESENT LEGAL STATUS OR OTHER FORMAL STATUS

Summary:
Tephrosia virginiana is listed in the atlas of the rare vascular plants of Ontario (Argus *et al.*, 1982-87). It is listed as ENDANGERED in New Hampshire (Tolman, pers. comm.), SPECIAL CONCERN in Minnestota (Minnesota Department of Natural Resources, 1986) and RARE in Rhode Island (Gillet, 1984 in Argus *et al.*, 1982-87).

International status:
Tephrosia virginiana is ranked G5 (demonstrably secure globally) by the Natural Heritage Information Centre. It is common throughout most of is range in the eastern United States.

National status:
Tephrosia virginiana is listed as rare in Canada (Argus & Pryer, 1990).

Provincial status:
Ontario: S1, RARE
Tephrosia virginiana is given an element ranking of S1 (critically imperilled because of extreme rarity, five or fewer locations) by the Ontario Natural Heritage Information Centre (Oldham, 1994). It is listed by Argus *et al.* (1982-87) in the atlas of the rare vascular plants of Ontario.

State status in the US:
Arkansas:
Common, found in virtually every county.

Georgia: S5.
Ubiquitous.

Illinois:
Common, found in dry upland forest with incomplete canopy closure. Not monitored.

Indiana:
Common, particularly in the northwest and southeast. Not listed or monitored.

Iowa: S? (probably S4).
Not monitored.

Kansas: S4.
Common in tall-grass and mixed-grass prairies. Virtually absent in the Glaciated Region north of the Kansas River. Not tracked or protected

Louisiana:
Common. Not state ranked, but probably S4S5. Not monitored.

Michigan:
Occurs in sand barrens, fields and prairies in the south and west.

Minnisota: SPECIAL CONCERN.
Receives some legal protection. Occurs only in the southeastern corner of the state and is limited to uncommon habitats (sand barrens). Has suffered significant habitat loss.

Mississippi:
Common. Not tracked or monitored. Not protected by legislation or classification.

Missouri:
Rather common in most counties except the northwest corner of the state. No state ranking, not monitored.

New Hampshire: ENDANGERED.
Many documented occurrences are historic. Former locations have been severely impacted by development. The only current occurrence is in a heavily used city park where fragments of habitat persist (Tolman, pers. comm.).

New York:
Most records are from the south east portions of the state.

North Carolina: S5
Widespread, reported from nearly all counties. Common to abundant in the southeast quarter of the state, uncommon to rare in the Blue Ridge Mountains, uncommon in the Piedmont. Some habitat loss has occurred through agriculture and suppression of natural fires. Not tracked or monitored.

New Jersey:
Not officially ranked. Common throughout the Coastal Plain, occasionally found in the Piedmont or Highlands. Not tracked.

Pennsylvania:
Not state ranked, probably S4 or S5. Less common or absent in the northwest parts of the state.

Rhode Island: RARE

Tennessee:
Most common in the east. Threats low to moderate, some protection on state and federal lands.

Wisconsin:
Common, not state ranked. Occurs in dry sandy areas over a range of community types. Some loss of habitat due to natural succession. Not monitored.

II ASSESSMENT OF STATUS

11. GENERAL ASSESSMENT

The populations of *Tephrosia virginiana* in the Turkey Point area of Ontario appear to be healthy and vigorous. Although the occurrence is very limited in total geographic area, within the range there are a number of small populations. The main population at Turkey Point is quite extensive, covering and area of about 30 X 40 m with many outlying plants. There is evidence that some stands are spreading. Although seeds are set, and apparently viable, there is heavy predation of seeds, by weevils and larvae of other insects, in the main population.

Since most populations are in areas which receive some degree of protection, the main threat to the species appears to be from shading through natural succession in the oak savannas and openings where *Tephrosia* is found. This succession is a response to the suppression of natural fires which would normally occur in these habitats. *Tephrosia virginiana* appears to require open areas and loss of habitat through shading has been reported in several states. Management of the oak savannas at Turkey Point now includes prescribed burning, but it is too early to assess the effects of burning on *Tephrosia*.

