

# Identification, Preservation, and Management of Minnesota Roadside Prairie Communities

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Surveys to identify stands of high-quality native vegetation were initiated by the Minnesota Department of Transportation on highway and railroad rights-of-way in 1988. They were based on two earlier right-of-way surveys (in 1978 and 1980) that had identified 25 corridors supporting high- to relatively good-quality native prairie vegetation in Minnesota. The recent surveys indicate that 30 to 50 percent of the corridors identified in 1978 and 1980 have been lost because of railway abandonment, reconveyance of land to adjacent landowners, and highway reconstruction and maintenance activities. This finding is consistent with the overall dramatic decline of tallgrass prairie on rights-of-way throughout its range in Minnesota and the rest of the upper Midwest. In order to prevent further degradation of these valuable roadside prairie communities, Minnesota's Departments of Natural Resources and Transportation initiated an innovative and cooperative roadside prairie preservation and management program. The program is based on a preservation and management strategy that had been in use on Minnesota Trunk Highway 56 (TH 56) since 1983, where high-quality prairie vegetation was identified by early survey work. Since that time, the TH 56 right-of-way has been maintained using prescribed burning as the primary management tool, while at the same time mowing and herbicide use have been minimized. Management of TH 56 to enhance the right-of-way prairie there has been so stressful that this corridor was designated as Minnesota's first wildflower route on August 19, 1989.

Rights-of-way have been recognized historically as refuges for native vegetation communities (1). This is particularly true in the tallgrass prairie regions along highway and railroad rights-of-way constructed in the late 1800s and early 1900s. Before European settlement, the dominant vegetation community of nearly the entire upper Midwest was tallgrass prairie. However, since that time, large expanses of native vegetation (including prairie) have become increasingly less common. Nearly one-third of Minnesota was once native prairie (Figure 1). Now less than 1 percent of it is left (2). Today, much of the native prairie that remains is found in areas that were unsuitable for agriculture, such as cemeteries, steep bluffs, and along rights-of-way.

When the railroads were first built in the 1800s and 1900s, they transected the virgin tallgrass prairie of the upper Midwest. Prairie species reestablished back into the railroad rights-of-way that were initially disturbed by construction. Subsequently, many highways followed these early transportation

routes and were built adjacent to railroad tracks. Frequently, long narrow corridors of prairie were isolated and protected in the shared highway and railroad rights-of-way. These corridors were left undisturbed by agriculture, whereas most of the rest of the surrounding prairie disappeared. Periodic fires along railroad rights-of-way have enabled the fire-adapted prairie species to maintain a foothold there (4).

There are a number of benefits to working with native vegetation along roadsides. Practical benefits to highway departments include the potential for a reduction in the cost of roadside maintenance and increased erosion control when native vegetation communities are present. Ecological benefits include the preservation of habitat for wildlife that uses roadsides for nesting cover and forage (5,6), protection of rare plant and animal species, potential preservation of natural genetic exchange between these species along linear corridors (7), and the protection of a significant percentage of the remaining tallgrass prairie communities in the upper Midwest. Rights-of-way containing native vegetation also serve as a seed source for future restoration efforts. Finally, native plants provide a display of seasonal color changes along roadsides, a natural beautification. Current state-of-the-art techniques for restoring prairie and other native vegetation communities are costly because high-quality native seed is often in short supply. Because the establishment characteristics of native species from seed is not the same as more traditional turf mixes used by many highway departments, restorations on roadsides are often deemed unsuccessful (especially in the short term), whereas management of existing native vegetation communities provides more immediate results for state agencies and the public to see.

In 1978, The Nature Conservancy (TNC) and the Minnesota Department of Natural Resources (MnDNR) sponsored a vegetation survey of highway and railroad rights-of-way in central and western Minnesota. Results of this survey published in 1983 (8) identified 16 corridors (544 mi) that contained high- to fair-quality native prairie species. In 1980, Bolin et al. (unpublished) identified nine additional corridors in southeastern Minnesota that contained high-quality native prairie vegetation. Beginning in 1988, additional roadside survey work has been performed by the Minnesota Department of Transportation (Mn/DOT).

