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Planning for Encounters with Special Management Areas: Characterization, Management Approaches, and Syntheses

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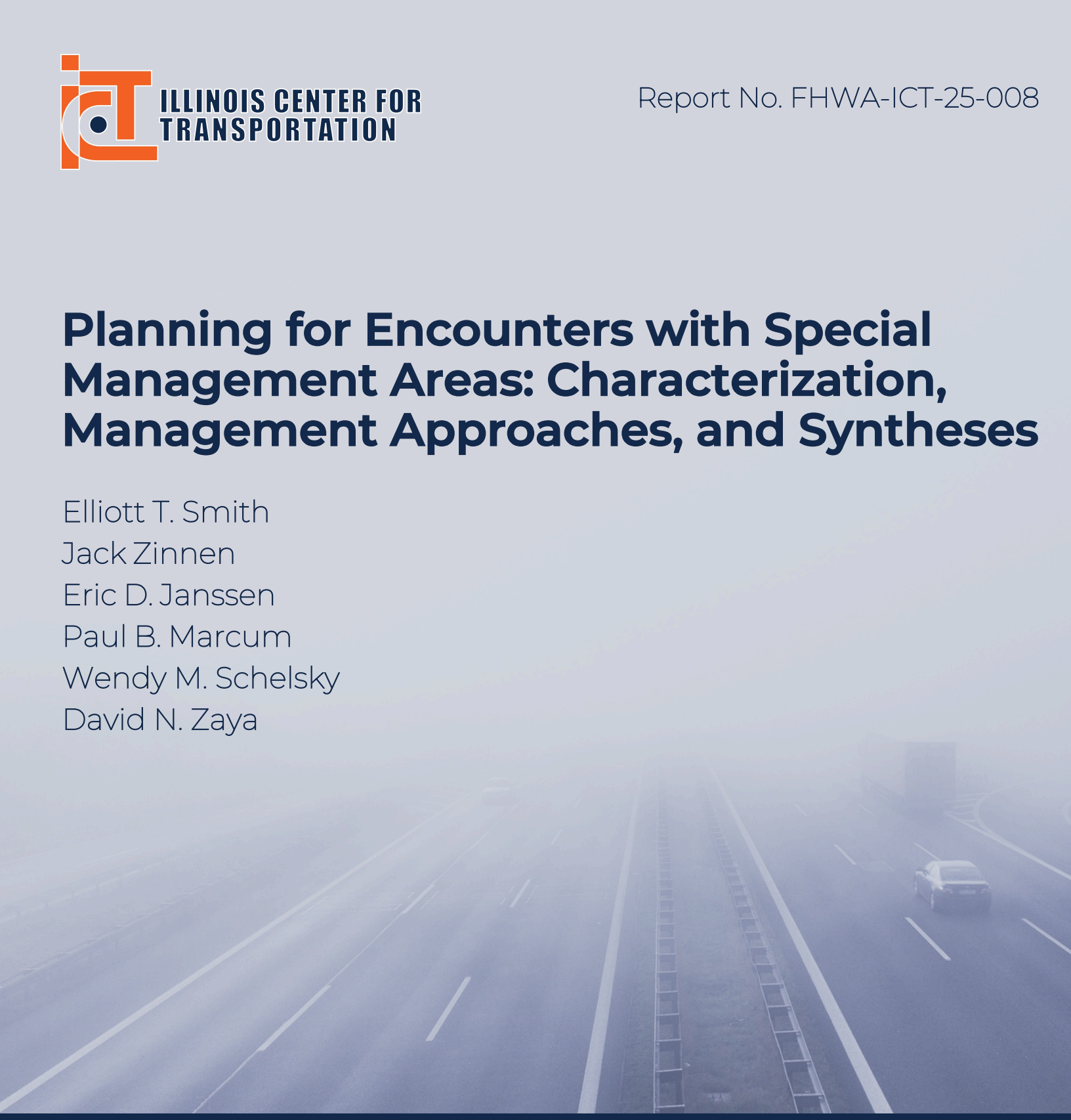

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16. Abstract
The Illinois Department of Transportation (IDOT) manages land with considerable conservation value. Some IDOT roadways contain, or are near, special management areas (SMAs): places that have legal protection, are habitat for species with legal protection, or contain valuable biodiversity. Although SMAs are important for IDOT's environmental objectives, historically, IDOT has addressed the management of SMAs on an as-needed basis with no broad-scale management plan or characterizations. We investigated SMAs on or near IDOT property, aiming to compile information and to help set the stage for a cohesive management strategy. We used mapping, policy and literature review, and a survey of roadside stakeholders to better understand SMAs and their management. We identified over 8,000 SMAs across Illinois on or near IDOT roadways. Municipal parks, habitat with protected species, and Illinois Natural Areas Inventory sites were the most frequent SMA types. SMAs tended to consist of forest, grassland, or wetland habitats that were geographically concentrated in northeastern and southern Illinois. We received survey responses from stakeholders across 20 states. The most reported practices for managing SMAs included mowing, herbicide application, native seeding, and brush/tree cutting. Participants noted the difficulty of controlling invasive plants, insufficient funding, logistical constraints, and limited staffing as obstacles to achieving management objectives. We created a template of best management practices—conventional sets of practices that are effective for conserving sensitive biological resources. We overview frequently encountered scenarios in common natural areas encountered by IDOT and provide suggested management practices based on the literature and survey responses. Broadly, we suggest management can be improved by carefully timing activities, hiring or training specialized staff, communicating spatial information on SMAs, and considering a prevention-based rather than reactive management doctrine. Our efforts can be a foundation for more detailed best management practices and formulation of an integrated roadside vegetation management plan.

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EXECUTIVE SUMMARY

The basic objective of the Illinois Department of Transportation (IDOT) is to promote an effective and safe transportation network within the state of Illinois. IDOT has additional goals of environmental prudence and is beholden to state and federal laws pertaining to the conservation of sensitive biological resources. IDOT frequently manages land on or near special management areas (SMAs) with sensitive biological resources. SMAs are defined as areas that may have legal protection because of natural features, house species with legal protection, or contain communities that are deemed valuable in terms of biodiversity. Historically, IDOT has considered impacts to SMAs on an as-needed, case-by-case basis. A lack of cohesive guidance on SMAs and proven management strategies can undermine the goals of IDOT to protect the environment, create inefficiencies with management and coordination, delay projects, and lead to legal liabilities. Managing diverse sets of SMAs is a broad challenge that requires greater information and clarification.

To address this need, we combined policy and literature review, sensitive natural resource identification and elaboration, and a survey of roadside practitioners to better understand roadside management challenges and successes in SMAs. The objectives of this document are to (a) identify and summarize the types of SMAs encountered by IDOT, (b) summarize best management practices (BMPs) for issues related to vegetation management in or near SMAs, and (c) create guidance meant to inform future efforts to create a cohesive strategy for environmentally conscious roadside management.

We found over 8,000 SMAs within a quarter mile of an IDOT roadway, with 67.5% of those within 500 feet of an IDOT roadway's centerline. SMAs tended to be geographically concentrated in northeastern Illinois and southern Illinois (IDOT Districts 1 and 9). The most frequent SMAs were municipal parks, followed by known occurrences of threatened or endangered (T/E) species and Illinois Natural Areas Inventory (INAI) sites. Habitat classifications of SMAs tended to be forest, grassland, or wetland ecosystems. Herbaceous plants were the most frequently encountered T/E taxonomic group near IDOT roadways, followed by birds.

Our survey of roadside managers explored typical management practices, challenges, and the needs of SMA management for stakeholders from IDOT and other DOTs. One of the most universally described challenges described by respondents was invasive plant species management, especially for prolific and widespread species like Canada thistle, common reed, reed canary grass, teasels, and honeysuckles. Other salient challenges noted by respondents included limitations in both staffing and funds to carry out desired management activities, especially with diverse demands of roadside management. The most pertinent management strategies included herbicide application, mowing, tree/brush control, erosion control, and native seeding. Conservation strategies included pollinator conservation, seeding roadsides with native species, and mitigating impacts to T/E species. Respondents noted they desired additional written resources, GIS or other mapping layers of sensitive roadside areas, and new partnerships with other stakeholders.

We summarized some of the most important management approaches using literature review and survey responses—especially by comparing and contrasting IDOT practices with other state DOTs. We

provided a set of BMPs for commonly utilized management strategies meant to be applied to frequent SMA situations. Our example BMPs for common SMA situations can be used as frameworks for expanded contexts or future management plans. Although we cover specific challenges and management practices, many of these topics are broader and require greater depth than we can provide here—such topics may benefit from additional study by IDOT.

Finally, we propose a scheme to determine which SMAs should be prioritized when developing and applying conservation management plans, and provide a supporting spatial dataset with priority scores assigned to roadways under IDOT jurisdiction.

The key opportunities for IDOT that we identified are as follows:

- Modifying the timing of mowing to emphasize action outside of the growing season when possible and to reduce the harm to monarch butterfly larvae during the growing season.

- Improving mowing and herbicide guidance maps, preferably shifting to a web-based GIS map like those used by Ohio DOT and Wisconsin DOT. This would also improve communication of conservation priorities with equipment operators and roadside managers, and can be flexible enough to incorporate information to help with other compliance requirements beyond mowing and herbicide application.

- Increasing resources and training for field staff, including in areas related to herbicide licensure, vegetation management guides, and educational opportunities regarding conservation.

- Modifying tree trimming and branch removal procedures and timing to reduce potential impacts to T/E summer-roosting bat species.

- Creating more consistent and effective guidance on managing teasel-infested areas so as to increase herbicide application and reduce mowing of the invasive species in the late summer, with the goal of reducing spread.

- Prioritizing invasive species removal, brush control, and native seeding near sensitive natural areas. Further prioritization can target higher quality habitat areas. Once invasive or woody plants encroach on an SMA, they become more difficult to control.

- Utilizing prescribed burning as a management approach for remnant prairies, when possible. Several transportation-related burn programs can be used as a guide.

- Increasing the use of native seed mixes, while continuing to improve the seed mixes and methods of establishment.

- Forming partnerships with conservation organizations to aid in the management of IDOT-owned habitat.

- Develop a comprehensive Integrated Roadside Vegetation Management strategy. Preferably the IRVM strategy would be specific to each IDOT district, or smaller geographical units (such as in Iowa, with IRVM plans for each county).

These results and efforts are intended to improve IDOT management of SMAs and promote a more comprehensive understanding of roadside management. This research will assist IDOT in the favorable stewardship of sensitive biological resources, while avoiding liability and project delays.

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LIST OF ABBREVIATIONS

BHM	Bureau of Highway Maintenance
BMP	Best Management Practices
BSS	Biologically Significant Stream
CCAA	Candidate Conservation Agreement with Assurances
CBO	Central Bureau of Operations
DelDOT	Delaware Department of Natural Resources
DNREC	Department of Natural Resources and Environmental Control
DNR	Department of Natural Resources
DOT	Department of Transportation
EO	Element of Occurrence
ESA	Endangered Species Act [1973]
ESR	Environmental Survey Request
IDNR	Illinois Department of Natural Resources
IDOT	Illinois Department of Transportation
INAI	Illinois Natural Areas Inventory
INDOT	Indiana Department of Natural Resources
INPC	Illinois Nature Preserves Commission
IRVM	Integrated Roadside Vegetation Management
MJV	Monarch Joint Venture
MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MODOT	Missouri Department of Transportation
NLEB	Northern Long-Ear Bat
ROW	Rights-of-Way
SMA	Special Management Areas
T/E	Threatened and Endangered [species]
TCB	Tri-Colored Bat
USFWS	United States Fish and Wildlife Service

CHAPTER 1: INTRODUCTION

BACKGROUND

Roadways traditionally have not been treated as being relevant to biological conservation—and may seem antithetical upon first thought. Roads themselves are constructed features, being places of intense human impact. They are the arteries of the modern age, physically and metaphorically dividing natural landscapes. Yet roadsides play an important role in conservation and biodiversity. Many have recognized their importance by virtue of their sheer frequency, landscape positioning, and influence on adjacent areas (Forman 2003). Most importantly, their seminatural rights-of-way (ROW) can serve as habitat for wildlife or connect habitat in modern fragmented landscapes (Harper-Lore et al. 2013). Sensitive biological resources, such as rare plants or remarkable natural features, can and do occur within or near roadways, sometimes with regularity. Agencies at both state and federal levels incorporate environmental considerations when building and maintaining roadways. Roads and ROWs are ubiquitous on a landscape level. In fact, the Illinois Department of Transportation (IDOT) is the largest land manager in Illinois because of the sheer volume of ROW. Therefore, roadside management practices have enormous implications to the conservation and persistence of many sensitive biological resources within the state of Illinois.

Interest in the conservation impacts of highway ROWs has grown in the past several decades. For example, academic research interest in ROW vegetation management for pollinator habitat goals has increased in recent years (Phillips et al. 2020). Additionally, ROWs are cited as a substantial contributor to the conservation of some imperiled species, such as the monarch butterfly (Thogmartin et al. 2017). Roadsides can also serve as both reservoirs and habitat corridors for sensitive species, facilitating the movement of populations or genetic materials, especially for mobile species (Fenderson et al. 2014). Because roads and ROWs fundamentally connect places for human travel, they also represent an opportunity to improve habitat connectivity at large (i.e., across the landscape) spatial scales (Huijser and Clevenger 2006). These examples suggest roadside conservation implications should not be underestimated.

Unfortunately, managing sensitive biological resources along roadsides can be challenging. Due to their impact and human usage, roadsides are areas of intense human influence, which can adversely impact biological resources (e.g., vehicular collisions causing pollinator mortality; Baxter-Gilbert et al. 2015). Because ROWs are long and narrow, they are influenced by sharp edge effects—often receiving influence from sharp ecological boundaries (Lázaro-Lobo and Ervin 2019). There can also be tradeoffs or difficulties to balance the functional requirements of roads (i.e., the basic, public value) and those of sensitive resources. For example, salt application of roadways can improve the safety of driving conditions during winter, but can cause harm and mortality to sensitive organisms and alter ecosystem processes (Findlay and Kelly 2011). Other disturbances of roadsides are quite common, including physically disturbing vegetation via mowing regimes or herbicide application (Showers and Rotman 2024). These examples suggest that roadside management, while a critical component of broad-scale biological conservation, has some substantial and unique challenges relative to traditional conservation contexts.

Integrated roadside vegetation management (IRVM) as a strategy has emerged with the increasing interest in conservation along roadsides and addressing the challenges thereof. Generally, IRVM describes a set of roadside management practices that balance the practical needs of roadside construction and management with the desire to benefit the environment via the protection and promotion of desirable or sensitive biological resources (Johnson 2008; Brandt et al. 2015). Pertinent doctrines that underly IRVM include that (1) DOTs have a responsibility to promote the safety, efficacy, and efficiency of roadsides as transportation corridors while following other laws, (2) DOTs have a secondary responsibility and concurrent legal responsibilities to promote the environment, particularly for protecting native ecosystems and the most sensitive resources that utilize DOT corridors as habitat, and (3) that points 1 and 2 do not have to be inherently conflicting principles (Berger 2005; Showers and Rotman 2024).

Several authors have overviewed the general history of IRVM. Historically, state DOTs were more concerned about the practical attributes of roadside management, sometimes neglecting environmental impacts (and conversely, the opportunities) thereof (Berger 2005). IRVM policies emerged in Iowa in the 1980s with the increasing recognition of these aforementioned factors, especially pertaining to developing standard sets of practices and an underlying management philosophy (Brandt et al. 2015; Quarles 2003). IRVM has since expanded to several other state DOTs, and includes several publications overviewing their practices. Other specialized research projects have been supported by DOTs to improve specific components of IRVM (e.g., research toward management of specific weed species; Herold et al. 2014).

IRVM practices vary by state policies and sometimes within states. Example practices include strategically timed mowing, herbicide application—especially for the control of the most ecologically detrimental invasive plants, brush cutting, plantings or native seed mixes or plants for the purposes of ecological improvement or restoration, and several others that seem more situational (MNDOT 2017). Some practices may simply alter existing management practices, whereas other IRVM best management practices (BMPs) might consist of novel management practices (e.g., prescribed fire) in situations that were not under traditional DOT purviews.

PROSPECTS FOR IRVM AND THIS STUDY

Although IRVM is considered a helpful framework to meet the objectives of many DOTs, creating an IRVM policy is not straightforward. Currently, IDOT lacks an IRVM framework, and several components must be clarified and met before one is developed. Utilizing IRVM would require knowledge of (1) where the roadsides or areas of focus are, (2) which policies and management strategies are possible or fruitful, (3) what management obstacles are commonly encountered, and (4) an understanding of how other DOTs have implemented IRVM.