The population at Vittoria is expanding towards a sand cutting at the edge of the road. Some plants already overhang the edge of the cutting. Removal of sand from the roadside, roadside spraying or road widening would all adversely affect this population.

12. STATUS RECOMMENDATION

It is recommended that *Tephrosia virginiana* be considered THREATENED in Canada and THREATENED in Ontario

13. RECOMMENDED CRITICAL HABITAT

Critical habitat for this species appears to be oak savannas and opening on sand.

14. CONSERVATION RECOMMENDATIONS

Conservation and management of *Tephrosia virginiana* in Ontario should be closely tied to the management of oak savanna habitats. Since the main populations are on provincial land, management should be continued through the ongoing efforts of the Ministry of Natural Resources and local conservation groups who are involved in management initiatives.

The population at Vittoria should be protected in the event of road widening. Spraying and sand removal at this site should be stopped.

III. SOURCES OF INFORMATION

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16. FIELD WORK

Field work for this project consisted of checking the populations of *Tephrosia* in the locations where it is known to occur. Plant locations were checked and plants were examined, drawn and photographed. Site visits were made on 28 and 29 June, 1991, 13 September, 1991, 5 October 1991 and 30 September 1994. The site visit in October 1991 were made with Donald Kirk. The site visit in September 1994, following the prescribed burn at Turkey Point Provincial Park, was made with Peter Carson.

17. KNOWLEDGABLE INDIVIDUALS

Jane M. Bowles
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- report author
- familiar with *Tephrosia* populations in Haldimand-Norfolk

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- MNR Regional Ecologist at Simcoe during prescribed burn

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RR # 1, Wallsingham, Ontario N0E 1X0
- knowledgable about the flora and natural areas in Haldimand-Norfolk
- familiar with *Tephrosia* populations in Haldimand-Norfolk
- knowledgable about prairie and oak savanna management
- involved in prescribed burn management planning

Donald Kirk
Ministry of Natural Resources, 605 Beaverdale Road, Cambridge, Ontario N3C 2W1
- author of plant checklist for Turkey Point Provincial Park (Kirk, 1990)
- author of plant checklist for Spooky Hollow ANSI (Kirk, 1985)
- mapped *Tephrosia* populations in both areas
- former MNR District Botanist for Simcoe

Donald A. Sutherland
Ontario Natural Heritage Information Centre, P.O. Box 7000, Peterborough, Ontario K9J 8M5
- author of the annotated checklist of the plants of Haldimand-Norfolk
- knowledgable about the flora and natural areas in Haldimand-Norfolk
- familiar with *Tephrosia* populations in Haldimand-Norfolk

18. OTHER INFORMATION SOURCES

The following people provided information on the status of *Tephrosia virginiana* in the United States:

ARKANSAS:	C. Osbourne, Data Manager, Arkansas Natural Heritage Commission.
GEORGIA:	T. Patrick, Botanist, Georgia Department of Natural Resources.
ILLINOIS:	J. Schwegman, Botany Program Manager, Illinois Department of Conservation.
INDIANA:	M. Homoya, Indiana Department of Natural Resources.
IOWA:	M. Leoschke, Botanist, Iowa Department of Natural Resources.
KANSAS:	C. Freeman Assistant Scientist Coordinator, Kansas Natural Heritage Inventory.
MINNESOTA:	W. Smith, Botanist, Natural Heritage Program, Department of Natural Resources.
LOUISIANA:	N. McInnis, Louisiana Natural Heritage Program.
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NEW JERSEY:	D. Snyder, New Jersey Department of Environmental Protection.
NEW HAMPSHIRE:	F.B. Tolman, Coordinator/Botanist, New hampshire Natural Heritage Inventory.
NORTH CAROLINA:	A. Weakley, Botanist, North Carolina Natural Heritage Program.
PENNSYLVANIA:	J. Kunsman, Botanist, The Natural Conservancy, Pennsylvania State Office.
TENNESSEE:	P. Somers.
WISCONSIN:	J. Dobberpuhl, Botanist, Natural heritage Inventory, Department of Natural Resources.

19. MATERIALS ON FILE

Information about *Tephrosia virginiana* used for this report, including copies of descriptions, references and correspondence, photographs, maps and herbarium information, are in the files of the author.