The current survey work was initiated as the first step in part of the development of a comprehensive vegetation management plan for Minnesota roadsides. It was found that the locations of high-quality remnants of native vegetation on rights-of-way, if known, were not easily accessed by state

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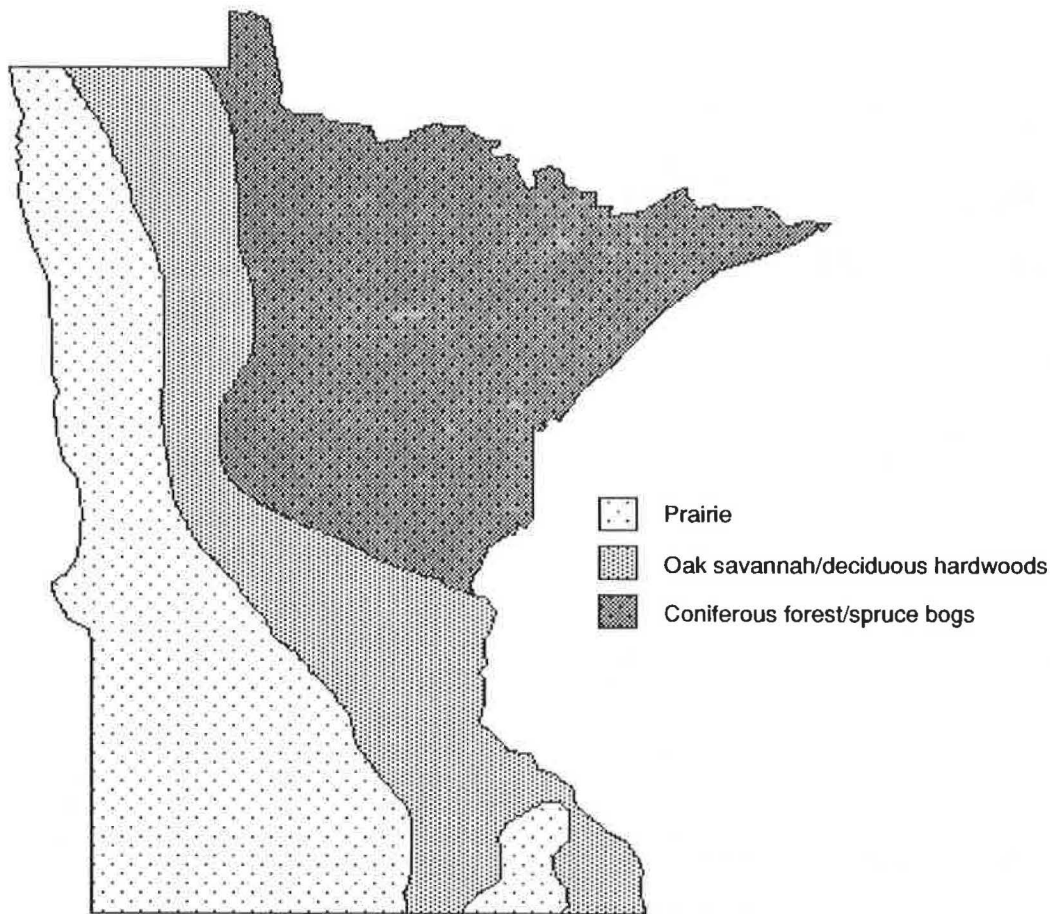


FIGURE 1 Major vegetation communities of Minnesota, circa 1850s (3).

agencies, private corporations (railroads), or the public. As a result, native plant communities were not addressed when highways, railroads, and their associated rights-of-way were upgraded or managed. Traditional management practices had concentrated on weed control by using herbicides and mowing as opposed to native plant community enhancement through periodic prescribed burns. It was hypothesized that only through a combination of the two approaches could a state-wide vegetation management program on roadsides be successful.

The results of the surveys that began in 1988 and of a cooperative prairie corridor preservation and management strategy implemented in 1983 along Minnesota Trunk Highway TH 56 in southeastern Minnesota by MnDNR and Mn/DOT are described. Information gained from these investigations provides the background that will be instrumental in the formation of a state-wide comprehensive roadside vegetation management plan for the state of Minnesota.

## MATERIALS AND METHODS

### Background Research

Several criteria were used to direct the surveyors to roadsides potentially having high-quality native vegetation (prairie) still existing in the right-of-way. These were (a) a computer search of the MnDNR Natural Heritage Program data base for rare plant elements on rights-of-way; (b) corridors identified by

earlier surveys (8 and Bolin et al., unpublished); (c) a questionnaire sent out to knowledgeable individuals representing various state agencies, universities, and conservation groups; and (d) trunk highways that had either active or recently abandoned railway lines adjacent to them.