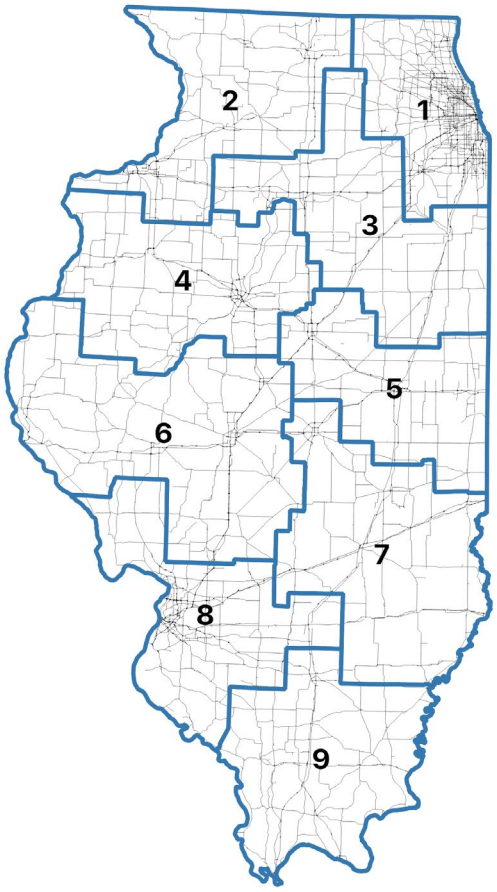

Figure 1. Map. The nine IDOT districts and major roadways under IDOT jurisdiction.

Several specific challenges have been identified as barriers to IRVM implementation for IDOT. First, it is unclear whether there is a convenient resource to summarize the number, types, and distributions of special management areas (SMAs): sensitive biological resources that may have special legal protections, act as habitat for legally protected species, or contain communities that are deemed valuable in terms of biodiversity. Routine IDOT activities (e.g., mowing, roadside construction), or conversely a lack of management at all, can adversely impact SMAs. The variation of ROW management contexts, the multiple bureaucratic units (IDOT districts: Figure 1), as well as sheer acreage of IDOT SMAs, further complicates the issue. Second, formulating IRVM also must navigate the jurisdiction of other federal and state laws. Relevant laws for roadside management in Illinois are organized in Table 1. These laws can be relevant when IDOT manages SMAs or areas adjacent to them. A lack of compliance can incur issues such as mandated management alterations, financial compensation, or lawsuits. Compliance with state and federal laws often coincide with the environmental goals of IDOT. However, these laws can trigger institutional culpability for IDOT with respect to roadside management. There are also situations where multiple SMAs can overlap, causing the jurisdiction of multiple, concurrent laws. These situations must be given careful attention by IDOT to avoid impacts and fulfill legal and policy standards. Third, IDOT has addressed SMA impacts on a case-by-case basis. A lack of authoritative guidance can hamper the effective fulfillment of IDOT objectives.

Table 1. Relevant Laws for IDOT Roadside Management Pertaining to Special Management Areas

Law	Jurisdiction	Summary	Relevance to sensitive biological resources
Endangered Species Act of 1973 (ESA)	Federal; USFWS	Legal protections conferred to animal and plant species listed as federally threatened or endangered (construed to account for their range within the entire United States). This includes active protection of those species' habitats. Taking (death, harm, or harassment), other interactions (e.g., study), or habitat destruction of listed species requires authorization and formal permitting.	Federally protects listed species and their critical habitats. IDOT may manage some roadsides that are known habitats for federally listed species, representing a liability due to the potential for the take of listed species or their critical habitat.
(520 ILCS 10/) Illinois Endangered Species Protection Act	State; IDNR	Similar to the ESA, this confers legal protections to animal and, to a lesser extent, plant species listed as state endangered or threatened within the state of Illinois. Prohibits the take (death, harm, or harassment) of listed animals or their habitats without authorization/permitting.	Protects individual species and their habitats from unpermitted take and can extend into habitat destruction. IDOT may own and manage roadsides that are known habitats for state-listed species, representing a liability due to the potential for unintentional take or their essential habitat. This law confers stricter protections for endangered animals than plants.
Illinois Natural Areas Preservation Act	State; IDNR	Established the Illinois Nature Preserves Commission. Legal protections for designated nature preserves, areas that are managed as special natural areas for perpetuity.	Protects natural areas and manages them to preserve their distinct, sensitive environmental characteristics. IDOT may manage areas close to or directly adjacent to listed nature preserves, representing a liability due to the potential for environmental harm to those natural areas.
Illinois Noxious Weed Law	State; Illinois Department of Agriculture	Mandates the control of plant species listed as noxious by the University of Illinois; these are plants uniquely harmful to human health and the economy.	IDOT roadsides may be habitats for noxious weeds, which would therefore require targeted destruction at the behest of the Department of Agriculture. This may also incur risks to sensitive biological resources near noxious weeds due to mandated control.
Injurious Species Act	State; IDNR	Lists several Injurious Species, both plants and animals. Among plants the emphasis is on aquatics. The Act states, "Injurious species shall not be possessed, propagated, bought, sold, bartered or offered to be bought, sold, bartered, transported, traded, transferred or loaned to any other person or institution unless a permit is first obtained from the Department of Natural Resources."	Similar to the Noxious Weed Law, though there are a wider breadth of species (plants and animals), and for plants the emphasis is on aquatic species.

Law	Jurisdiction	Summary	Relevance to sensitive biological resources
Exotic Weeds Act	State; IDNR	All exotic plants are listed under this law, unless an exempted by IDNR. The Act states that it is illegal to "buy, sell, offer for sale, distribute, or plant seeds, plants, or plant parts of exotic weeds without a permit issued by the Department [of Natural Resources]."	The law could limit activities related to seeding and the spread of invasive species.
Bald and Golden Eagle Protection Act 16 U.S.C. 668-668d	Federal; USFWS	Prohibits harming, killing, harassing, or otherwise "taking" bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*).	Activities near known eagle nests (usually within 660 ft) require a general permit from the USFWS.

Additional research can improve organization and development of IRVM. This would lead to several benefits, including improved management of SMAs and organized sets of BMPs, avoiding liabilities, and preventing project delays. This project consists of a combination of policy and literature review, summarization of known natural resources, and stakeholder outreach to lay the foundation for the development of an IRVM for IDOT. The objectives of our research were to:

1. Summarize the types of SMAs encountered on or near IDOT ROWs.

    a) Determine the most common types of SMAs, in terms of habitat and taxonomic groups

    b) Include summaries of spatial distributions (e.g., across IDOT districts)

2. Identify current policies/practices used within IDOT in relation to conservation, invasive species management, and the treatment of SMAs.

3. Collect and summarize policies, BMPs, and IRVM plans from DOTs in nearby states regarding SMA management practices.

4. Make inquiries to IDOT and similar organizations to identify effective/ineffective management tools, needs for successful habitat management, and challenges related to SMAs.

5. Propose decision rules to be used by IDOT when SMAs are encountered, which help guide future efforts to establish an IRVM.

6. Propose a scheme for determining which IDOT roadsides near SMAs should be prioritized when developing and applying conservation management plans.

CHAPTER 2: CHARACTERIZATION OF SPECIAL MANAGEMENT AREAS

SMA COMPILATION AND ANALYSIS

We summarized the most common types and attributes of SMAs that occur on or near IDOT roadways in Illinois. To do this, we first compiled spatial data from several sources.

We compiled spatial data for SMAs from public sources and personal communication with staff at the Illinois Natural History Survey, IDOT, and the Illinois Department of Natural Resources (IDNR; Table 2). IDOT roadways data and IDOT district boundaries data came from IDOT's online data portal (IDOT 2024a). Level 3 Ecoregion data were downloaded from the EPA website. In all analyses and summaries, SMAs were only included if some part of their area came within 0.25 miles of a road under IDOT jurisdiction (Figure 2).

Table 2. The 11 Spatial Datasets Used to Identify and Map SMAs

Special Management Area Type	Description	Source
Elements of Occurrence (EOs)	Threatened and endangered species (federal and state), bald eagle nest locations, sensitive habitats, geological features.	Illinois Natural Heritage Database
Illinois Nature Preserves Commission (INPC)	Sites included in the Illinois Nature Preserves Commission system. Sites can be privately or publicly owned. Includes nature preserves, land and water reserves, and natural heritage landmarks	Illinois Natural History Survey
*Biologically Significant Streams (BSS)	Stream segments with high biological diversity or integrity, as defined by the IDNR and Illinois Natural History Survey. Can be classified as Class I (higher rating) or Class II.	IDNR (2025)
Illinois Natural Areas Inventory sites	Natural areas registered by the IDNR that have high conservation value due to low anthropogenic impact, and resembling the ecological conditions found prior to widespread environmental degradation. INAI sites are not inherently legally protected but may be covered by some of the	Illinois Natural History Survey

Special Management Area Type	Description	Source
	other laws in this table. Includes high-quality natural communities, specific suitable habitat occupied by endangered and/or threatened species, Illinois nature preserves, outstanding geologic features, and unusual concentrations of flora and/or fauna.	
Roadside Prairie	Prairie vegetation, especially remnant natural prairie, adjacent to or owned by IDOT as ROWs. Oftentimes jurisdiction or management is shared with railroads. These were areas identified by previous efforts (Handel 2003) and are currently under reassessment by the Illinois Natural History Survey. Although they lack formal legal protection, they receive special management practices by IDOT due to their conservation value.	Illinois Natural History Survey, IDOT
Federal Land	Properties owned by the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, or U.S. Forest Service.	US Forest Service (2025); US Fish and Wildlife Service (2025); iView
Illinois Department of Natural Resources lands	Properties owned, managed, or leased by the Illinois Department of Natural Resources.	Illinois Natural History Survey
County Park	Properties owned by county forest preserve districts or county conservation districts.	iView
Private-sector Parks (NGOs, etc.)	Properties owned by nongovernmental organizations with a conservation focus.	iView
Municipal Park	Properties owned by municipalities or townships.	iView
Easement, Leased, or Managed	Private properties managed, leased, and/or under conservation easement with a federal, state, county, municipal, or NGO organization.	iView

* The Illinois Wetlands and Small Streams Act (https://www.ilga.gov/legislation/103/SB/10300SB3669.htm) has been proposed as a bill in the Illinois General Assembly and will likely come up for vote in the spring. If passed, it would increase protection for BSS.

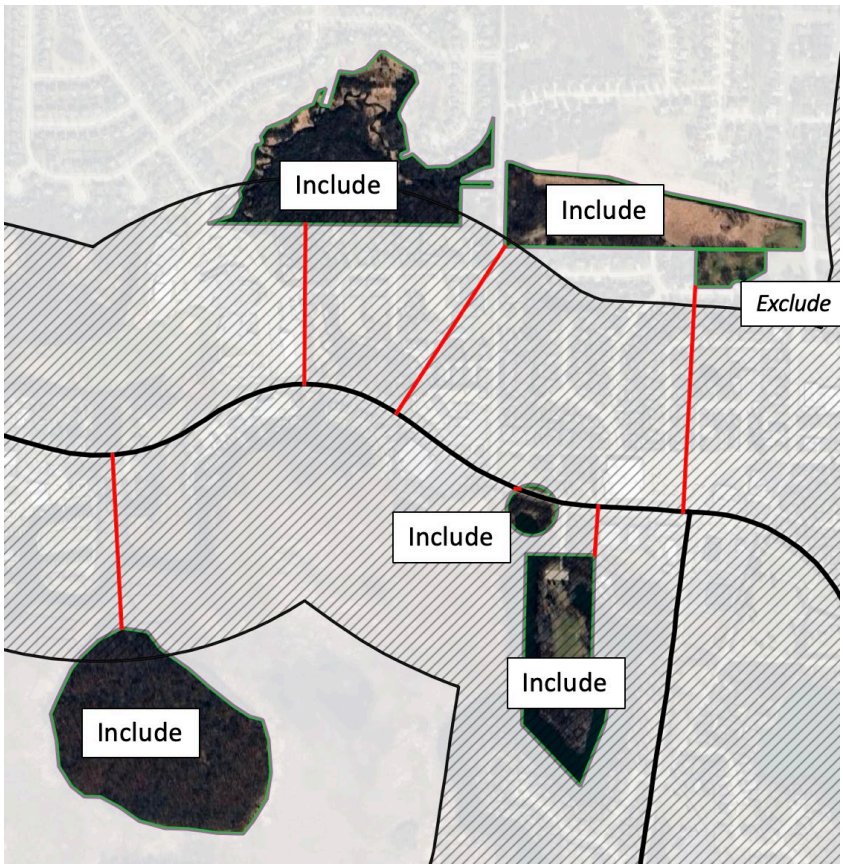

Figure 2. Map. Example of SMAs that were included and excluded in the 0.25-mile buffer (hashed area) from IDOT roads (black lines).

Spatial data on threatened and endangered (T/E) species at the state level were obtained as elements of occurrence (EOs), which are records of the species encountered, location, and additional general information (such as dates). All federally listed and state listed T/E species are included in this data set. The EO records also included information on sensitive habitats and geological features tracked by the Illinois Natural Heritage Database. Illinois Nature Preserves Commission lands typically include high-quality habitat and have strong legal protection under state law (Table 1). Biologically significant streams (BSS) and Illinois Natural Areas Inventory (INAI) sites are important in terms of biodiversity, though they have no formal legal protections as of the start of 2025; BSS would receive protection if the proposed Illinois Wetlands and Small Streams Act becomes state law. Roadside prairies are prairie remnants, and they are unique among the SMA types in that most of them are on IDOT property. IDOT has voluntarily agreed to prioritize the conservation of these remnants. Areas that are owned, managed, or leased by the IDNR are state-owned lands that include state parks, state natural areas, and state fish and wildlife areas. Additionally, there are substantial quantities of federally protected land owned by the US Forest Service in southern Illinois, and smaller total areas owned by the US Fish and Wildlife Service (USFWS) or the US Army Corps of Engineers (typically along large rivers).

Additional SMA data were downloaded from iView (Prairie State Conservation Coalition 2025), a project that serves as a comprehensive database of protected lands for Illinois. Incorporating data

from iView provided additional coverage of protected areas, such as municipal parks, county forest preserves, conservation easements, and lands owned by private conservation organizations. While it provided additional coverage of protected areas, it also created duplicates with some of our other spatial data. We removed duplicate features across datasets by identifying features with similar names (using Levenshtein name matching) and/or a high percentage of area overlap using QGIS version 3.40.1. Potential duplicates were manually inspected and removed if it was clear that two polygons represented the same SMA. In total, we removed 1,509 features from the iView dataset. Although this process removed duplicates across datasets, some feature polygons still overlapped with each other, and these features were not removed from SMA counts. For instance, where two EOs overlapped each other, both EOs were kept in the final analysis. Whenever we calculated SMA areas, we dissolved overlaps between polygons of the same category to avoid double counting areas of overlap.

In addition to this filtering process, we also removed (a) INAI sites denoting mussel beds, (b) EOs denoting fish and mussels, and (c) county parks or state land whose dominant land cover was either cropland, mowed grass, or developed. We excluded areas associated with mussels and fish because the SMA management guidelines that we lay out in this report will largely apply to vegetation management in terrestrial systems. We excluded areas dominated by cropland, mowed grass, or developed areas because they do not represent natural systems and, thus, are not considered SMAs. A few INPC sites and INAI sites were dominated by cropland or mowed grass, and those were kept because their inclusion in these programs indicates on-the-ground ecological quality that may not be captured by satellite imagery.

We did not assess stream environments, as a result we cannot address multiple issues associated with protected or sensitive aquatic resources. Aquatic resources are a substantial concern for IDOT, with several projects and infrastructure potentially affecting habitat in streams and other water features. Further research efforts may be worthwhile to determine best management practices for aquatic habitats and approaches used by other DOTs.

We classified the dominant habitat type for all SMAs except for municipal parks and T/E EOs. We investigated the utility of the US Department of Agriculture's National Agricultural Statistics Service Crop Data Layer for automatically assigning dominant habitat classifications to sites. However, we found poor agreement between the remotely sensed data and our own classifications, especially for non-forest habitats. Instead, we decided to classify dominant habitats using a combination of name filtering (for example, anything named "Fen" was called a wetland) and manual inspection of satellite imagery. (See Appendix A for the full methods.) Existing habitat classifications existed for INAI sites and roadside prairies, and we used those classifications when possible. All spatial data were transformed to UTM Zone 16N with the NAD83 Datum (EPSG:26916) projection system.

TYPES OF SMAS: CHARACTERISTICS AND DISTRIBUTIONS

We identified 11 SMA categories (Table 2). These SMAs are a mixture of lands with different types of ownership and land usage, some with special or robust legal protections. From our spatial datasets, we found over 22,000 SMAs in Illinois, about 37% of which were ≤ 0.25 miles from IDOT roadways

(Table 3). The frequency of SMAs to the distance of IDOT roads was right skewed (Figure 3); SMAs were often adjacent to IDOT roads, or nearly so (< 0.05 miles). For most analyses (other than Table 3 and Figure 3), only SMAs within a 0.25-mile "buffer distance" were included, because these sites are most likely to be affected by IDOT ROW management activities. The decision we made about what SMAs to include could be characterized as mildly conservative, because using a smaller buffer distance would have reduced the number of SMAs encountered. However, 67.5% of the 8,200 SMAs we included in this study occurred within 500 feet, and more than half within 250 feet, of an IDOT roadway centerline.

Table 3. Count of SMAs Inside and Outside of the Distance Threshold from IDOT Roads, Summarized by District

IDOT District*	≤ 0.25 mi from road	> 0.25 mi from road	Total
1	4,187	4,728	8,915
2	746	1,367	2,113
3	562	1,012	1,574
4	472	1,049	1,521
5	305	604	909
6	580	1,686	2,266
7	333	943	1,276
8	466	940	1,406
9	586	1,876	2,462
Outside Illinois	1	11	12
Total	8,238	14,216	22,454

* If an SMA overlaps multiple IDOT districts, then it is assigned to the district with the greatest area of overlap.