20. AUTHORSHIP OF STATUS REPORT

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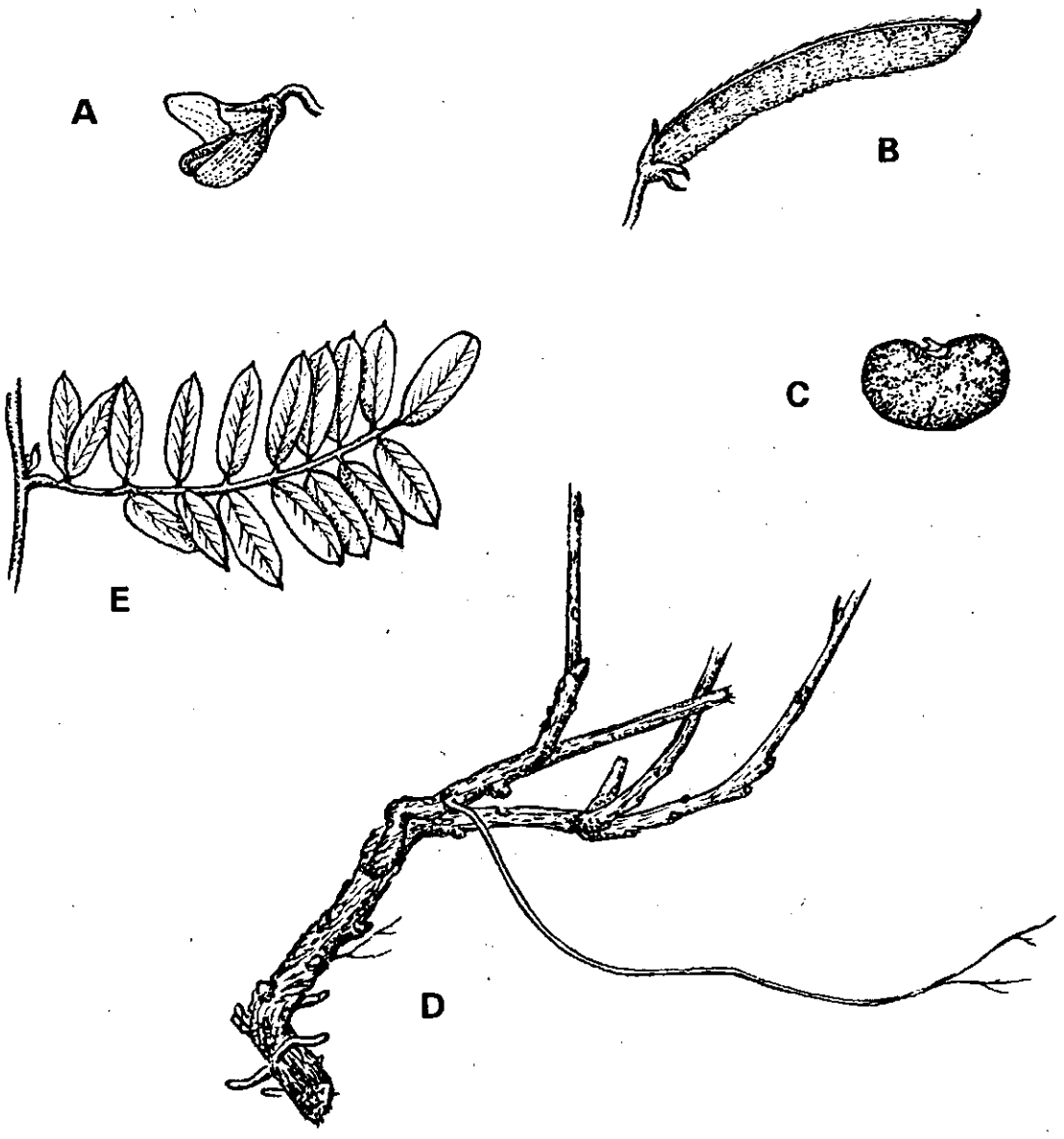
21. MAINTENANCE OF STATUS REPORT