### Vegetation Surveys

All previously identified corridors were resurveyed using a modified version of the method of Borowske and Heitlinger (8). Nineteen additional highways were surveyed using the same method. The presence of five or more prairie species served as an indicator of high-quality (A) prairie vegetation. Disturbed, or fair-quality prairie vegetation, was designated B and was characterized by having fewer than five prairie species present or having a large number of nonnative species present. Quality C indicated no prairie species were present. Highways were reviewed in the field from a moving vehicle for indicator species. Stops were made periodically when indicator species were observed and high-quality assessments were made. Inventories were performed at sites that were determined to be Quality A. Additional notes were taken relating the quality of the entire corridor to the sites surveyed.

### Species Inventory

For Quality A sites that were surveyed, a species inventory was conducted along a stretch of roadside that was approxi-

mately 100 ft long. The inslope, ditch bottom, backslope, and the railroad right-of-way were all included in the survey. All plants that were blooming and any identifiable species still in the vegetative stage were documented using a simplified version of Braun-Blanquet's floristic system (9). This system identified the species present along with their relative cover, abundance, and sociability (growth habit, e.g., growing singly, in groups, or as a mat). The following additional information was also frequently recorded: site conditions (dry, mesic, or wet); length and continuity of the native vegetation stand; adjacent land use; indications of disturbance by railroad, utility, or highway maintenance activities; presence of natural or constructed fire breaks (for future burn management); potential for extending the stand by restoration; and potential for harvesting seed from the site for future restoration purposes.

### Preservation and Management of TH 56 Prairie Communities

TH 56 was initially identified as containing a high diversity of prairie species in 1980 by Bolin et al. Since that time, it has been managed cooperatively by Mn/DOT and MnDNR. In 1983, TH 56 was posted with Do Not Mow and Do Not Spray signs so that maintenance personnel, utilities, and adjacent landowners did not mow, hay, or spray herbicide in the right-of-way. Permits allowing utility construction and herbicide use in the right-of-way have been closely monitored and have sometimes been restricted by the Mn/DOT area maintenance engineer when it was deemed that their activities posed a threat to the prairie communities present. In addition, TH 56 has recently been posted with special Wildflower Route signs to notify the public that the highway is of special significance.

Also since 1983, parts of the TH 56 right-of-way have been managed using prescribed burns performed by crews composed of Mn/DOT and MnDNR personnel. A prescribed burn proposal was developed for each segment to be burned, indicating the size of the segment (usually between 0.25 and 1.0 mi as determined by natural or constructed fire breaks); fire prescription, including season, relative humidity, temperature, and wind direction; and purpose of the burn, e.g., for brush control or prairie vegetation enhancement. Proposals were approved by the area MnDNR forester and the Pollution Control Agency. Local enforcement agents, fire departments, and adjacent landowners were also contacted. If the right-of-way was shared with a railroad or private utility company, its permission was also obtained to perform the burn.

During a burn, traffic was monitored by Mn/DOT personnel at all times, and the work areas were marked with Roadwork Ahead signs. If weather conditions fit those prescribed in the burn proposal, traffic was allowed to flow as usual. However, if wind direction shifted affecting visibility, then traffic was shut down to one lane, or a pilot car was used to guide traffic through the work area. If traffic flow was stopped or delayed, waiting vehicle drivers were given information packets describing what was being accomplished with the prescribed burns.

Prescribed burns have been designed to accomplish several objectives: (a) stop the encroachment of brush into the prairie

remnant; (b) decrease the abundance of cool-season, non-native grasses that are invariably present; and (c) enhance the growth of native warm-season grasses and herbaceous species (forbs) that are present. In order to accomplish these objectives, burns are performed in late April to mid-May, when the cool-season grasses are actively growing and the native warm-season grasses are still dormant. Individual segments have been burned on a 3- to 5-year cycle. Qualitative assessments of the burn are performed later in the season and again the following year.