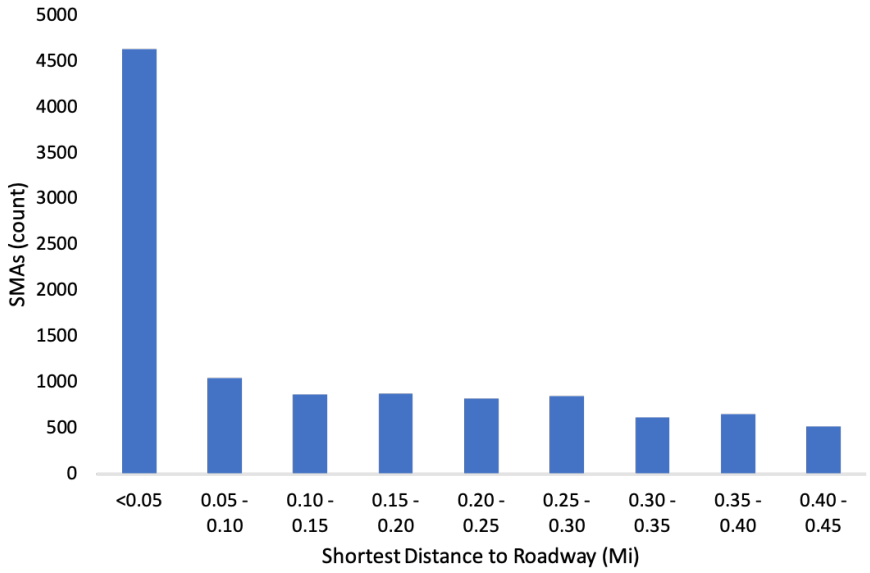

Figure 3. Chart. Count of SMAs by distance to the nearest road under IDOT jurisdiction.

The total count of SMAs was distributed unequally among districts (Table 4). District 1 accounted for over half of all SMAs near IDOT roads. The most frequently encountered SMA categories were municipal parks, T/E records, and INAI sites. There were notable differences among districts in terms of distribution of SMA types, especially municipal parks and EO records. SMA area was likewise distributed unequally (Figure 4; Table 5), with Districts 1 and 9 accounting for over half of SMA area near IDOT roads. The results were generally similar when comparing counts and areas of SMAs (Table 4, Table 5); however, low raw counts of some SMAs still meant high spatial coverage in some districts. For example, despite only having three federal land SMAs in District 9, those parcels associated with the Shawnee National Forest accounted for nearly 21 square miles (> 13,000 acres).

We identified the dominant habitat types for SMAs near IDOT roads. Forests, grasslands, and wetlands were the most frequent habitat types, with forests the most frequent (Table 6). Other SMA types were generally infrequent, though BSS and special geological features were occasional. When looking at the area of SMAs (Table 7), the patterns generally coincide with counts of SMAs, though wetlands had greater area than grasslands despite being fewer in number across districts. When considering SMA characteristics and distributions, District 1 held special relevance. District 1 had the most SMAs by both number and area. District 1 also had an abundance of SMA types that were infrequent elsewhere (e.g., county and municipal parks).

Table 4. Count of SMAs by Type and IDOT District

District:*	1**	2	3	4	5	6	7	8	9	Total
EOs	912	242	114	130	68	202	105	157	307	2,237
INPC	108	23	16	19	8	19	16	20	18	247
Biologically Significant Streams	28	25	64	36	31	33	39	31	30	317
INAI Site	187	59	57	47	23	62	36	51	67	589
Roadside Prairie	45	23	52	16	47	44	35	21	24	307
Federal Land	3	1	0	3	0	2	0	7	3	19
State Land	23	25	18	20	10	23	13	20	34	186
County Park	359	33	16	0	8	0	5	4	0	425
Parks (NGOs, etc.)	45	20	4	8	4	6	5	33	2	127
Municipal Park	2,332	257	208	161	98	91	67	76	44	3,334
Easement, Leased, or Managed	145	38	13	32	8	98	12	46	57	449
Total	4,187	746	562	472	305	580	333	466	586	8,237

* If an SMA overlaps multiple IDOT districts, then it is assigned to the district with the greatest area of overlap.
** White-red and white-blue color scales are defined for each IDOT district, with darker colors corresponding to higher relative counts in each column.

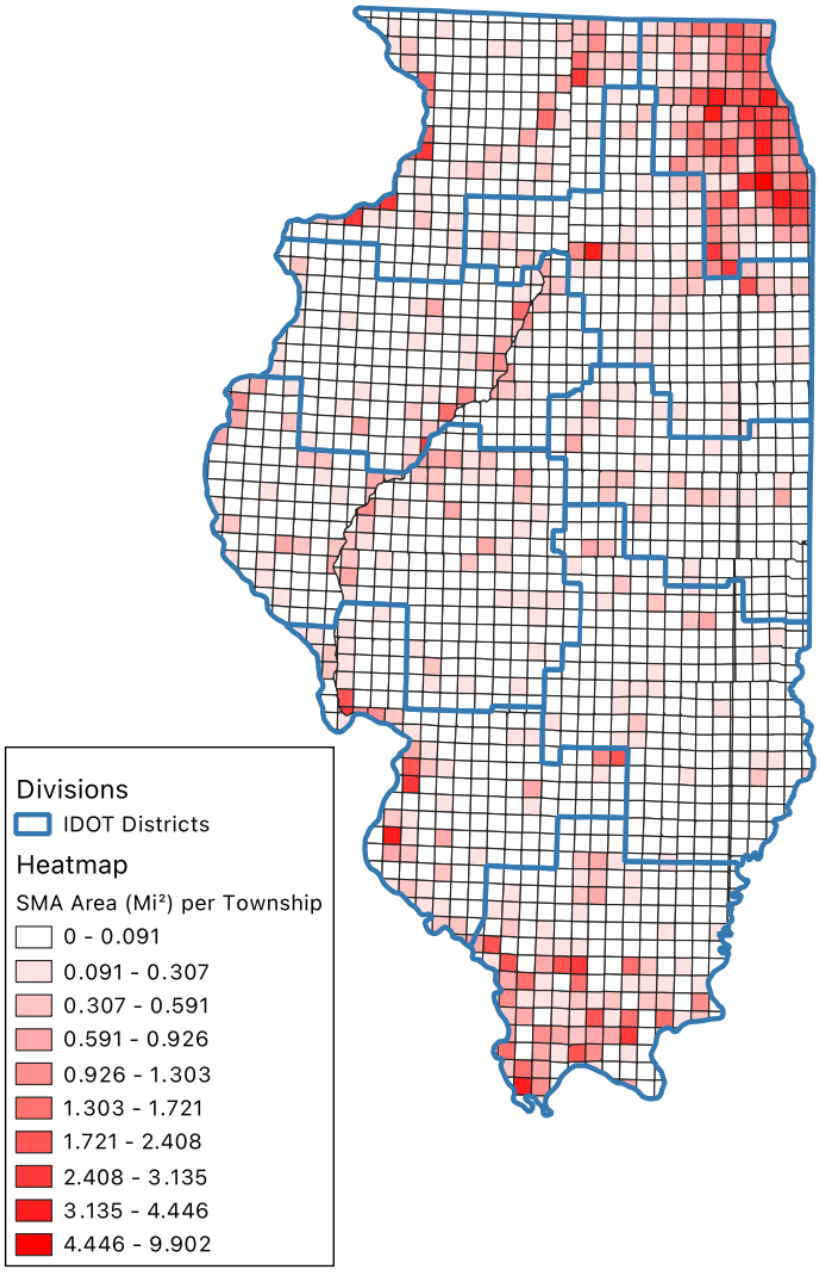

Figure 4. Map. Total area of special management areas in each public land survey system township.

Table 5. Summed Area (Square Miles) of SMAs by Type and IDOT District

District:*	1**	2	3	4	5	6	7	8	9	Total
EOs	43.05	24.69	12.49	8.87	1.47	14.88	2.65	17.92	23.92	149.9
INPC	12.72	1.59	0.99	1.09	0.57	0.80	0.91	1.65	2.55	22.9
INAI Site	21.50	11.11	6.65	3.50	1.55	6.60	2.33	9.48	9.48	72.2
Roadside Prairie	2.09	0.33	1.54	0.40	1.42	1.66	1.08	0.57	0.60	9.7
Federal Land	2.25	0.69	0.00	1.76	0.00	0.40	0.00	2.86	20.77	28.7
State Land	4.01	5.22	10.95	7.34	3.53	2.86	2.48	9.96	14.42	60.8
County Park	71.78	2.32	0.50	0.00	0.59	0.00	0.21	0.47	0.00	75.9
Parks (NGOs, etc.)	2.17	1.03	0.07	2.60	0.43	0.61	0.39	0.65	0.02	8.0
Municipal Park	31.16	4.62	2.58	4.75	1.57	1.54	1.96	1.34	1.12	50.6
Easement, Leased, Managed	3.77	2.32	0.76	3.23	0.22	5.75	0.61	2.35	5.14	24.2
Total	194.5	53.9	36.5	33.5	11.4	35.1	12.6	47.3	78.0	502.8

* If an SMA overlaps multiple IDOT districts, then it is assigned to the district with the greatest area of overlap.
** White-to-red and white-to-blue color scales are defined for each IDOT district, with darker colors corresponding to higher counts in each column.

Table 6. Counts of Dominant Habitat Types for SMAs, by IDOT District

District:*	1**	2	3	4	5	6	7	8	9	Total
Forest	411	90	53	74	32	130	55	103	133	1,081
Grassland	287	89	97	46	62	87	51	72	34	825
Wetland	235	48	35	37	19	30	15	30	28	477
Biologically Significant Stream	28	25	64	36	31	33	39	31	30	317
Geological Feature	6	16	8	0	0	18	5	22	23	98
Savanna	45	0	1	5	1	8	6	2	12	80
Forest & Grassland	16	0	1	0	1	7	2	0	2	29
Forest & Wetland	9	2	1	2	0	2	0	2	2	20
Barren	2	1	2	0	0	2	0	0	0	7
Wetland & Grassland	5	0	1	1	0	0	0	0	0	7
Large Complex	0	0	2	0	0	0	1	1	1	5
Developed	1	0	0	0	1	0	0	1	0	3
Cropland	0	0	0	0	0	0	1	0	0	1
Forest & Cropland	0	0	0	0	0	0	0	0	1	1
Forest & Developed	1	0	0	0	0	0	0	0	0	1
Pasture	1	0	0	0	0	0	0	0	0	1
Wetland & Developed	1	0	0	0	0	0	0	0	0	1
Wetland & Savanna	0	0	0	0	0	0	0	1	0	1
Not Classified	3,139	475	297	271	158	263	158	201	320	5,282
Total	4,187	746	562	472	305	580	333	466	586	8,237

* If an SMA overlaps multiple IDOT districts, then it is assigned to the district with the greatest area of overlap.
** White-red and white-blue color scales are defined for each IDOT district, with darker colors corresponding to higher counts in each column.

Table 7. Area (Square Miles) of Dominant Habitat Types for SMAs, by IDOT District

District:*	1**	2	3	4	5	6	7	8	9	Total
Forest	53.65	10.92	12.06	3.37	3.36	9.36	4.35	13.99	25.53	136.58
Wetland	26.90	10.07	3.63	13.10	2.09	4.12	0.94	4.03	5.19	70.09
Grassland	26.03	3.61	3.64	2.32	2.87	3.34	1.25	9.68	2.37	55.10
Large Complex	0.00	0.00	1.72	0.00	0.00	0.00	0.81	0.02	11.90	14.45
Forest & Wetland	4.24	0.20	0.16	0.91	0.00	0.09	0.00	0.56	7.95	14.12
Forest & Grassland	4.08	0.00	0.14	0.00	0.02	1.89	0.40	0.00	0.57	7.10
Savanna	5.69	0.00	0.11	0.16	0.04	0.12	0.30	0.02	0.61	7.06
Wetland & Grassland	1.63	0.00	0.06	0.28	0.00	0.00	0.00	0.00	0.00	1.97
Geological Feature	0.14	0.18	0.07	0.00	0.00	0.14	0.06	0.24	0.39	1.23
Forest & Cropland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19
Pasture	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
Forest & Developed	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Cropland	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Barren	0.02	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.04
Developed	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.02
Wetland & Savanna	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
Wetland & Developed	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Not Classified	71.9	28.9	14.9	13.4	3.0	16.0	4.4	18.7	23.3	194.6
Total	194.5	53.9	36.5	33.5	11.4	35.1	12.6	47.3	78.0	502.8

* If an SMA overlaps multiple IDOT districts, then it is assigned to the district with the greatest area of overlap.
** White-red and white-blue color scales are defined for each IDOT district, with darker colors corresponding to higher counts in each column.

DISTRIBUTIONS OF THREATENED AND ENDANGERED SPECIES

We further explored distributions of T/E species. Giving T/E species further consideration was important because several SMAs in all districts were associated with T/E species, and they have special relevance to roadside management, IRVM, and legal protection (especially animals). Additionally, different taxonomic groups create various management challenges and have different management needs, so we summarized broad taxonomic classifications of T/E species (Table 8). District 1 had by far the most T/E species near IDOT roads, followed by District 9. Herbaceous plants were the most frequent taxa, followed by birds. Terrestrial communities were also relatively common. Most T/E species occurred in forests, grasslands, and wetlands (Table 9). Some differences in habitat fidelities were visible among taxonomic groups. For example, the frequency of wetlands with T/E bird, amphibians, and reptile species was of special interest.

Table 8. Count of Threatened and Endangered Species by Taxonomic Group and IDOT District

District:*	1**	2	3	4	5	6	7	8	9	Total
Herbaceous Plants	354	69	24	33	7	60	22	30	99	698
Birds	237	38	15	49	11	20	25	30	36	461
Reptiles	71	25	5	5	7	26	20	28	21	208
Woody Plants	61	14	5	1	1	3	2	1	34	122
Mammals	8	10	9	8	9	20	3	12	28	107
Terrestrial Invertebrates	53	22	5	3	0	5	2	5	0	95
Amphibians	9	5	3	0	6	27	4	5	15	74
Aquatic Invertebrates	0	2	0	0	1	0	0	5	19	27
Lichens	0	0	0	0	0	0	0	0	4	4
Terrestrial Communities	109	48	41	31	24	32	25	32	42	384
Geological Features	3	8	5	0	0	9	2	9	8	44
Aquatic Communities	7	1	2	0	2	0	0	0	1	13
Total	912	242	114	130	68	202	105	157	307	2237

* If a T/E species overlaps multiple IDOT districts, then it is assigned to the district with the greatest area of overlap.
** White-red and white-blue color scales are defined for each IDOT district, with darker colors corresponding to higher counts in each column.

Table 9. Count of Threatened and Endangered Species by Taxonomic Group and SMA Habitat Type

	Amphibians*	Aquatic Invertebrates	Birds	Herbaceous Plants	Mammals	Other Plants	Reptiles	Terrestrial Invertebrates	Woody Plants
Forest	23	10	127	306	34	1	69	26	71
Wetland	23	13	213	223	22	1	60	24	50
Grassland	11	1	124	214	11	0	53	35	20
Biologically Significant Stream	15	4	62	34	36	0	43	6	32
Savanna	2	1	32	70	1	1	15	11	12
Large Complex	4	5	11	20	9	0	8	0	3
Geological Feature	1	8	8	19	7	0	5	1	7
Forest & Grassland	0	1	13	15	4	0	6	3	4
Forest & Wetland	1	0	17	9	1	0	3	4	4
Wetland & Grassland	0	0	19	9	0	0	5	1	2
Barren	0	1	8	13	0	0	1	2	3
Developed	0	0	0	2	0	0	0	0	1
Pasture	0	0	0	2	0	0	0	1	0
Cropland	0	0	0	0	0	0	2	0	0
Forest & Developed	0	0	0	2	0	0	0	0	0
Forest & Cropland	0	0	0	1	0	0	0	0	0
Not Classified	21	5	159	150	21	1	66	30	32
No Overlap	26	4	126	100	42	2	65	22	17

* White-red and white-blue color scales are defined for each taxonomic group, with darker colors corresponding to higher counts in each column.

We found a notable concentration of bird T/E species in wetlands in District 1. Forests had high numbers of listed herbaceous plants, woody plants, reptiles, and mammals. Moreover, BSS also had a relatively large number of mammal T/E species due to the presence of listed bat species. We also note that terrestrial invertebrates were common in grasslands. The presence of rusty patched bumble bees (*Bombus affinis*) may be a particularly relevant species to IRVM of roadside grassland management, because of its frequency and federal protections.

We summarized T/E species by dominant habitat around each EO, separating birds (Table 10) and non-avian species (Table 11). For birds, bald eagles (*Haliaeetus leucocephalus*), least bitterns (*Ixobrychus exilis*), and black-crowned night herons (*Nycticorax nycticorax*) were the most commonly observed taxa (Table 10). All three species showed an affinity to wetlands. Bald eagles were also commonly found in forests. The most common non-avian animal taxa were Blanding's turtle (*Emydoidea blandingii*), Indiana bat (*Myotis sodalis*), and timber rattlesnake (*Crotalus horridus*). For the most common reptiles, Blanding's turtle was abundant in wetland habitats, but also common in grasslands and forests; the timber rattlesnake was found generally in forest and BSS habitats. Indiana bats were found commonly in forest and BSS habitats.