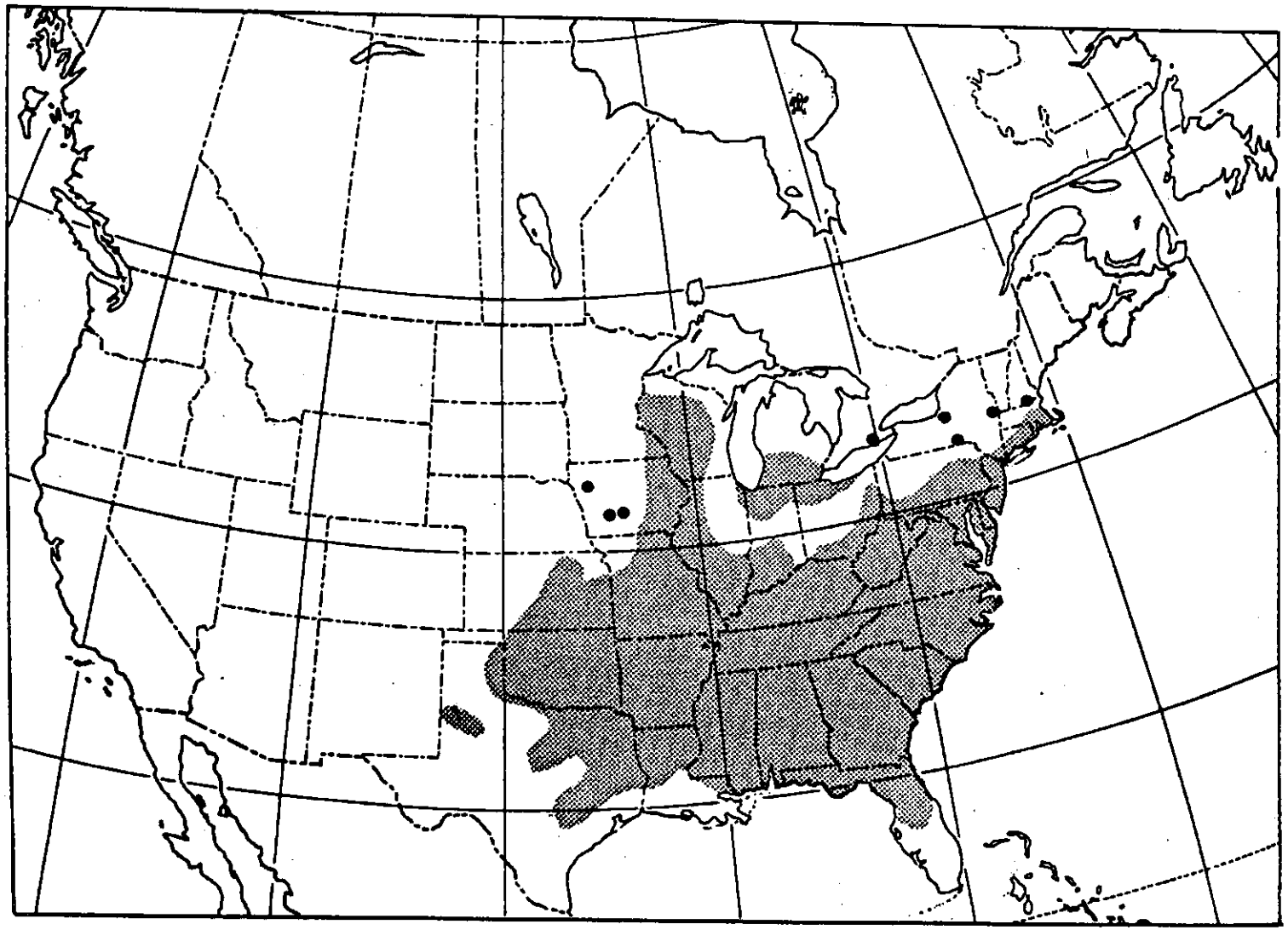
The report will be maintained by the author. New information, corrections and revisions should be directed to her for updating.