### RESULTS

The current vegetation surveys reviewed 35 Minnesota trunk highways (approximately 3,000 mi) for remaining stands of native vegetation communities (Table 1). Included in the current surveys were the trunk highways surveyed by Borowske and Heitlinger in 1978 (8) and those surveyed by Bolin et al. in 1980 (unpublished). It is estimated that 30 to 50 percent of the Quality A rights-of-way identified in 1978 and 1980 have either been destroyed or have degraded significantly since that time (see Figure 2 and Table 2). The major causes for loss or degradation of native vegetation communities in rights-of-way are (a) abandonment of the rail line by the railroad and subsequent reconveyance of the railroad right-of-way to adjacent landowners, who put the land to agricultural use; (b) highway reconstruction, repair, and maintenance activities; (c) utility and railroad maintenance activities; and (d) haying or mowing of rights-of-way by adjacent landowners. Approximately 15 percent (450 mi) of the total miles of trunk highways reviewed since 1988 contain Quality A native vegetation. Few of the corridors had long continuous stretches of high-quality native vegetation. However, many corridors contain longer intermittent stretches of high-quality prairie vegetation.

Rights-of-way that were considered to be Quality A on initial review were nearly always found to contain a very high diversity of native species. Frequently, 40 to 50 native species were identified when an inventory was conducted on Quality A rights-of-way. Native grasses served as the best criteria for gauging the quality of right-of-way vegetation. However, the presence of rare species also served as an excellent indicator of high-quality right-of-way. Many native forbs appeared to be able to persist in areas dominated by disturbance indicator species such as smooth brome (*Bromus inermis*). Quality B right-of-way vegetation was frequently found to be dominated by *Bromus inermis*, with a few native forbs also being present. Table 3 presents some of the species found in Minnesota rights-of-way.

All surveyed rights-of-way were found to contain vegetation communities that were in a state of flux. Native species were found intermingled with nonnative species that had either been planted on the inslopes of the road bed or that had invaded the right-of-way from adjacent fields. The highest-quality areas were generally found in the ditch bottom, backslope, and railroad right-of-way (when there was a railroad present). It is hypothesized that the fire history of these areas has played a major role in the ability of the native vegetation communities to resist invasion by introduced cool-season species and noxious weeds; or, in the case of prairie, encroachment by woody species.

TABLE 1 COMMUNITY TYPE AND QUALITY OF RIGHTS-OF-WAY SURVEYED IN 1988 AND 1989

Highway	Community Type	Quality
T.H. 1	P	A
T.H. 2*	NCF	B
T.H. 4	P	B
T.H. 6	NCF	B
T.H. 7	P	A (Intermittent)
T.H. 9*	P	A
T.H. 10*	P	A (Intermittent)
T.H. 11	P/DH/NCF	A
T.H. 13*	P	C
T.H. 14	P	A (Intermittent)
T.H. 22*	P	A (Intermittent)
T.H. 23*	P	B
T.H. 30	P	B
T.H. 32*	P	C
T.H. 34	NCF	B
T.H. 46	NCF	B
T.H. 52 (old)*	P	B
T.H. 53	NCF	B
T.H. 56*	P	A
T.H. 59	P	A (Intermittent)
T.H. 60	P	A
T.H. 61*	NCF	B
T.H. 65*	P	B
T.H. 71*	NCF	B
T.H. 72	NCF - bogs	B
T.H. 73	NCF	B
T.H. 75*	P	A (Intermittent)
T.H. 83	P	B
T.H. 89	NCF/DH	B
T.H. 102*	P	C
T.H. 169	NCF	C
T.H. 210	P/DH/NCF	B
T.H. 212	P	A (Intermittent)
T.H. 218*	P	A
T.H. 371*	P/DH/NCF	A (Intermittent)

P = Prairie

DH = Deciduous Hardwood Forest

NCF = Northern Coniferous Forest

\*Previously Surveyed

The TH 56 right-of-way prairie community that was identified in 1980 by Bolin et al. (unpublished) has flourished since the prescribed burn management plan was implemented by Mn/DOT and MnDNR in 1983. Fire management has begun to decrease the encroachment of brush into the right-of-way and has stimulated the comeback of native prairie species. There are a number of rare plants that can be found in rights-of-way (Table 3). Populations of two rare species found along TH 56, rattlesnake master (*Eryngium yuccifolium*) and wild quinine (*Parthenium integrifolium*), have maintained or increased slightly in areas that have been managed.