With the frequency in mind—particularly considering their fidelities to specific habitat types—we have incorporated a selection of these T/E animals into the BMP framework (see Chapter 4). When T/E species are present, the management approach often needs to be modified, largely to reduce harm to the species.

Table 10. Habitat Type in Which Avian T/E Species Occurred for the Most Common Birds

	Barren	Forest	Forest & Grassland	Forest & Wetland	Geological Feature	Grassland	Large Complex	Savanna	Wetland	Wetland & Grassland	BSS Stream	Unclassified	No Overlap
Bald Eagle	2	31	2	9	3	10	5	2	32	0	19	21	52
Least Bittern	1	9	0	1	0	16	1	4	26	3	2	18	2
Black-crowned Night Heron	1	10	2	1	0	11	0	3	22	1	3	25	3
Common gallinule	0	7	1	0	0	10	0	1	26	4	2	17	7
Yellow-headed Blackbird	0	8	2	1	0	12	0	3	25	4	0	12	3
Osprey	0	15	0	1	0	4	0	3	10	0	0	2	25
Northern Harrier	0	7	1	1	1	8	2	2	8	0	5	11	3
Black tern	0	3	1	1	0	9	0	2	15	3	3	8	1
Short-eared Owl	0	5	1	0	1	10	0	1	7	0	6	8	0
Cerulean Warbler	2	9	0	0	3	2	0	2	4	0	13	2	0
King Rail	0	1	1	0	0	7	0	2	10	2	2	5	0
Upland Sandpiper	1	1	0	0	0	6	0	2	4	2	0	3	6
Loggerhead Shrike	0	0	0	0	0	5	0	0	0	0	0	3	16

* White-red color scale indicates the number of occurrences, with redder squares indicating greater counts.

Table 11. Habitat Type in Which Non-Avian T/E Species Occurred for the Mostly Common Species

	Barren	Cropland	Forest	Forest & Grassland	Forest & Wetland	Geological Feature	Grassland	Large Complex	Savanna	Wetland	Wetland & Grassland	BSS Stream	Not Classified	No Overlap
Blanding's Turtle	1	0	19	3	2	1	24	0	8	35	5	13	26	18
Indiana Bat	0	0	16	2	1	3	3	5	0	9	0	17	9	15
Timber Rattlesnake	0	0	18	1	0	3	6	7	3	1	0	9	10	6
Northern Long-eared Bat	0	0	12	2	0	2	1	2	0	6	0	8	5	15
Illinois Chorus Frog	0	0	7	0	1	0	8	1	0	7	0	1	8	13
Kirtland's Snake	0	1	7	2	1	0	1	0	2	4	0	4	4	11
Common Mudpuppy	0	0	4	0	0	0	1	0	1	9	0	10	8	4
Ornate Box Turtle	0	0	2	0	0	0	11	0	2	3	0	0	4	14
Smooth Softshell Turtle	0	1	4	0	0	0	1	0	0	4	0	6	5	4
Bird-voiced Tree Frog	0	0	5	0	0	1	2	3	0	5	0	4	4	1
Franklin's Ground Squirrel	0	0	0	0	0	0	7	0	1	2	0	0	3	7
Southeastern Myotis	0	0	4	0	0	1	0	1	0	2	0	7	2	2
Eastern Massasauga	0	0	5	0	0	0	3	0	0	1	0	3	4	1
Eastern Ribbon Snake	0	0	4	0	0	0	0	0	0	3	0	3	3	0
Alligator Snapping Turtle	0	0	1	0	0	0	1	1	0	2	0	5	1	1
Western Hognose Snake	0	0	3	0	0	0	2	0	0	3	0	0	1	1

* White-red color scales are defined for each taxonomic group, with darker colors corresponding to higher counts in each column.

CHAPTER 3: MANAGEMENT APPROACHES

The goal of our exploration into management approaches implemented by DOTs covered three of the overall objectives of this work. Briefly, we wanted to (a) identify current and proposed IDOT policies, (b) summarize policies, BMPs, and IRVM plans from nearby states, and (c) use targeted questions to roadside managers in the region to better understand practices employed. It is useful to take a broad view of management actions taken across several transportation organizations because it helps to determine strategies that are more (or less) effective and approaches that are possible but may not be currently in use by IDOT. Additionally, one of our overall recommendations is that IDOT develop an IRVM strategy, and it is important that a wide range of management methods complement one another in an IRVM approach.

SURVEY METHODOLOGY

We created two question-based surveys developed in collaboration with staff from the Natural Resources Unit within the Bureau of Design and Environment at IDOT. We created separate surveys for IDOT stakeholders and those from other state DOTs, though the two versions had similar topics and questions. We used Qualtrics web-based software to construct and circulate the surveys. Exported copies of the survey questions and instructions seen by participants can be found in Appendix B and Appendix C for respondents from IDOT and other DOTs, respectively. Covered topics included DOT management practices, policies, and types of SMAs encountered. We also asked participants to summarize opportunities and challenges associated with important types of management activities. We used a mixture of written, multiple choice, and Likert scale questions. Additional space was provided for sharing literature or web pages throughout the survey.

To determine how to disseminate the survey, we identified a pool of potential participants prior to survey release using a variety of resources and methods. We generally emphasized the Midwestern United States—especially states bordering Illinois. However, we included other state DOTs outside of the region for greater sampling breadth. Some DOT stakeholders were identified from Schelsky et al. (2024) and Pociask et al. (2024), whereas others were sourced from custom mailing lists among our professional contacts or state websites. We used web searches and opportunistic sampling (e.g., asking for additional contacts from DOT contacts) to complement our searches. Using this approach, we identified 56 DOT or roadside manager contacts, representing 16 different states; 10 potential participants were in Illinois, and 46 in other states. Moreover, approximately 50 other potential survey respondents were contacted in all 50 states through John Senger (IDOT Bureau Chief of Research). We contacted all potential participants via email during early February 2025, requesting a response within two weeks from the contact period. An additional follow-up email was sent to all nonresponding contacts a week prior to the requested date to encourage participation.

We received a total of 40 responses, representing seven out of nine IDOT districts and 31 other participants from 19 other states (i.e., we estimate a 38% response rate across all 106 potential participants). Note that these figures included partially complete surveys, which were also included into some of our findings.

We inspected the responses and iteratively summarized pertinent information, especially by comparing and contrasting results from the IDOT respondents to out-of-state respondents.

MOWING

Mowing Introduction

The primary function of highway mowing is to maintain a safe, obstruction-free area for vehicles to exit the roadway in emergency situations. Historically, entire ROWs were mowed frequently and with little regulation. Mowing policies have evolved to encompass safety, aesthetic, and conservation goals. In Michigan and Wisconsin, the entire width of the ROW was mowed consistently throughout the mowing season until the 2000s, when mowing became limited to roadside shoulders and areas needed for vision lines (Tibbits 2003; WisDOT 2024). Limitations on mowing timing were occasionally met with resistance when they were first implemented (Tibbits 2003).

Because mowing benefits the growth and reproduction of some plants over others, highway mowing has significant impacts on conservation outcomes in ROW. Recognizing this, the 2021 IDOT mowing policy (Maintenance Policy Manual §5-400) states that "it is the department's policy to provide wildlife habitat and to preserve and encourage native vegetation." Mowing can kill or stunt certain plant species, and it is therefore an effective and common tool for invasive and toxic weed control. Mowing some invasive plant species before they go to seed can control their populations and promote the growth of desired roadside vegetation. After invasive and toxic plants have produced seeds, however, mowing equipment can transport seeds to new areas and facilitate the spread and reproduction of a population of problem plants. In some species, like common reed (*Phragmites australis*) and Japanese knotweed (*Reynoutria japonica*, also known as *Polygonum cuspidatum*), seed is not required because they can spread by vegetative tissue fragments.

In native plant and pollinator habitat management, mowing is an important tool for preventing woody plant growth and favoring the long-term establishment of planted or naturally occurring native forbs and grasses (MNDOT 2018). Conservation mowing is often best implemented in tandem with other practices, like spot herbicide application of invasive species or periodic prescribed fire. Mowing T/E plant species can harm or kill them, depending on the species, and disturbance from mowing equipment can harm nesting grassland bird species. Additionally, mowing when pollinators are actively using floral resources can deprive them of food or cause direct mortality, which can be of serious concern for imperiled pollinators that rely on roadsides, such as the federally endangered rusty patched bumble bee. For bumble bees and likely many other pollinators, floral resources are especially important early in the growing season when they are most vulnerable (Malfi et al. 2019; Malfi et al. 2021; Mola et al. 2021). Even more important than nectar plants are sensitive invertebrates' larval host plants. Larvae are not as mobile as adults and mistimed mowing will generally mean certain death when host plants are mowed. Examples include the eryngium stem borer (*Papaipema eryngii*) on rattlesnake master or the monarch butterfly (*Danaus plexippus*) on milkweeds.

To balance these various mowing goals and impacts, state DOTs regulate the timing, location, and practices associated with roadside mowing. In some cases, highway ROW mowing is regulated by state laws (e.g., Minnesota Statute § 160.232; Michigan Act 174 § 247.665b; Iowa Code § 314.17), but more often mowing regulations are internal to DOTs. Generally, mowing policies specify mowing practices for

a “safety zone” along the edge of the roadway and a separate set of practices for the rest of the ROW. The safety zone is mowed routinely and is between 8’ (Minnesota) to 30’ (Ohio and Indiana) wide depending on the state and locality. Illinois mows a 15’ wide safety zone. Mowing policies tend to contain exceptions for medians, interchanges, steep slopes, and other special features.

Several state DOTs, including IDOT, are enrolled in the Candidate Conservation Agreement with Assurances (CCAA) for monarch butterflies. The Monarch CCAA requires signatories to commit to conservation measures to “sustain, enhance, and restore” habitat for monarch butterflies (*Danaus plexippus*) and avoid covered activities that result in the “take” of monarch butterflies through direct mortality or indirect habitat effects (Cardno Inc. 2020). The key activities regulated under the Monarch CCAA are loss of habitat resulting from land conversion, herbicide use, and mowing. Enrolled DOTs have updated their internal mowing policies and guidelines to reflect this agreement. As part of its enrollment in the Monarch CCAA, IDOT (2024b) committed to “conservation mowing to enhance floral resources during migration.” The current IDOT policy includes two prominent elements related to monarch conservation, dates during the growing season when mowing is restricted and the frequency of mowing (rotational mowing). Both elements of the policy provide benefits to wildlife, but the rotational mowing approach is especially effective and innovative.

Limiting Mowing Outside the Safety Strip

When determining preferred mowing times in a conservation policy, several factors need to be considered. A large variety of sensitive organisms and habitats can be found on or near roadsides, and they have conflicting needs when it comes to the timing of mowing (or other disturbance). The two species that receive the most attention for highway mowing restrictions are monarch butterflies and rusty patched bumble bees (Forsberg 2023). Beyond these species, though, there are hundreds of species of pollinators (and other taxa) that occur in roadside ROW, with vastly different life cycles, nesting habitat needs, and foraging timing.

For example, early-season mowing is most harmful to bumble bees and grassland birds. Mid-season (and to a lesser extent late-season) mowing is most harmful to monarch butterflies. Meanwhile, mowing at all during the active season can cause direct harm to less mobile herpetofauna (e.g., Blanding’s turtles).

Additionally, strategically timed mowing can be part of an effective strategy for controlling aggressive woody species or invasive species, though timing is not aligned for all problematic species. Ideally, if invasive control is not needed, all mowing would occur in the offseason, approximately October 1 to April 1. However, that is not usually feasible due to logistics (equipment, personnel, etc.) and habitat management needs.

One approach that state DOTs take to provide the benefits of mowing while limiting impacts to sensitive species is to restrict the times that mowing is allowed during the growing season. Mowing policies for Minnesota (August 1–September 1) and Michigan (July 15–September 1) emphasize mowing during the later summer months. Ohio has a window of time in summer when mowing is allowed, and also mows outside the growing season. The windows when mowing is allowed in Wisconsin, Iowa, and Missouri appear to emphasize off-season mowing, though Wisconsin and Iowa allow mowing into the summer months. Some local regulators have policies that restrict mowing

during the growing season. For example, the policy for Polk County in Iowa is to wait until October for most mowing to maintain nectar availability and to wait until November to mow areas with high-quality natives so that plants can go to seed and reproduce.

Illinois policy states that mowing during the growing season is to occur between July 1–August 14, which is a similar timeline to Michigan and Minnesota. The IDOT dates follow the guidance of the Illinois Monarch Project Mowing Guidelines for Pollinators (Illinois Monarch Project 2019). The six-week mowing window suggested by the Illinois Monarch Project Mowing Guidelines for Pollinators gives a feasible timeline to complete roadside mowing, however, it concentrates mowing at times when monarch larvae are most abundant in much of Illinois (Zaya et al. 2022).

Illinois policy has at times been ambiguous regarding off-season mowing (also referred to as "end of season mowing"), though in the most recent documents we found it is largely discouraged. Some policy documents and discussions with staff have suggested that IDOT policy only allows mowing outside the safety strip to occur in the summer, though the policy may be updated to allow some mowing after October 1 for spots that were missed during the summer (IDOT 2021a; Brittany Gavin, pers. comm., March 14, 2025). The Illinois Monarch Project Mowing Guidelines for Pollinators (Illinois Monarch Project 2019) does not restrict off-season mowing. Recent proposed modifications to the mowing policy only encourage off-season mowing in the safety strip, at interchanges, and in prairie habitat (Scott Hall, pers. comm., March 2025).

General guidance for monarch butterfly conservation recommends minimizing mowing during the growing season in Illinois, and many (but not all) sources suggest avoiding growing season mowing when possible. This guidance comes from several sources, including the Monarch CCAA, Xerces Society, and the Monarch Joint Venture (MJV 2025). MJV provides specific recommendations for ROW mowing during the growing season based on the known biology and movement of monarch butterflies and their larvae (MJV 2025). MJV emphasizes that summer mowing should only be done "if necessary." This mid-summer mowing is not without risk to monarch populations, but it is likely to cause reduced mortality and may beneficially promote the growth of milkweed leaves that are more palatable to monarchs (Fischer et al. 2015; Haan and Landis 2020; MJV 2025). In a previous version of the MJV guidance, the suggested summer mowing dates varied with latitude and geography. The MJV recommended mowing between June 30 and July 10 in northern Illinois (north of the 40th parallel) and between July 1 and July 20 in southern Illinois (south of the 40th parallel). One benefit of the MJV recommendations for summer mowing was that they were less likely to cause harm to other major taxonomic groups of concern along roadsides, such as grassland birds and social bees. However, the suggested summer mowing windows are prohibitively short (12 days in most of Illinois) and are not realistic for organizations managing large areas. Note that very recently (2025) the MJV guidance was updated to follow ecoregions rather than the 40th parallel, and completely eliminates the summer mowing window for the ecoregions in northern Illinois. Alternatively, the Rights-of-Way as Habitat Working Group at the University of Illinois Chicago—the group that administers the Monarch CCAA—recently recommended that if the monarch becomes federally protected that the US Fish and Wildlife Service allow a single mowing event when monarchs may be present to allow for milkweed regeneration or extended bloom periods (Iris Caldwell, pers. comm., May 2025). Their recommendation is based on a series of recent articles that find benefits of early summer mowing for monarchs (e.g., Haan and Landis 2020).

The Midwestern state that most closely aligns their mowing timing with the original MJV recommendations is Ohio. Ohio DOT has split their mowing windows to the north and south of highway I-70, which closely matches the 40th parallel dividing line established in previous MJV recommendations. Areas south of I-70 can be mowed between July 1 and July 20, and areas north of I-70 can be mowed between June 30 and July 10. Like Ohio, Illinois is also intersected by two MJV zones but does not currently split the state into separate mowing windows. The roadside management specialist from Illinois District 3 supports establishing two mowing date ranges for northern and southern Illinois, though for a different reason, stating, "Changes should be made to the timing of mowing to reflect downstate and upstate growing seasons and/or appropriate times to control specific invasive species through mowing." Wisconsin DOT and Arkansas DOT have also set split mowing windows for northern, central, and southern counties, though the mowing dates for these regions do not align with MJV recommendations and likely have other motivations. Wisconsin DOT mowing timing was developed in coordination with the Wisconsin Department of Natural Resources to target invasive plant species "before they go to seed and during periods of low energy reserves" (Jennifer Gibson, pers. comm., June 2025; WisDOT 2022a).

Although the mowing dates in the Illinois policy do not align with some recommendations for monarch butterflies, they do well to protect grassland birds and many other taxa along roadsides. Additionally, the negative effects of concentrating mowing when monarch larvae are most numerous are largely ameliorated by the multi-year rotational mowing policy.