Figure 1:
***Tephrosia virginiana*, parts of the plant. (A) flower, (B) pod, (C) seed, (D) underground parts, (E) leaf.**



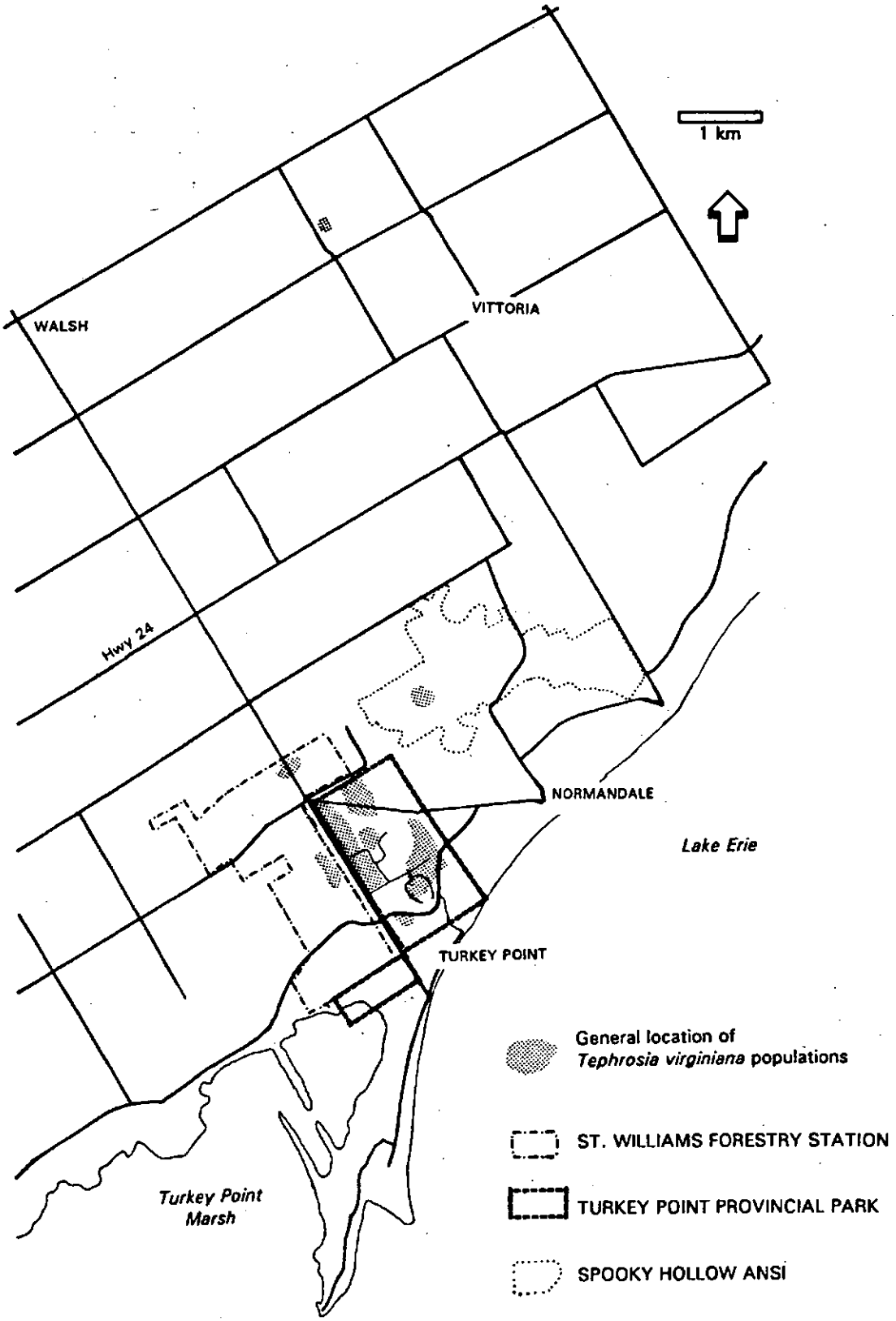
Jane M. Bowles, 1994

Figure 2:
Range of *Tephrosia virginiana* in the United states and Canada. Shading represents the major continuous range, dots represent outlying populations.



Jane M. Bowles, 1994

Figure 3:
General location of populations of *Tephrosia virginiana* in Ontario.



Jane M. Bowles, 1994