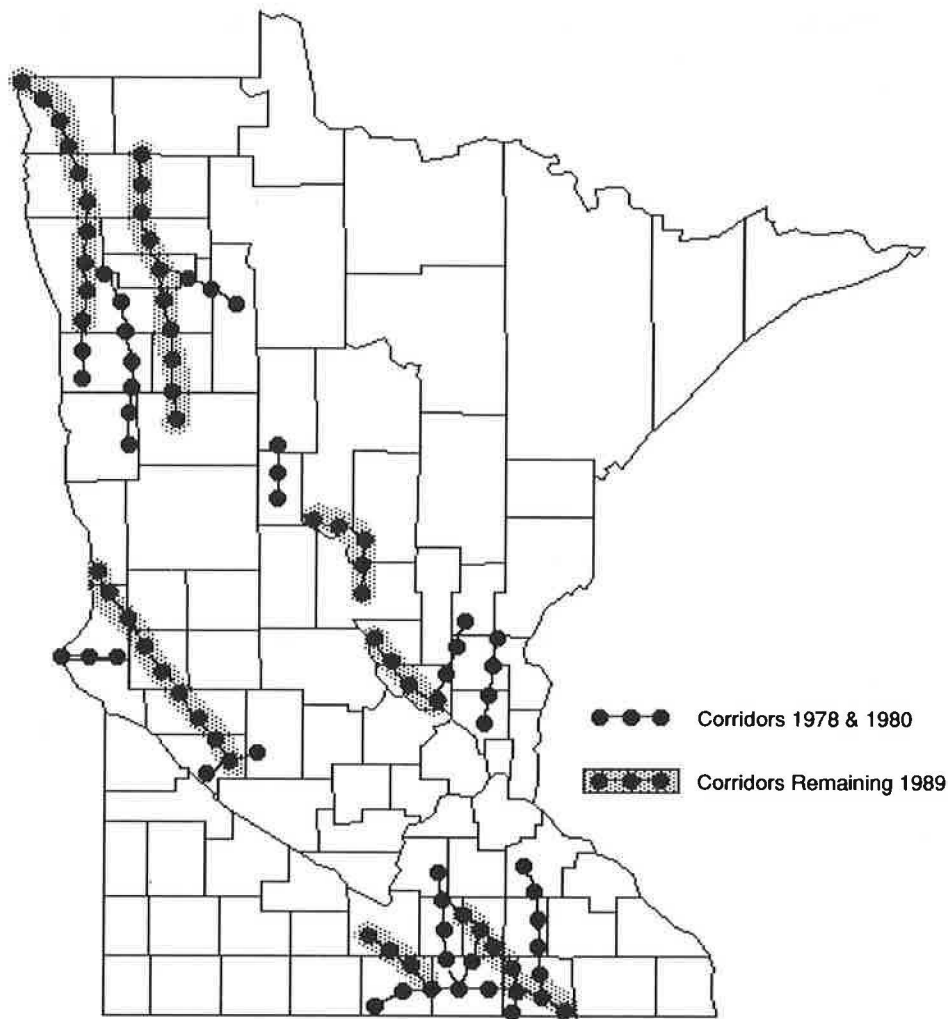
## DISCUSSION

The loss or degradation of 30 to 50 percent of the native vegetation corridors that were identified in 1978 and 1980, coupled with the overall decline of tallgrass prairie communities in Minnesota, has prompted state agencies and conservation groups to work together in identifying, preserving, and managing what remains of these communities in rights-of-

way. The methodology (using native grasses as indicator species) for identifying high-quality native vegetation communities in rights-of-way is relatively simple, but it does require botanical or ecological expertise. This method appears to be reliable as a way to cover many miles of right-of-way in a relatively short period of time, leaving more detailed inventories for later. The preservation and management of prairie communities in rights-of-way requires the cooperation of all of the entities that use or share the right-of-way. The unique skills of personnel both from highway departments and departments of natural resources are required to safely and effectively manage right-of-way native vegetation communities.