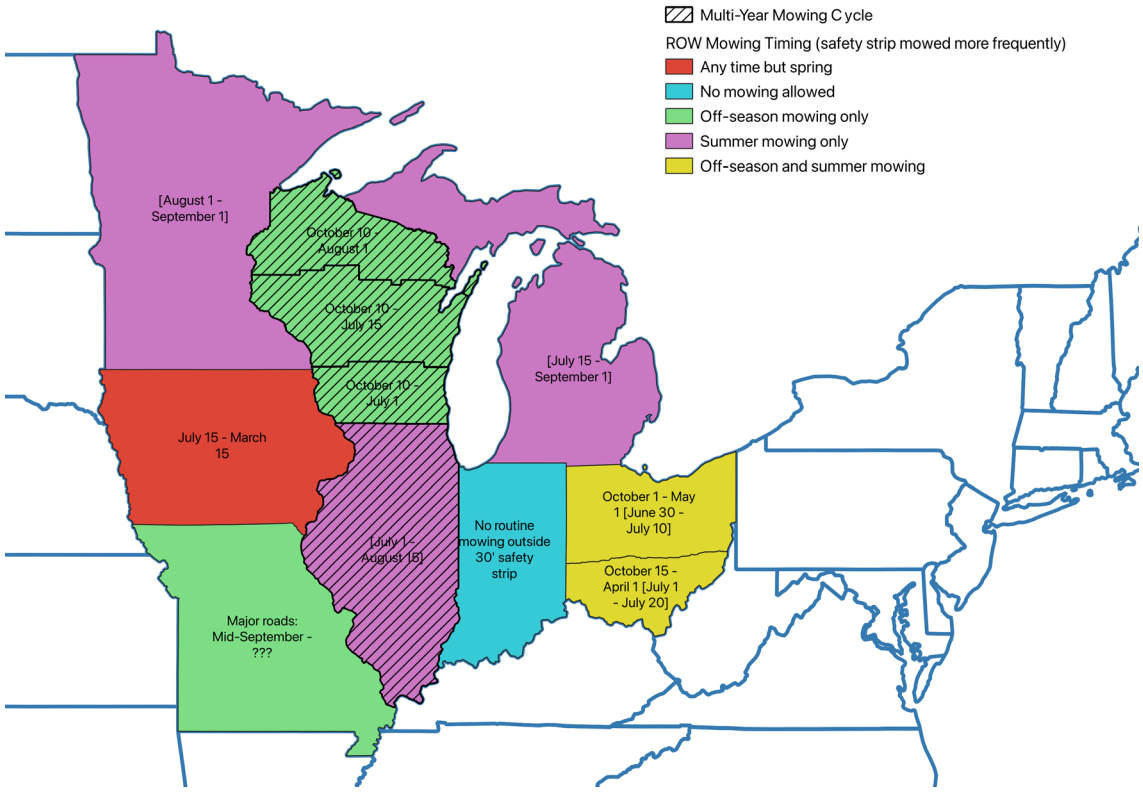

Figure 5. Map. Mowing windows for DOTs across the Midwestern United States. Mowing windows in brackets indicate summer mowing windows. Mowing in Missouri does not have a specific end date, though it usually is completed by December (Chistopher Shulse, pers. comm., June 2025).

Multi-Year Rotational Cycles

Beyond limiting the timing of mowing to protect sensitive species along roadsides, stakeholder groups, conservation organizations, and resource management professionals recommend only mowing certain parts of the ROW each year (e.g., MNDOT 2018). One approach to this is to mow ROW on a rotational multi-year cycle. Rotational mowing is especially beneficial to conservation along ROWs because it balances the maintenance of grassland habitat while reducing direct negative impacts on wildlife. The decision to implement rotational mowing involves fewer complications than when choosing the timing of mowing. Additionally, rotational mowing substantially reduces fuel consumption. Thus, we encourage IDOT to maintain the rotational mowing policy.

Illinois and Wisconsin are the only Midwest states that currently require a multi-year mowing cycle. In Illinois, each section of highway outside of safety strips is currently mowed once every 3–4 years (IDOT 2021a). Medians are mowed on year one, roadsides along westbound and southbound lanes are mowed on year two, roadsides along eastbound and southbound lanes are mowed on year three, and primary and unmarked routes are mowed on year four (note that a modification to this pattern was proposed in 2025, Scott Hall, pers. comm., March 2025). Wisconsin uses a three-year cycle. In other Midwestern states, annual ROW mowing is allowed, though some areas restrict mowing more than state law dictates. Polk County in Iowa avoids mowing the entire ROW during the growing season, and some roadside managers in Minnesota mow on two- or three-year cycles (Forsberg 2023).

In Illinois, a challenge with the current rotational multi-year mowing cycle is that areas that are missed for mowing one year may be unable to be mowed for several years, until the next mowing cycle. In District 4, portions of ROW have been missed due to planning challenges or other time-sensitive needs (Brittany Gavin, pers. comm., March 14, 2025). In District 3, challenges with receiving mowing exemptions for restricted mowing areas have caused areas with brush or invasive species to be unmowed, potentially harming the prairie remnants and T/E species that these restricted areas are meant to protect. IDOT mowing policies are being updated to encourage mowing missed areas after October 1, in coordination with the district roadside manager.

Areas with Selective Mowing

DOTs may choose to limit mowing around special areas within the ROW, including planned pollinator plantings, patches of remnant habitat, sensitive wetlands, and known occurrences of T/E species. In Wisconsin, for sites that have been assessed as high potential zones for endangered rusty patched bumble bee, operators have a restricted “second-pass” mowing window for brush and urban mowing between October 10 and March 15 (WisDOT 2024). Operators also must receive approval for non-mowing activities from the Bureau of Highway Maintenance. Indiana restricts mowing in ROW areas outside a 30’ safety strip, only ever managing these areas with spot mowing and spot herbicide treatments. A stakeholder group in Minnesota suggested permanently designating half of ROW area for permanent management using an IRVM approach, with the other half mowed and hayed with no restrictions. The Roadsides for Wildlife Program in Minnesota is a program of the MNDNR that designates areas of high-quality habitat in ROWs that should not be mowed. This program has no enforcement mechanisms and is voluntary.

A key challenge to managing areas of ROW that are not mowed is encroachment by invasive plants and brush (discussed further in the "Seeding" section). Communicating mowing limitations to roadside operations and maintenance staff is another key challenge in Illinois and at other DOTs. States may denote these areas using maps (printed or web based) or on-the-ground signage. Wisconsin and Ohio provide publicly available, interactive, web-hosted guidance maps to roadside managers.

In Illinois, county-specific mowing and herbicide restriction maps were printed and posted at section headquarters at the beginning of each field season. These maps were approved by the district operations engineer and forwarded to the Central Bureau of Operations (CBO) (IDOT 2021a) and were difficult to read and were impractical for field use (IDOT District 3 survey response). Pollinator plantings were not listed on these printed maps, leading to these sites being missed in the environmental review process and being mowed or otherwise disturbed (i.e., through soil dumping during construction projects) (IDOT District 3 survey response). Additionally, these maps were quickly out of date, and we understand that they have not been updated in years (Kimberly Burkwald, pers. comm., June 2025).

A GIS-based map of areas where mowing and herbicide use are limited exists and is (or may be soon) accessible to roadside managers in Illinois. These interactive GIS-based maps can be accessed using state-issued mobile phones or tablet computers. However, these devices are not available to operations workers because Illinois does not issue mobile phones or tablets to operations workers (IDOT District 3 survey response). These GIS-based maps are designed to withhold information about sensitive features present at a site (e.g., what kind of endangered species is present). District managers cannot edit GIS maps other than by adding pollinator areas and weeds/trees/brush, which is an additional challenge (IDOT District 3 survey response). Metal stakes are also placed around no-mow areas, though it is problematic that not all of these areas are signed in the field (IDOT District 3 survey response).

Exemptions for Limitations on Mowing

IDOT roadside managers may apply for mowing outside the state mowing windows through the SAVE (Strategically Applied Vegetation Exemption) mowing program (IDOT 2021a). SAVE mowing occurs in special cases when it is beneficial for conservation to mow during restricted times. SAVE mowing "promote[s] regrowth of pollinator plants, and may be used to help control brush and invasive trees on ROW as a part of a brush control plan. SAVE mowing has been approved by the USFWS for use in areas where the Rusty Patched Bumble Bee is known to occur." This approval process may be onerous for some roadside managers. One IDOT roadside management specialist commented that it is difficult to get approval for mowing outside the summer mowing window. He suggested that "changes should also be made to the work order process, allowing Districts more control/flexibility for controlling invasive species. Clarifications should be made for how to address brush infestations within 'restricted' areas during the four-year mowing cycle."

Mowing Invasive Species

Mowing can be an important tool for controlling populations of invasive plants. Mowing can also spread the seeds of invasive plants if timed improperly, both within sites and between sites. The IDOT

Maintenance Policy Manual §5-400 states that "mowing of noxious and other problem weeds can cause seeds to be spread to uninfested areas. If mowing of these locations is directed, the equipment shall be cleaned in accordance with 5-400.11." It should be noted, that in some cases mistimed mowing can encourage seeding within a site, in addition to spreading seed to new sites. In District 4, mower operators keep leaf blowers in the cabs of tractors, and staff blow off decks "prior to leaving an infield or area of teasle or other invasives that prolifically seed" (Brittany Gavin, pers. comm., March 14, 2025). Timing is a crucial component to limiting the spread of invasive species through mowing. IDOT currently does not place restrictions on the timing of mowing invasive species, though several districts do have their own standard practices for strategically timing the mowing of invasive species. IDOT District 4 does not encourage mowing teasel after it has gone to seed (Brittany Gavin, pers. comm., March 14, 2025). These areas are mowed before teasel has bolted, and herbicide is then applied. Roadside operators in District 4 are encouraged to mow common reed (*Phragmites australis*) after October 1 "pending it's dry enough" before putting areas with common reed present on a schedule to spot spray the following late spring (Brittany Gavin, pers. comm., March 14, 2025). Mowing timing strategies for common invasive species are discussed further in Chapter 4 of this report.

Mowing Heights

Most states mow the ROW to a minimum height of 6"–8". In Illinois, safety strips and the rest of the ROW both may be mowed to as short as 6". In Ohio, ROW outside the safety strip may be mowed to an 8"–10" minimum. In Michigan, grass is mowed in the summer and should regrow to 12" by September 1 (Geib 2012). The MJV and Xerces Society recommend a minimum cutting height of 10"–12" to control invasive plants while minimizing impacts to wildlife. The Xerces Society and the MJV also recommend that mowers utilize a flushing bar attachment and drive at slow speeds to allow wildlife to avoid mowers.

Mowing by Non-DOT Entities

In District 4, we learned from survey responses that adjacent property owners near highways have frequently mowed controlled-access highway ROWs without a permit. Some survey respondents from other states mentioned a similar challenge. The District 4 roadside manager desires conservation policies that apply to non-DOT entities that mow sections of highway ROW.

Table 12. Summary of Mowing Practices Across Select States

	Routinely mowed width	Routinely mowed height	ROW mow height	ROW mow window: spring	ROW mow window: summer	ROW mow window: fall	Other policies, exceptions
Illinois (IDOT 2021a)	"One pass" (15')	> 6"	> 6"	No spring mowing	July 1–Aug. 14	No fall mowing except in special cases	Mowing occurs on four-year cycle. Mowing outside summer mow window must be approved by CBO
Ohio (Ohio Department of Transportation n.d.)	30'	6"–8"	8"–10"	Finish before May 1 (north of I-70) or April 1 (south of I-70)	Begin after June 30 and finish before July 10 (north of I-70) or begin after July 1 and finish before July 20 (south of I-70)	Begin after Oct. 1 and finish before May 1 (north of I-70) or begin after Oct. 15 and finish before April 1 (south of I-70)	N/A
Minnesota (Minnesota Statute § 160.232; MNDOT 2016)	8'	Not defined	Managers refer to regional IRVM plan for minimum mowing heights	No spring mowing	Aug. 1 to Aug. 30	No fall mowing	May be mowed to height of at least 12" outside mowing window only for safety or establishment of permanent vegetative cover or for prairie vegetation management
Michigan (Geib 2012)	12'	Not defined	Vegetation should grow to 12" by Sept. 1	No spring mowing	July 16 to Aug. 31	No fall mowing	Mowing restricted in medians wider than 50'

TREE TRIMMING AND BRUSH CONTROL

DOTs control brush and trees along highway ROW primarily to maintain unobstructed site lines and to create clear zones for motorists to exit highways in case of emergencies (IDOT 2018; Federal Highway Administration 2023). Tree and brush control policies may target living plants that have encroached on the clear zone, trees that are diseased or damaged (e.g., by being struck by a vehicle), and dead trees that pose a hazard to motorists (IDOT 2018 5-600.1). Managers may also control woody vegetation for the purpose of aesthetic improvements or for conservation purposes (e.g., to prevent the succession of roadside grasslands into brush). Undesirable woody plants that IDOT targets for brush control are largely invasive woody species, including, but not limited to, multiflora rose, buckthorn, and autumn olive (IDOT 2018 5-600.1.2). With the new Exotic Weeds Act going into effect soon in Illinois, it may be advisable to expand control efforts to other invasive woody species such as Callery pear (*Pyrus calleryana*), tree of heaven (*Ailanthus altissima*), and winter creeper (*Euonymous fortunei*).

Woody species control was a common practice across DOTs and contexts, being of similar frequency to some of the other common management strategies. In fact, all but one IDOT respondent listed it as occurring within their district, and about 80% of other respondents always or sometimes conduct woody species control. Survey respondents generally had favorable opinions on the completeness and flexibility of policies and practices related to tree trimming and brush control. Perhaps the most obvious reason these practices are so common is because some vegetation near or on roadsides (namely, forested SMAs, see Table 6) are inhabited or encroached by woody species. Otherwise, benign or beneficial woody species can even invade open sites, such as roadside prairies (e.g., Handel 2003), warranting control to maintain favorable natural conditions. Another reason tree trimming and brush control is so common is because the practice intergrades with invasive species management. Several of the most problematic invasive species along roadsides are large shrubs or small trees, specifically autumn olive (*Elaeagnus umbellata*), bush honeysuckle (*Lonicera* spp.), or buckthorn (*Rhamnus cathartica*). These species, while not listed as being the most common invasive species overall, were nonetheless quite frequently listed when we asked respondents about particular invasive plant species they encounter.

Tree and brush trimming and removal can harm nesting birds and bats. As such, state DOTs take measures to reduce the likelihood that tree/brush control will result in the incidental “take” of endangered bird and bat species, which is prohibited under the Migratory Bird Treaty Act of 1918, the Bald and Golden Eagle Protection Act of 1940, and the Endangered Species Act of 1973. In Illinois, the Illinois Endangered Species Protection Act also regulates the take of state-listed species.

Survey respondents indicated that the most common approach to limiting adverse impacts to nesting animals is to restrict the timing of brush control and tree trimming/removal to times of the year when target species are not nesting in trees. In Illinois, woody plants may not be removed between April 1 and September 30. This policy primarily targets the northern long-eared bat (*Myotis septentrionalis*; NLEB) and the Indiana bat (*Myotis sodalis*), which are known to roost (April 1–September 30) and pup (May 15–July 31) during this period (IDOT 2018 5-600.2; USFWS 2024b). Most Midwestern state DOTs permit brush control and tree removal during a window similar to Illinois’ (October 1 to March 31) (see Table 13). Michigan restricts brush cutting/mowing only between March 1 and July 15, but

MDOT only allows 50% of roadsides to be managed for brush control annually (Michigan Act 174 1999).

Table 13. Summary of Tree and Brush Cutting Across Select States

State	Tree and Brush Removal Allowed
Illinois	October 1 to March 31 (IDOT 2018)
Minnesota	September 1 to April 14 (Beer 2024)
Wisconsin	November 1 to April 14 within the FWS-defined range of the NLEB and TCB (Jennifer Gibson, pers. comm., June 2025). No timing restriction outside the range area, though generally encouraged to wait until the NLEB dormant period (WisDOT 2022b).
Michigan	October 1 to March 31 within the range of the NLEB and Indiana bat; no timing restriction for tree removal in areas outside the Indiana bat range (MIDOT 2022).
Iowa	October 1 to March 31 (Iowa Department of Transportation 2015)
Missouri	November through mid-March (MODOT 2014)
Indiana	October 1 to April 1 (INDOT Division of Maintenance 2024)
Ohio	October 1 to March 31 (Ohio Department of Transportation 2024)

Tree trimming/pruning for the purpose of safety or for the benefit of other plant species can occur in Illinois at any time, though the use of certain equipment (e.g., boom mowers) is not allowed (IDOT 2023). Other states also tend not to restrict the timing of tree trimming/pruning. Indiana DOT has no firm restrictions on tree trimming timing, though it encourages operators to trim trees January to March to reduce stress on trees (INDOT 2024). Minnesota DOT requires operators to inspect branches for occupied bird nests or hollows that may be used for bird or bat nesting before trimming trees (Beer 2024).

Due to ongoing declines to NLEB (*Myotis septentrionalis*) due to white nose syndrome, the species was reclassified in 2023 from threatened to endangered by USFWS (Endangered Species Status for Northern Long-Eared Bat 2022). As a result of NLEB being reclassified from threatened to endangered, restrictions on tree clearing near NLEB hibernacula and maternity roost trees that were specified in the threatened NLEB 4(d) Rule were replaced by final consultation guidance published on October 23, 2024 (USFWS 2024a). The final consultation guidance provides recommended actions for projects that may impact the NLEB and the tri-colored bat (*Perimyotis subflavus*; TCB), which is a proposed endangered species. The final guidance gives different directions for actions that may result in the incidental take of NLEB or TCB, depending on whether an action is federally funded (USFWS 2024a). Projects that have received federal funding or permits must consult with USFWS if the project is likely to result in the incidental take of NLEB, as specified by the ESA Section 7(a)(2) (USFWS 2024a). Non-federal projects still may not harm or harass NLEB, but pursuing an incidental take permit under Section 10(a)(1)(B) of the ESA is voluntary in these situations.

Current IDOT policies on tree removal are in keeping with the final consultation guidance on NLEB. IDOT requires that roadside managers submit an environmental survey request (ESR) to the IDOT Bureau of Design and Environment for federally funded tree-removal activities. The Bureau of Design

and Environment will then determine whether coordination with USFWS is necessary for the project (IDOT Bat Memorandum, n.d.). IDOT requires that non-federally-funded projects occurring during the April 1 to September 30 date restriction must also submit an ESR if they will occur within 0.5 miles of Indiana bat or NLEB records contained in the Natural Heritage Database (IDOT Bat Memorandum, n.d.).

The tri-colored bat was classified as proposed endangered when the NLEB was listed as endangered. Current IDOT brush control policies do not mention the TCB, though the species' "consultation area" includes much of southern Illinois and parts of northern Illinois (IDOT 2018 5-600.2; USFWS 2024a). If the TCB becomes listed, it will receive the same ESA protection as the NLEB. Furthermore, additional bat species are likely to be listed as endangered in the near future (Beer 2024).

We identified two species of T/E birds that occur within our 0.25-mile highway buffer distance and that are known to nest in brush: the loggerhead shrike (*Lanius ludovicianus*) and black-billed cuckoo (*Coccyzus erythropthalmus*) (Wendy Schelsky, pers. comm., March 25, 2025). Though IDOT brush control policies do not mention these species, these species lay eggs within the restricted brush removal window (April 1 and September 30) and, thus, are unlikely to be affected by off-season brush removal activities (Deeble 2025; Soule 2025).

Bald eagles (*Haliaeetus leucocephalus*) are another avian species that may be affected by tree removal activities. Forest management activities that occur within 660 feet of a bald eagle nest are regulated under the Bald and Golden Eagle Protection Act and require a general permit from USFWS (Permits for Incidental Take of Eagles and Eagle Nests 2024).

SEEDING

Native plant seeding and mulching are frequent practices associated with IRVM and BMPs. Both practices can reduce invasive species and promote wildlife habitat. For this section, however, we primarily focus on native plant seeding. Native seeding was reported as being a nearly universal conservation activity across all out-of-state survey participants; native seeding and pollinator habitat management are assuredly interconnected conservation practices. Respondents in both Illinois and other states reported positive opinions of seeding policy completeness and flexibility.

Out-of-state survey responders mentioned some challenges regarding native seed planting several times. These included funding and the poor availability of native plant materials (namely, seed mixes)—a well-known difficulty of ecological restoration. Native seed mixes were also reported to establish slowly. Slow or poor establishment of native species can be due to contexts such as poor climate at the planting time, the life histories of native species, or germination requirements. While native seed mixes provide benefits for wildlife conservation, native grass and wildflower mixes may have slower growth rates than fast-growing non-native grass mixes due to their deep root systems and slower germination. An IDOT technical report suggests native grasses and wildflowers take 3 to 5 years after planting to show visually appealing results (IDOT 2022b). Likewise, relative to traditional mixes, successful establishment may be more contingent upon planting time (or in other words, more susceptible to timing difficulties). Other challenges included competition and interference of invasive species—especially when slow establishment is considered, acceptance of native plantings, and

likewise skepticism and/or interference from other roadside stakeholders. However, a recent report developed and tested native seed mixes meant to replace commonly used IDOT seed mixes that rely heavily on introduced grass species, with promising results regarding the early stages of establishment (Bollinger et al. 2025).

A challenge for areas that are seeded or planted with native plants is the follow-up maintenance that they require (District 2). One challenge of managing areas that are seeded or planted with native species is encroachment by invasive plant species. Respondents from IDOT District 1 and District 3 both mentioned this as a challenge in their survey responses. Due to this challenge, District 3 would prefer an approach of planting native grasses across all ROWs, rather than creating and maintaining certain areas with native forbs. Grasses can be mowed frequently—unlike forbs, which are more sensitive to mowing—limiting the encroachment of broadleaf invasive species. Native grasses are drought tolerant and provide high-quality habitat for wildlife, though native grass seed mixes tend to be more expensive than standard grass mixes (Forsberg 2023).

Several IDOT and out-of-state survey participants shared additional information regarding native seed mixes. Table 14 summarizes pertinent details. Standard specifications documents and/or construction manuals incorporate reference of native seed mixes in roadside management, which detail site preparation prior to seeding, equipment, accepted seeding practices (e.g., planting dates), protocols for erosion control, and describing the process of seed sourcing and certification. Some also specify and detail the contents of standard seed mixes for DOT uses depending on planting context. Often the mixes only incorporate non-native cool season grasses. However, all states describe one or more native seed mixes, at least for some planting contexts. The Minnesota Department of Transportation (MNDOT) in particular incorporates native seed mixes in many situations and explicitly emphasizes biodiversity of native plants as a core pillar of their seeding doctrine. MNDOT seeding policies also might deserve special attention from IDOT because several native mixtures may be used at a single roadway (e.g., using a non-native mix, native wetland, and native prairie mix across the roadside gradient). Some notable differences between IDOT and other state DOTs include the lack of reference to the use of local seeds, which was present in Minnesota, Missouri, and Wisconsin. However, according to the IDOT specification book (IDOT 2016), ecotypes or seed locality are not mentioned as standards for seed materials—with the exception of the listed origins being accurate. Moreover, several IDOT native mixes were described, more than several other states, including native grass, forb, and emergent wetland communities.

Table 14. Native Seeding Practices for Select DOTs Based on Policies Published in Specifications or Seeding Manuals

State	Detailed native seed mixes	Native grass mixtures	Wildflower mixtures	Other native mixtures	Seed requirements	Seeding windows for natives	Regionalized seed mixes	Local ecotype seed preferences or requirements
Illinois (IDOT 2016)	Yes	Yes	Yes	Yes	Purity > 90%	Varies by region Districts 1–6: April 1–June 15; Aug. 1–Nov. 1. Districts 7–9 Mar. 1–June 1; Aug. 1 to Nov. 15	Yes	None described
Arkansas (ASHTD 2014)	Yes	No	Yes	No	98/95% purity (depending on mix type)	None—year-round	No	None described
Indiana (INDOT 2024)	Yes	No	No	Yes	Generally > 75% purity and > 85% germination	Generally Aug. 15–May 1	No	None described
Michigan (MIDOT 2020)	*Some-what	*Some-what	No	No	Generally > 85% purity and > 85% germination	Varies by region Upper Peninsula: May 1–Sep. 20 Northern Michigan: May 1–Oct. 10 Southern Michigan: April 15–Oct. 10 After Nov. 1 or 15 for dormant seeding	No	None described
Minnesota (MNDOT 2024)	Yes	Yes	Yes	Yes	Implied but not described	April 15–July 20; Sep. 20–Oct. 20	Yes	Yes: exceptions for nearby states; guidelines given for sourcing mix and project distance

State	Detailed native seed mixes	Native grass mixtures	Wildflower mixtures	Other native mixtures	Seed requirements	Seeding windows for natives	Regionalized seed mixes	Local ecotype seed preferences or requirements
Missouri (MODOT 2024)	Yes	Yes	Yes	No	Generally > 85% purity	Oct. 15–April 15	Yes	Yes: exceptions if unavailable
Wisconsin (WisDOT 2024)	Yes	Yes	Yes	No	Generally > 90% purity and > 85% germination	Oct. 15–June 15 for some native mixes	No	Yes: exceptions for wild sources but not improved varieties and restricted to certain adjacent states

*Native mixes were not described in MIDOT (2020), but additional online documents suggest they are a part of MIDOT policy.

Native seed mixes used by DOTs tend to be relatively poor in species diversity compared to natural areas and consist of "workhorse" species that are fairly easy to establish and affordable relative to other native species (Zinnen and Matthews 2022). With respect to roadside management in Illinois, using native seed mixes of a select group of reliable species is an important component to a broad strategy. Native seed mixes control erosion, promote wildlife habitat, reduce management needs—especially for limiting invasive species, and can achieve basic functional characteristics of natural areas. IDOT managers may benefit from the gradual replacement of non-native species with natives in some situations. Alternatively, future seed mixes might incorporate more native species into more traditional roadside cool season mixtures for functional complementarity and biodiversity (e.g., Bollinger et al. 2025). Some states, like Missouri, already utilize such mixes. However, one factor to consider in IRVM is the limited utilization of native seed mixes of nonlocal ecotype near some SMAs (e.g., Illinois Nature Preserves), since there is a possibility of genetic swamping of local population genetics of some natural areas. Additional research may be needed to optimize the establishment of native mixes in field settings. Future IDOT research could investigate native seeding policies or supply given its importance in wildlife habitat and environmental benefits within IRVM.

PRESCRIBED BURNING

Prescribed burning may be a special BMP for some SMA situations—particularly fire-adapted ecosystems like tallgrass prairies. Prescribed burns yield several benefits to plant communities that range from removing dead biomass, promoting healthy competition among plants, reducing woody encroachment or other invasive species, and the promotion of nutrient cycling. Mowing or brush cutting with equipment can accomplish some of these benefits—namely, limiting woody encroachment. However, for particularly sensitive SMAs, burning regimes may be necessary to best maintain the desirable ecological conditions. Nonetheless, prescribed fire was an uncommon management practice, both in Illinois and the other states. The status of prescribed burning within Illinois is especially limited. District 3 is in the process of implementing new burns, and District 1 "rarely implements" prescribed burning. For out-of-state respondents, prescribed burns were the rarest conservation activity listed, with over 70% of respondents declaring that burns are not used. Prescribed fires were the rarest strategy for controlling problematic invasive species. Moreover,

relative to other conservation activities, most respondents were unsure regarding the completeness and flexibility of burning policies.

Several challenges were listed as barriers to the implementation of fire. One challenge explicitly or implicitly described was safety concerns. Smoke management may be problematic in some areas, particularly in urban areas or those with high traffic. In fact, one IDOT district roadside management specialist wrote that "burning had not been conducted in District 3 since the 1990s apparently due to a smoke incident that occurred back then [emphasis ours]." Similar to other conservation practices and BMPs, staffing and manpower issues were notably common among respondents. The successful usage of prescribed fire is also incredibly weather dependent. Burning windows already consist of a portion of the year, and improper wind, humidity, or precipitation/drought conditions can all contribute to delays or cancellations. Three respondents (IDOT, MODOT and MNDOT) mentioned institutional approval as an additional barrier. For implementing prescribed burns, external partnerships, utilizing the knowledge of internal coordinators and/or experts, proper training, and access to fire equipment, were successful factors that were listed multiple times.

Two respondents from the Minnesota and Wisconsin DOTs included additional details regarding prescribed fire policies (MNDNR 2024; WI-BHM 2024). Both states had generally similar burn statewide policies. These documents centered around burn planning, role delineation and training, permitting, and safety practices. Burn plans are the lynchpin document in both states for executing prescribed burns. Burn plans are written templates that incorporate burn unit attributes, describe safety plans and considerations, and list desired objectives. In Wisconsin, mandated permits from the Wisconsin DNR are county specific, with some counties requiring permits. In both states, state and local laws (e.g., ordinances) must be followed when conducting DOT-prescribed fires.

Complexity ratings are described by both state DOTs and incorporated in burn plans: calculators that use site attributes to estimate a degree of proficiency needed by a "burn boss" (the person responsible for safe, law-abiding, and effective execution of the burn). Sources for complexity ratings include The Nature Conservancy for Wisconsin and the National Wildfire Coordinating Group for both states. Minnesota lists tiers of burn bosses based on relevant experience and training. For the documents we received regarding Minnesota, burn plans are reviewed and approved by the Minnesota Department of Natural Resources (MNDNR): ultimate authority varies depending on the DNR division. However, for MNDOT burns, the handbook states a "permit is not required [when burning MNDOT ROW]" (MNDNR 2024). The handbook states that the road regulation supervisor in MNDOT should be contacted prior to a burn. Additional safety considerations for MNDOT ROW included standardized road signage and other policies detailed by the *Minnesota Temporary Traffic Control Field Manual*. Of special relevance to ROW management was the Natural Heritage Information System screening tool in Minnesota. Bosses must include this tool in the written plan to ensure the protection of T/E species. Burn bosses are required to get permission from regional ecologists within the MNDNR when T/E species are present. Several of these states' policies are similar to the Illinois Prescribed Burning Act. The Act mandates a "written plan" for a prescribed burn. Generally, prescribed burning is an involved management practice that may be best reserved for the highest quality natural areas owned by IDOT. Prescribed burns present special permitting and safety

challenges—they also can pose threats to other sensitive biological resources (e.g., T/E). Additional study and clarification on fire policies may be warranted for the best utilization of this technique.

HERBICIDE USE

Herbicides are an important tool that DOTs use to manage roadside vegetation. Herbicides may be applied to plants in a variety of manners, including broadcast spraying from a vehicle-mounted sprayer (e.g., a boom apparatus), hand wicking, foliar spraying, basal spraying, and spot spraying of stumps. Vehicle-mounted sprayers can quickly treat large areas with herbicides, but this herbicide application targets species indiscriminately. Other methods allow for more targeted application. The most careful approach is to apply herbicides by hand via hand wicking or cotton glove application. This strategy should be considered in areas where threatened or endangered species are known to occur. Foliar spraying involves applying herbicide to the leaves of a target plant, where the herbicide is then absorbed into the plant's tissues. Herbicides can also be applied to the base of plants, either while the plant is standing or to a stump after the plant has been cut. Different herbicide chemicals and brand formulations are appropriate for different application strategies (INDOT survey response). Different chemicals may also be appropriate for different classes of vegetation (e.g., broadleaf-selective, grass-selective, and non-selective) and proximity to open water (for example, Rodeo is a formulation of glyphosate that can be safely used in aquatic areas).

Herbicide use can have adverse effects to native communities, and proper planning is essential to minimize these effects. Habitat loss due to herbicide use is a key threat to monarch butterflies (Cardno Inc. 2020). Herbicide use can harm non-target species, leading some survey respondents to limit herbicide use in sensitive habitats, near endangered plants, and near areas with native forbs (Webster County Iowa survey response; NJDOT survey response). Much like mowing, DOTs may restrict the timing, location, and practices associated with herbicide spraying to achieve conservation goals.

IDOT places several restrictions on the use of herbicides. Herbicides cannot be applied when wind speeds are greater than 10 to 15 mph, and they cannot be applied over waterways (Stevens 2010). IDOT historically provided mowing and herbicide "restriction" maps that indicated INAI sites, nature preserves, and EOs that are within or near the highway ROW (Stevens 2010). Future planning tools for operations are being developed that would allow managers to interact with information on various SMAs to determine appropriate herbicide application measures; however, when spraying must occur near INAI sites or nature preserves due to an infestation of an invasive or noxious plant, this action should be coordinated with the IDOT district environmental coordinator and the IDNR district heritage biologist. When spraying must occur near EOs due to an infestation of an invasive or noxious plant, managers must spot spray plants rather than using a vehicle-mounted sprayer to avoid herbicides drifting onto non-target species. The timing of herbicide application in Illinois is regulated by IDOT's compliance with the Monarch CCAA, outlined in the next paragraph.

The IDOT *Maintenance Policy Manual* specifies that chemical control measures should target specific, pre-planned targets "rather than a broad, general application" (IDOT 1999). Illinois roadside managers are generally encouraged to avoid broadcast spraying of herbicides (Brian Shull, pers.

comm., March 19, 2025). If broadcast spraying does occur, the IDOT CBO recently provided guidance to roadside managers that no broadcast spraying of herbicides should occur between May 15 and October 1 (IDOT District 3 survey response). Accordingly, Illinois District 2 does not broadcast spray between May 15 and October 1, and Illinois District 4 does not broadcast spray between May 1 and October 1 (Brittany Gavin, pers. comm., March 14, 2025; Paul Spangler, pers. comm., March 17, 2025). Under recent Monarch CCAA commitments, foliar spraying is limited in Illinois to April 1 through October 15 (IDOT Pollinator-Friendly Practices Plan: Appendix C). Basal spraying and cut-stump spraying may occur year-round (IDOT Pollinator-Friendly Practices Plan: Appendix C).

Other states take varying approaches to broadcast herbicide spraying. Ohio DOT does not allow full-width broadcast spraying of the ROW (survey response). Arkansas only allows broadcast spraying outside the growing season or in a "period (5-10 days) after a mowing cycle in June or July" (Arkansas DOT 2018). However, Arkansas does not allow any herbicide use near publicly owned conservation areas, such as federal lands, wildlife management areas, and state parks (Arkansas DOT survey response).

Wisconsin DOT allows adjacent property owners to request that a no-spray area be established on ROW near their property. The property owners enter an agreement with Wisconsin DOT that the property owner will maintain the ROW to minimum standards, otherwise regular maintenance activities (including spraying) will resume (WisDOT 2015).