Roadside rights-of-way are environments that are continually disturbed and exposed to harsh conditions; whether it be from human activities such as automobile exhaust, salt, and applied chemicals, or from naturally occurring adverse climactic conditions like drought, flooding, and extreme temperatures. It was apparent from the current surveys that rights-of-way containing established native vegetation communities were less susceptible to drought kill, weedy invasion, and erosion than those rights-of-way that contained introduced





**FIGURE 2** Prairie corridors lost since 1980.

species. It is thought that this is because native plants are better adapted to survive in Minnesota than nonnative plants, and diverse plant communities (such as a prairie community) are more able to withstand adverse conditions and frequent disturbance than monoculture or low-diversity plantings composed of nonnative grasses or forbs.

With the management plan that has been implemented on the TH 56 right-of-way, it has been found that the use of herbicides and mowing for weed control have decreased. Fire has reduced chemical and mechanical removal of brush as well. This translates into direct cost savings over the years as herbicide use and mowing decrease. It is anticipated that under the present management plan that emphasizes the enhancement of the native prairie community along TH 56, the need for mowing will decrease to keeping the inslopes mowed short, to keeping the sight lines clear for safety purposes, and to patch-mowing of weeds. This type of management plan decreases disturbance of the right-of-way by human activities substantially. Remaining disturbances are then left to natural causes (which are beyond control), but for which the native species are adapted to survive.

In order to further explore the possibilities and benefits of working with native vegetation on Minnesota roadsides, the state has formed a task force composed of representatives

from various state agencies, the University of Minnesota, private corporations, and the public sector. The task force serves to make recommendations and suggest guidelines for various state programs. The task force is also able to serve as an interface between the state and the public, with its growing interest in the use of native wildflowers and grasses for highway beautification. In addition, Mn/DOT and MnDNR have begun cooperation, on a state-wide basis, in developing an integrated roadside vegetation management program. An interagency committee has been formed to set guidelines for such a program. Management to enhance native prairie communities similar to that being used along TH 56 will begin along a number of Minnesota highways in 1990 (Figure 3). Because these prairie communities are composed of native grasses and wildflowers, enhancement of these areas has enabled Mn/DOT to designate them as wildflower routes. It is felt that a combination of management to enhance existing prairie and restoration (usually locally occurring native species) to expand existing stands along these corridors, will create a scenic wildflower route system that is both aesthetically pleasing and requiring of low maintenance (Figure 3).

The designation of TH 56 as Minnesota's first wildflower route is testimony to the fact that the goals of Mn/DOT, MnDNR, and conservation groups can all be met, and at the

TABLE 2 CHANGE IN QUALITY OF CORRIDORS FROM 1978 TO PRESENT

<u>Highways Surveyed 1988-1989</u>	<u>Surveyed 1978</u>	<u>Surveyed 1980</u>	<u>Δ Quality</u>
T.H. 2	yes	no	Decline
T.H. 9	yes	no	No Change
T.H. 10	yes	no	Decline
T.H. 13	no	yes	Large Decline
T.H. 22	no	yes	No Change
T.H. 23	yes	no	Decline
T.H. 32	yes	no	Large Decline
T.H. 52/56	no	yes	Large Decline
T.H. 56 (Mower Co.)*	no	yes	Improved
T.H. 61	yes	no	No Change
T.H. 65	no	yes	No Change
T.H. 71	yes	no	Decline
T.H. 75	yes	no	Decline
T.H. 102	yes	no	Large Decline
T.H. 218	no	yes	No Change
T.H. 371	yes	no	No Change

\*On managed segments

TABLE 3 SOME SPECIES OF SIGNIFICANCE FOUND IN PRAIRIE RIGHTS-OF-WAY

#### Native Grasses - Prairie Indicators

Big Bluestem (*Andropogon gerardi*)  
 Sideoats Grama (*Bouteloua curtipendula*)  
 Switch Grass (*Panicum virgatum*)  
 Little Bluestem (*Schizachyrium scoparium*)  
 Indian Grass (*Sorghastrum nutans*)  
 Prairie Cordgrass (*Spartina pectinata*)  
 Dropseeds (*Sporobolus* spp.)  
 Needle Grasses (*Stipa* spp.)

#### Native Forbs - Prairie Indicators

Lead Plant (*Amorpha* spp.)  
 Stiff Tickseed (*Coreopsis palmata*)  
 Common Oxeye (*Heliopsis helianthoides*)  
 Blazingstars (*Liatris* spp.)  
 Prairie Clovers (*Petalostemum* spp.)  
 Prairie Phlox (*Phlox pilosa*)  
 Coneflowers (*Ratibida* spp.)