Herbicide application is a key approach to controlling populations of invasive ROW plant species. The IDOT Roadside Pollinator Plan sets a goal of expanding the use of targeted herbicide treatment to control invasive species. Mowing may spread the seeds of invasive plants, and as such, herbicide treatment (and biological control) is IDOT's "preferred alternative" to controlling invasive plant populations (IDOT 2021a). The INPC provides guidance on the specific timing, chemicals, and strategies that are most appropriate for most major invasive plants in Illinois. See the INPC Vegetation Management Guidelines and Herbicide Reference Tool for complete invasive plant management recommendations (INPC n.d.).

IDOT roadside managers shared that there are not enough roadside operators that are licensed herbicide applicators to sufficiently control invasive plant species (District 3 survey response). IDOT maintenance staff are currently not required to receive herbicide application licenses, which means that many local maintenance yards do not have the capacity to do in-house herbicide application (District 3 survey response). Ohio DOT reports struggling to find and retain herbicide applicators, though it is unclear whether this is for similar reasons to Illinois. One solution that was shared was to rely more on private contracting and intergovernmental agreements with state agencies (District 3 survey response). The Texas Department of Transportation invests heavily in herbicide applicator training. They train and licenses 1,100 herbicide applicators a year (survey response).

Insecticides are rarely used by DOTs, and when used, are typically limited to special situations. In Illinois District 4, insecticides have been used on pest outbreaks on ornamental plantings. As part of IDOT's participation in the Monarch CCAA, IDOT has discontinued the use of insecticides (IDOT Pollinator-Friendly Practices Plan: Appendix C). In Michigan, insecticide has been used in limited cases

to control infestations by spongy moths (*Lymantria dispar* and related groups) (Kelsey Alvarado, pers. comm., Jan. 24, 2025).

INVASIVE SPECIES MANAGEMENT

Respondents from Illinois and other state DOTs rated invasive species management as the most significant challenge. Invasive species management rated higher than challenges like woody plant encroachment or challenges related to mowing. Invasive species management is often cited as a predicate for other conservation goals, like native species survival in pollinator habitat management (IDOT District 7 survey response). Concerningly, IDOT respondents had mixed confidence in operation workers' abilities to identify and differentiate plant species. The IDOT respondent from District 3 expressed a desire for additional resources for the identification of invasive plants.

In Illinois, the 2021 Maintenance Policy Manual (§5-400 Mowing) specifies that areas with invasive or noxious weeds should be treated with herbicide or biological controls rather than be mowed, when possible (IDOT 2021a). If mowing is necessary, mowers and tractors should be swept clean after mowing each patch of problem weeds. Other states are generally in agreement with this cautious approach to mowing invasive species. The Missouri Department of Transportation (MODOT, 2017) specifies that mowers should be "regularly cleaned to eliminate the spread of weeds, especially if mowing problem or noxious weeds." Brad Bolduan from the MNDNR suggests that roadside operators should clean equipment for seeds at frequent checkpoints, such as each time they cross a road (Brad Bolduan, pers. comm., Feb. 19, 2025).

Spot spraying and broadcast spraying are primary approaches to controlling invasive species. Illinois District 4 spot sprays invasive species outside the flower nectar windows listed in the Monarch CCAA. Spot herbicide treatment of *Phragmites* typically occurs in June, or when plants reach 18" tall. In Illinois District 4, brush removal typically begins after September 30 (due to brush removal restrictions focused on T/E bats), and herbicide is applied to stumps before or after brush is removed to cull invasive species. This district primarily targets bush honeysuckle and Russian/autumn olive using this approach.

A major challenge to invasive species management that was mentioned by survey respondents from Illinois and other states was a lack of personnel to sufficiently control invasive species. One respondent suggested increasing the number of current maintenance staff who are licensed herbicide applicators (IDOT District 3 survey response). As an alternative to in-house staff, some states have successfully controlled invasive species through external contract workers (INDOT survey response). If Illinois followed such an approach, one survey respondent suggests that IDOT contractors should have at least one staff member on site who is a "Certified Ecological Restoration Practitioner" through the Society for Ecological Restoration (IDOT District 3 survey response).

IDOT should also prepare procedures for the establishment and spread of new invasive plant species beyond those listed here. One example of a rapidly spreading recent invader is creeping foxtail (*Alopecurus arundinaceus*) in southern Minnesota ROWs. We have heard that land managers are "amazed how often [they] encounter this species which was poorly documented just a few years ago" (Brad Bolduan, pers. comm., Feb. 19, 2025). When new invasive species become established in

Illinois, having a plan in place for evaluating and quickly responding would help IDOT proactively manage ROWs when species are first detected.

SPECIAL MANAGEMENT AREAS

Endangered Species

Communication between a DOT environmental division and road maintainers is key to minimizing ROW management impacts on threatened and endangered bat populations. For instance, Arkansas cites poor communication between their Environmental Division and road maintainers about woody plant management planning and timing as a challenge to successful bat impact avoidance. In Illinois, roadside managers coordinate with the Bureau of Design and Environment in areas where T/E species are present for timing and impact minimization strategies of vegetation management activities.

Partnerships and Managing Adjacent Features

Management collaborations with outside organizations that own or manage adjacent lands can provide expertise, resources, or reduced workload for IDOT stakeholders. Moreover, some adjacent landowners can impede management objectives. Some survey responses gave specific examples where adjacent landowner actions impeded DOT vegetation management objectives (e.g., harming a pollinator planting, being reservoirs of invasive species). Communication with problematic landowners could be a useful tool for reducing harm to vegetation on IDOT property. Overall, working with adjacent landowners and land managers could be a useful tool for improving conservation outcomes efficiently. A respondent from Michigan shared that they have a permit-based process for adjacent landowners to manage invasive species within the ROW (Michigan DOT survey response).

Responses from IDOT suggested that partnerships were lacking. Only three out of nine districts reported partnerships from outside organizations. This was in stark contrast to the other states surveyed, where a substantial majority (12 of 14 respondents) of other DOT stakeholders stated that partnerships were available. Nonetheless, many out-of-state respondents claimed they desired additional collaborations with other stakeholders. Across other states, respondents occasionally noted that partnerships with other people or organizations (e.g., DNRs) helped with successfully implementing desired management objectives (e.g., native seeding, prescribed fire, invasive species control). When asked directly about establishing partnerships, respondents had a variety of experiences, noting mixed successes and challenges. Some DOTs noted a difficulty in finding suitable partners or maintaining collaborative capabilities over long periods. The Minnesota DOT and Ohio DOT noted especially positive successes among their organizations. Minnesota DOT has partnered with the MNDNR to avoid impacts to T/E species as well as seed producers for a quality assurance program. A respondent from Ohio wrote they had successfully partnered with a variety of stakeholders, including state and federal organizations and even corporations. This suggests a diverse pool of potential collaborators can be considered when managing SMAs.

Collaborations may be best suited for ROW or IDOT properties with substantial conservation value. Other conservation organizations may be excellent stakeholders to contact to assist with management of special biological resources managed by IDOT. For example, Twelve-Mile Prairie in southern Illinois is co-managed by a collaboration between IDOT and IDNR. Other locations may also

be considered, but we generally agree with a respondent to keep expectations modest for partners due to the logistical demands of IDOT work. Two examples of successful partnerships of DOTs with outside organizations are Shooting Star Prairie in Minnesota and the Lighthouse Road spawning area in Delaware. These might be considered "crown jewel" examples of successful collaborations that yield positive environmental benefits.

Shooting Star Prairie is a scientific and natural area that occurs along a 0.7-mile-long portion of state highway 56 in South Central Minnesota. The site is managed in tandem with MNDNR. MNDOT handles prairie management on the portion of Shooting Star Prairie that is on their property, and MNDNR does the same on their portion of the property. A survey respondent noted that the portion of Shooting Star Prairie that is in the ROW is in good condition. There are some differences in management on the two sides of the property line. MNDOT occasionally mows the prairie during the dormant season for brush control, which MNDNR has not historically done. MNDNR relies on hand cutting woody plants during the growing season, though they may start doing dormant season mowing, including exploring potential collaboration with MNDOT to mow both ownerships at the same time. Some collaborations like this already exist. MNDNR will conduct weed removal on the MNDOT side for problem invasive plants (specifically wild parsnip, bird's-foot trefoil, and one instance of Queen Anne's lace), and prescribed burning that MNDNR conducts will often cover the entire width of the site. MNDOT also conducts prescribed burns and is in the process of expanding their established burn crews.

The Delaware Department of Transportation (DelDOT) Division of Maintenance and Operations has a formal memorandum of understanding with Delaware's DNR and Environmental Control (DNREC), Division of Fish and Wildlife for restricted mowing along Lighthouse Road in Milford, Delaware. DNREC notified DelDOT that this roadside is a spawning location for horseshoe crabs (*Limulus polyphemus*) and a key stopover point for migrating marsh birds, including the federally endangered red knot (C*alidris canutus rufa*). As such, DelDOT and DNREC entered a memorandum of understanding that prohibits mowing along this roadside between May 1 and September 1. In addition, mowing in the month of April requires three days of advance notice so that DNREC may relocate horseshoe crabs that are present in the roadside ROW.

We are aware that similar coordination has occurred elsewhere, such as in Ohio with the Ohio Pollinator Initiative. This was a multi-layered collaboration between Ohio DOT and the Ohio Field Office of USFWS. Additionally, a respondent from the Ohio DOT has found strong benefits from working with external partner groups, stating that, "corporations, communities, conservation groups, state and federal agencies, and more have grown our [partnerships] program and taken establishment and maintenance responsibilities off our to-do list" (Joel Hunt, Ohio DOT survey response).

Potential Partnerships for IDOT

We identified 66 nongovernmental organizations that own or manage SMAs with 0.25 miles of IDOT-managed roadways. These organizations represent potential partnerships for IDOT to pursue. Nearby land managers could benefit from managing sections of ROW to buffer or connect high-quality habitats they already manage. We present a list of organizations, with counts of properties by IDOT district (Table 15).

Table 15. Nongovernmental Organizations That Own or Manage Land Near IDOT Roads

Organization	Total	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	District 9
Great Rivers Land Trust	28						1		27	
Openlands	24	17	7							
The Land Conservancy of McHenry County	24	24								
Pheasants Forever and Quail Forever	18									18
Lake Forest Open Lands Association	14	14								
The Conservation Foundation	13	5		8						
HeartLands Conservancy	12								12	
Natural Land Institute	12		11	1						
Barrington Area Conservation Trust	9	9								
Saint Clair County Greenspace Foundation	9								9	
The Nature Conservancy	9	7			2					
Citizens for Conservation	8	8								
Illinois Audubon Society	6		2				2		2	
Jo Daviess Conservation Foundation	6		6							
Lake Bluff Open Lands Association	6	6								
Prairie Land Conservancy	5				4		1			
Grand Prairie Friends	4					1		3		
Parks and Conservation Foundation	4		4							
Ballard Family Nature Center	3		1					2		
Forest Park Foundation	4				4					
Highland Park Historical Society	3	3								
Logan County Park and Trails Foundation	3						3			
ParkLands Foundation	3					3				

Organization	Total	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	District 9
Sugar Grove Foundation	3					3				
The Nature Institute	3								3	
Douglas-Hart Foundation	2							2		
Friends of the Sangamon Valley	2						2			
Friends of Wildlife Prairie Park	2				2					
Green Earth	2									2
Jane Addamsland Park Foundation	3		3							
Land Conservancy of Lake County	2	2								
Smeja Family Foundation	2		2							
The Conservation Fund	2	2								
The Prairie Enthusiasts	2		2							
The Wetlands Initiative	2				2					
Augustana College	1		1							
Aull Nature Preserve	1	1								
Brookville Cemetery Association	1		1							
Campton Historic Agricultural Lands	1	1								
Ducks Unlimited	1									1
Franklin Creek Conservation Association	1		1							
Friends of the Kankakee	1			1						
Funks Grove Cemetery Association	1					1				
Girl Scouts of Whispering Oaks	1			1						
Hybernia Associates Limited Partnership, Hybernia Homeowners' Association	1	1								
Illinois - Michigan Canal Natural Heritage Corridor Civic C	1	1								
Karst Conservancy of Illinois	2								2	

Organization	Total	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	District 9
Liberty Prairie	1	1								
Max McGraw Wildlife Foundation	1	1								
Middle Rock Conservation Partners	1		1							
Morton Arboretum	1	1								
Ogle Natural Areas Alliance	1		1							
New Crystal Lake Club	1				1					
The Nature Conservancy & Grand Prairie Friends	1			1						
Patton Township Cemetery Association	1			1						
Pheasants Forever	1				1					
Rock Island Conservation Club	1		1							
Smeja Homestead Foundation	1		1							
Spring Grove Cemetery Association	1				1					
Sugar Grove Foundation, Parklands Foundation	1					1				
The Archaeological Conservancy	1								1	
The Citizens for Conservation, Citizens for Conservation of Barrington Inc.	1	1								
Wetlands Research Inc.	1	1								

CHAPTER 4: FRAMEWORK FOR BEST MANAGEMENT PRACTICES

HOLISTIC RECOMMENDATIONS

On a practical level, one of the most pressing and consistent challenges across stakeholders was invasive species management. Controlling invasive species is an unfortunate reality of roadside managers. Managing them is already laborious, but can be further complicated when choosing control means, properly dealing with some of the most problematic species' ecologies (e.g., mowing times for *Dipsacus* spp.), or encountering special contexts (e.g., wetland ecosystems or T/E plant species). We suggest that in addition to control, prevention should be a major consideration for IDOT. Effective and targeted herbicide application can prevent invasive species' proliferation, both through limiting their spread and minimizing damage to beneficial vegetation. Seeding may also be an important component of prevention-oriented management. Improving the use or contents of native seed mixes (e.g., higher diversity and thus functional complementarity) may promote resilient and beneficial ecosystems. In other words, ROWs consisting of healthy, desirable plant communities are harder for undesirable species to invade. Currently, IDOT and other DOTs have shifted to seed mixes (with both native and non-native species) that have most likely reduced the burden and landscape-presence of invasive species. However, the evidence suggests native seeding can be improved and more widely adopted.

One of the most mentioned challenges in the survey of roadside practitioners was a lack of staffing (i.e., manpower), which was not surprising. Roadside managers have various responsibilities to maintain safe and effective transportation networks. SMAs are also scattered throughout the landscape, often with separate management contexts. Hiring staff dedicated to managing the most valuable SMAs, whether as habitat managers or consultants for navigating the variable management needs, could be a beneficial strategy for IDOT. Dedicated staffing can ameliorate the work burden on other IDOT stakeholders and build institutional capacity for future IRVM development. If the hiring of specialized staff is infeasible, then additional training, equipment, or tools could be given to operations workers. These suggestions could make roadside managers more proficient or efficient at effectively navigating the management needs of SMAs. One suggestion would be to offer plant identification training workshops. Plant identification skills are necessary when managing the range of SMAs and especially for treating invasive plant species. Concerningly, IDOT respondents also reported relatively low confidence in the ability of roadside managers to identify native plants or differentiate invasive plants from native ones. Additional training could ameliorate this challenge.

Mapping also represents both a challenge and an opportunity. Knowing where roadside managers are likely to encounter SMAs is critical. Some respondents in other DOTs noted this as either a challenge or something done well within certain contexts (e.g., for T/E species). We suspect a lack of mapping may similarly complicate IDOT roadside management when managers do not have detailed, interactive maps. Mapping resources can be important screening tools that save IDOT roadside managers time, facilitate communication, and coordinate action. Ultimately, these tools would be the first line of defense for adversely impacting SMAs and, thus, reducing IDOT's risk for liability or failure to meet its objectives.

There is an opportunity to form greater collaborations with other conservation partners. Collaborations with other conservation groups may ease the burden on IDOT to manage sites, promote communication, and, perhaps most importantly, improve the maintenance and preservation of sensitive biological resources. Some survey respondents noted the challenge of adjacent landowners influencing their roadsides. In such cases, outreach to form relationships, or at the very least communication, may be favorable.

Broadly, IDOT could also formally develop an IRVM for Illinois. This would require considerable time and expertise, but such a framework could create a formal template for balancing traditional and environmentally based roadside management. IRVM could be instituted at the state level or perhaps subdivided into the nine districts, and perhaps eventually into counties (such as in Iowa). Our findings represent an important first step to such a possibility because we have overviewed and identified SMAs, characterized management strategies, and summarized stakeholder sentiments and practices across many DOT stakeholders.

GUIDELINES AND TEMPLATE STRUCTURE

We synthesized our research to create general BMP guidelines for common SMA contexts. We first outline the broadest guidelines that are helpful suggestions for any SMA context. Next, we split specific recommendations and BMP guidelines for forests, grasslands, and wetlands. These three habitat types have differing challenges and management needs. They also have dissimilar sensitive biological resources and commonly encountered threats. For each habitat type, we first describe baseline characteristics and management contexts. We then overview common management scenarios we expect IDOT stakeholders to face.

With this structure, we have created a template BMP decision tool for SMAs across Illinois. The following outline summarizes the framework, and the following section provides details on each topic in the outline.