#### Rare Plant Species

Small White Ladyslipper\*  
 (*Cypripedium candidum*)  
 Rattlesnake Master\*  
 (*Eryngium yuccifolium*)  
 Prairie Bush Clover\*\*  
 (*Lespedeza leptostachya*)  
 Wild Quinine\*  
 (*Parthenium integrifolium*)  
 Western Prairie Fringed Orchid\*\*  
 (*Platanthera praeclara*)

#### Disturbance Indicator Species

Quack Grass (*Agropyron repens*)  
 Smooth Brome (*Bromus inermis*)  
 Canada Thistle (*Cirsium canadensis*)  
 Leafy Spurge (*Euphorbia esula*)  
 Sweet Clover (*Melilotus officinalis*)  
 Kentucky Bluegrass (*Poa pratensis*)  
 Timothy (*Phleum pratense*)

\*Protected by the State of Minnesota

\*\*Protected by the Federal Government

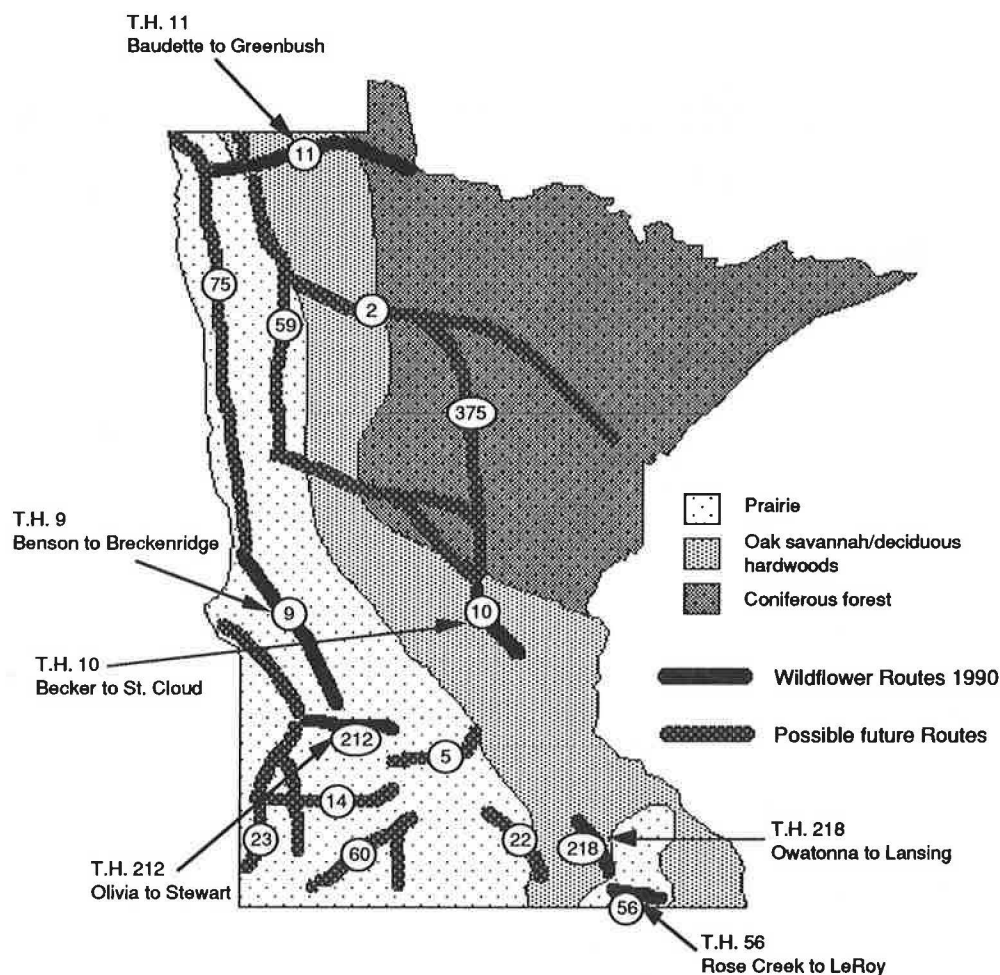


FIGURE 3 Minnesota wildflower routes and high-quality corridors.

same time the traveling public benefits by seeing part of Minnesota's natural heritage flourishing once again along Minnesota's roadsides.

#### ACKNOWLEDGMENT

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