1. General guidance across all SMA habitat types
2. BMP framework for forests
    a. Baseline recommendations for forests
    b. Are T/E bats present?
    c. Are bald eagles within 660 feet?
3. BMP framework for grasslands
    a. Baseline recommendations for grasslands
    b. Is management occurring on a remnant prairie?
    c. Are T/E invertebrates present?
    d. Is woody species encroachment a primary concern?

e. Are invasive grasses a primary concern?

f. Is teasel invasion a primary concern?

g. Are other invasive species a primary concern?

4. BMP framework for wetlands

    a. Baseline recommendations for wetlands

    b. Are Blanding's turtles present?

    c. Is reed canary grass invasion a primary concern?

    d. Is common reed (*Phragmites*) invasion a primary concern?

    e. Is purple loosestrife invasion a primary concern?

BEST MANAGEMENT PRACTICES DECISION TOOL AND FRAMEWORK

General Guidelines across All SMAs

A primary tool to protect SMAs along roadways is careful timing of various management actions, such as mowing, herbicide spraying, and tree trimming and removal. Tree removal has strict restrictions on timing to protect bats. If tree removal is required, it must be done between October 1 and March 31 while listed bat species are hibernating elsewhere or migrated (IDOT 2018). Current policy dictates that any trees that must be removed between April 1 and September 30 should be coordinated with the district environmental coordinator (IDOT 2018).

Management of areas adjacent to Illinois nature preserves, areas with state-listed animals, or with federally listed species of any taxonomic group should receive special care. Roadside management should carefully consider the life history of T/E species as well as sensitive habitats (e.g., remnant roadside prairies). In general, management should be applied when species are inactive (hibernating or dormant) or absent. In cases where it is necessary to conduct management when sensitive species are active, often there are options that reduce harm. Interactive web-based mapping available to roadside managers would be an effective way to communicate and implement management restrictions around T/E species. Such maps could include information on what species or other sensitive biological resources are present so that roadside managers can time their management accordingly. If specifics about species locations cannot be included in these maps, information on the restrictions associated with an unnamed species would be a valuable replacement.

Forest Habitat

A large proportion of SMAs that occur on or near IDOT roads are forests. We estimated 136.6 square miles (87,420 acres) of SMAs were dominated by forest habitats, and an additional 21.5 square miles (13,700 acres) where forests were codominant. Forests present unique management challenges.

Baseline Recommendations

Invasive species alter forest composition and dynamics. Bush honeysuckles (*Lonicera* spp.), buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), and garlic mustard (*Alliaria petiolata*) are commonly associated with forest habitats. These forest invasives can depress biodiversity, alter ecological processes, change forest structure, and create self-perpetuating cycles by altering fire, light, nutrients, or soil microbiome. Invasive plants invade forests easily from edge habitats, including forest edges along highways (Forrest Meekins & McCarthy 2001; Brown 2020). This makes invasive species management in and near forests especially important.

A large proportion of forests in Illinois are historically dominated by oaks and hickories, and oak-dominated forests support critical plant and wildlife species in Illinois. When feasible, managers can support oak forest health with prescribed burning, invasive species control measures (e.g., mechanical removal, herbicide application), and/or the use of canopy thinning (Darling 2021). An important prerequisite to burning is obtaining the appropriate permits (INPC 2017a). Not all forests are originally oak dominated, and adjustments will be needed depending on the community type (e.g., floodplain versus upland forests). However, in most cases, invasive plants are a major concern for Illinois forests.

Management Scenario: Threatened and Endangered Bats Present

There are 85 recorded occurrences of T/E bats within 0.25 miles of IDOT ROW, representing four bat species. The T/E bats most commonly occur in forested habitats and in areas with BSS. As always, tree trimming and removal in these areas should only occur between October 1 and March 31, when bats are hibernating in caves. Section 5-600.2 of the IDOT *Maintenance Policy Manual* allows for removing trees at any point in the year if they present a hazard to motorists. If hazard tree removal occurs in an area known to house T/E bats, roadside managers should coordinate with the district environmental manager to create a plan that avoids the illegal take of T/E bats (Endangered Species Act of 1973; Illinois Endangered Species Act 2022).

When potential habitat for bats overlaps with habitat for other protected species, such as the federally endangered rusty patched bumble bee, management guidelines can become contradictory. Rusty patched bumble bees overwinter underground in forested areas that may overlap with bat summer roosting habitat. The combination of both bees and bats, and their alternating use of forest habitat, complicates the search for optimal timing for forest management. In general, where both species are known to occur a site-specific plan that avoids impacts to both species is needed. One approach is to manually fell trees during the bat dormant period (October to March) and leave stumps in place to avoid disturbing rusty patched bumble bees (WisDOT 2023). Stumps can then be removed later when rusty patched bumble bees are no longer overwintering in forests.

Management Scenario: Bald Eagles Present

Bald eagles (*Haliaeetus leucocephalus*) have frequently (115 occurrences) been recorded within 0.25 miles of IDOT ROWs. Although bald eagles are no longer listed as federally T/E, activities that occur within 660 feet of a bald eagle nest are regulated under the Bald and Golden Eagle Protection Act and require a general permit from the USFWS (Permits for Incidental Take of Eagles and Eagle Nests § 22.280).

Grassland Habitat

We estimated that there were 55.1 square miles (35,200 acres) of SMA habitat near IDOT ROW classified as primarily grassland. An additional 7.1 square miles (4,500 acres) were classified as majority savannahs, which have similar management needs and challenges. While the area of grassland SMAs is lower than forests and wetlands, their importance and relevance to IDOT ROWs should not be underestimated. Anecdotally, the most common SMAs on (rather than near) IDOT ROWs are grasslands. Additionally, habitat on IDOT ROWs is more frequently structured like a grassland SMA, in terms of vegetation structure, plant communities, invasive species, and hydrology. If using IDOT ROWs to build habitat connectivity between SMAs becomes a priority, grassland management (and establishment) techniques will be key.

Baseline Recommendations

Grasslands present unique management challenges. Natural and managed grasslands require active management to prevent the encroachment of woody plants and invasive species. Grasslands are managed through a combination of mowing, brush control, and herbicide use. Prescribed burning is also an effective strategy that is especially appropriate for high-quality habitats. Several invasive plant species have established along open areas in IDOT ROWs, requiring tailored management approaches to prevent their spread and to control existing populations (see below).

IDOT seeds ROWs with standard grass and forb seed mixes (IDOT 2021b). Current standard seed mixes recommend the use of fescue and Kentucky bluegrass, which are both aggressive competitors that provide little value for wildlife, are difficult to eradicate, and can displace natural plant communities (INPC, n.d.). A shift to seeding native grass, native forb, and conservation mixtures provided in the standard specifications would increase the conservation value of IDOT ROWs and protect nearby grassland SMAs. Since seeded species can easily spread into nearby natural communities, it is important that roadside managers choose species that are native to Illinois. This approach of seeding native species near existing SMAs is consistent with the IDOT Pollinator-Friendly Practices Plan goal of connecting existing habitats, and is implemented in Minnesota near high quality habitats (Minnesota DOT survey response). IDOT should consider whether plant materials should be sourced within the same ecoregion where they are applied. Using locally sourced seed is not always feasible, but introducing materials from distant populations could potentially be detrimental to remnant communities.

Partnerships with outside organizations that manage nearby grasslands could aid with maintaining or establishing grasslands on IDOT ROWs. The goal may be to protect nearby SMAs by creating a buffer to reduce edge effects, to connect or expand habitat patches, or to focus on SMAs on IDOT property (e.g., roadside prairie remnants). IDOT roadside managers generally desire these partnerships (Survey findings Q43), and they have been successful in other states for reducing the management burden on DOTs (Ohio DOT survey response; Brad Bolduan, pers. comm., Feb. 19, 2025).

Management Scenario: Remnant Prairies and Savannas Present

A major obstacle to the health of remnant prairies on IDOT ROWs is a lack of management and disturbance. Often these areas are treated as “no mow, no spray” areas, which allow woody species to crowd out prairie species and invasive species to flourish. The healthier approach for a remnant

prairie would be to implement careful and precise mowing and herbicide application, as invasive species and woody encroachment are the two greatest threats to roadside prairies (Janssen et al. 2025a, Jansen et al. 2025b). These plant communities require active management to persist and are full of disturbance-adapted species. Conservation mowing, brush control, and prescribed burning are appropriate management strategies in these areas.

The timing of these actions is critical, as the wrong timing can harm wildlife (e.g., invertebrates that specialize on prairie plants, nesting grassland birds), encourage invasive plants (e.g., teasel), and suppress certain native species. It can be difficult to balance the sometimes-contradictory needs of plants and wildlife as well as logistics of roadside management. When possible, management that removes vegetation in roadside prairies should occur outside of the typical growing season. That may not be possible because of logistics (e.g., there is not enough time to successfully mow all target areas, or staff shifting efforts to snow removal). If limited offseason mowing is possible, the highest quality habitats should be prioritized. When mowing or other vegetation removal needs to occur during the growing season, the timing should be tailored to invasive species control and the needs of native species (including plants and animals).

In general, a primary goal of grassland management is to limit the growth of woody plants and other species that reduce light availability for desirable species. One group of native species, Canada and tall goldenrod (*Solidago canadensis*, *Solidago altissima*, they are sometimes treated as a single species), deserve special mention. These goldenrods can be so aggressive that they shade out other grassland species, thereby reducing the diversity of grassland plants and the arthropods associated with them (Eckberg et al. 2023). Goldenrods can be successfully controlled through prescribed fire, so high-quality roadside prairies with high densities of Canada or tall goldenrod may be suitable candidates for prescribed burning. Prescribed burns along or near roadsides are logistically difficult and require appropriate permits. Roadside managers may also consider introducing native parasitic plants as biological control for tall, dominant plants. Lousewort (*Pedicularis canadensis*) and bastard toadflax (*Comandra umbellata*) are two hemiparasitic plants that can be found in grasslands; false foxgloves (in the genus *Aureolaria*) are appropriate for savannas.

Management Scenario: Threatened and Endangered Invertebrates Present

We found 95 occurrences of listed terrestrial invertebrate species within 0.25 miles of IDOT roads. These terrestrial invertebrate EOs most commonly occur in grassland habitats. Roadside operators should avoid mowing areas (or otherwise removing vegetation) with known T/E invertebrates during the seasons when these species are active (e.g., nesting or foraging). If management is necessary in these areas (for example, to control an invasive plant that could harm the invertebrate species), managers should prioritize mowing outside the growing season.

If summer management is necessary, operators can take precautions to limit adverse effects on invertebrates. Modifications can be made to how mowing is conducted, both by driving mowers slowly to give invertebrates time to evacuate and increasing mowing heights. Illinois has one of the lower minimum mowing heights among comparable states (see Chapter 3). When feasible, low-disturbance management approaches to invasive control, like hand trimming and hand pulling, may protect sensitive invertebrates.

Leaving disturbance-free refugia is extremely important for some sensitive invertebrates, in particular those that spend their whole life cycle in grassland areas. For example, the eryngium stem borer (*Papaipema eryngii*) is a state-threatened moth that is one of two most frequently encountered listed insects along IDOT ROWs. The species spends its whole lifetime in grassland (typically remnant prairie) habitat. It is very susceptible to mowing during the growing season and burning during the offseason. When sensitive insects like the eryngium stem borer are present at a site, the general guidance is to only disturb one-third of the site at a time. That would mean mowing no more than one-third of a site during the growing season (or preferably waiting until after the growing season), and burning no more than one-third of the area at any time of year. The contrast would be a species like the rusty patched bumble bee (*Bombus affinis*), which is not susceptible to fires or mowing in the offseason. For the rusty patched bumble bee, offseason work does not need to be limited, though growing season precautions are warranted.

Management Scenario: Woody Invasive Plants Present

Autumn olive (*Elaeagnus umbellata*), Callery pear (*Pyrus calleryana*), buckthorns (*Frangula alnus* and *Rhamnus cathartica*), bush honeysuckles (*Lonicera* spp.), and white mulberry (*Morus alba*) are woody plants that commonly invade IDOT ROWs. When these woody species are present, cutting mature plants to the ground and treating stumps with herbicides is an effective control strategy. Illinois District 4 controls woody species through cutting and stump herbicide treatment after September 30 due to IDOT restrictions on the timing of brush control. Stem injection of glyphosate capsules into all main stems can also be effective and does not require further mechanical control. Capsule injection with an injector lance for woody invasive species control is safer for operators, approved for use in wetlands, and avoids drift onto non-target species (INPC 2017b). Though initial startup costs are higher than for cut stump treatments, capsule injection is 43% faster than cut surface treatments (INPC 2017b). Foliar herbicide sprays can be appropriate in the early spring or late fall, since many woody invasives grow during one or both of these times when native species do not. Foliar sprays can also be appropriate in especially dense stands where shade from the invasive species has completely excluded other plants. In such situations, however, repeated management and seeding may be necessary to avoid reinvasion. Mowing is an important strategy to prevent seedlings of woody species from growing and establishing. Seeds from these species tend to be animal dispersed, so mowing does not risk spreading seeds between sites. Prescribed burns are an effective tool to control woody invasive plants, especially when conducted repeatedly or with follow-up herbicide treatment to prevent resprouts. Prescribed burns generally kill woody invasive seedlings. The effect of prescribed burns on mature plants varies by species (INPC Vegetation Management Guidelines). We recommend prioritizing the use of prescribed burns for woody plant control in or near high quality habitats. It is reported that in Wisconsin prescribed burning is the “most effective method” for controlling woody species and invasive herbaceous species (WisDOT 2024).

Management Scenario: Invasive Grasses Present

Smooth brome (*Bromus inermis*), fescue (*Festuca pratensis* and *Festuca arundinacea*), and Kentucky bluegrass (*Poa pratensis*) are aggressive competitors that can displace native grassland species. They are often included in IDOT seed mixes. A shift to native grass, native flower, and conservation seed mixes would help protect grassland SMAs and generally improve habitat quality along IDOT ROWs.

Appropriate mixes are specified in Section 250 of the IDOT *Standard Specifications for Road and Bridge Construction*, and Bollinger et al. (2025) have proposed empirically tested modifications.

If these invasive grass species are present in or near a grassland SMA, population control may be warranted. Because grasses are difficult to identify, control measures should be approached with caution and preparation. Ideally, prescribed burning would be the main control strategy, with herbicide use as an effective alternative. Both strategies are most effective when grasses are growing and are ineffective when grasses are dormant. Prescribed burns and herbicide use should generally be timed in the late spring to most effectively control invasive grasses and increase the productivity of native warm-season grasses (April). This burn timing may not be appropriate in areas with grassland bird populations or sensitive invertebrates. Late spring prescribed burns can also harm native cool-season grasses and sedges. Grass-specific herbicides (clethodim, sethoxydim, fluazifop-P-butyl) are the most selective options, while glyphosate and atrazine are alternative non-selective herbicides that may be appropriate in more disturbed sites. Mowing is generally ineffective at controlling introduced grasses and may encourage those populations to proliferate. Multiple years of management (typically three years) may be necessary to achieve control.

Management Scenario: Teasel Present

Teasels (*Dipsacus laciniatus* and *Dipsacus sylvestris*) are the most referenced invasive species in our survey and in follow-up emails with roadside managers. Teasels are aggressive invasive plants that spread easily along roadsides. Spread between sites occurs largely by seeds "hitchhiking" on mower decks. Spread within a site can be enhanced by mowing if it occurs after seed has been set. Roadside operators can avoid spreading teasel by avoiding mowing areas where teasel occurs and has begun flowering, in the mid- to late summer. It is important to time mowing before teasel has bolted and developed flowers and to clean mowing equipment. IDOT roadside operators generally responded that they avoid areas with teasel present after the plant has gone to seed (Brittany Gavin, pers. comm., March 14, 2025), though others have expressed a desire to mow dense patches in the late summer (staff from District 1, pers. comm. 2024, predating this project). Survey respondents said that a key to teasel management is educating roadside operators about plant biology and when not to mow teasel (Ohio DOT survey response).

Regarding equipment cleaning, the IDOT 2021 Mowing Policy Manual states that "mowing of noxious and other problem weeds can cause seeds to be spread to uninfested areas. If mowing of these locations is directed, the equipment shall be cleaned in accordance with 5-400.11" (IDOT 2021a 5-400.9). In District 4, mower operators keep leaf blowers in the cabs of tractors, and staff blow off decks "prior to leaving an infield or area of teasel or other invasives that prolifically seed" (Brittany Gavin, pers. comm., March 14, 2025). This practice of cleaning tractor decks using leaf blowers between mowing areas is followed in District 7 as well (Brian Shull, pers. comm., March 19, 2025). See Chapter 3 for additional details.

To control and eradicate teasel populations, mechanical control is the best first approach, especially in sensitive areas or for smaller populations (INPC 2017c). Digging rosettes using a dandelion digger or severing the deeper tap root in the plant's second year will effectively kill a plant. Cutting off inflorescences after flowering has initiated and removing inflorescences from the roadside also

prevents reproduction and makes re-flowering unlikely. Prescribed burning in the late spring can be effective at controlling early infestation. Mowing can stunt teasel but is very harmful after plants have gone to seed because mowing equipment can spread teasel seeds, within and between sites. Foliar application of 2,4-D amine, triclopyr, or clopyralid (all broadleaf-selective herbicides) is appropriate when cutting or digging is not feasible. Glyphosate is a viable alternative, especially outside sensitive areas. Herbicide treatment is the most common teasel control method mentioned in responses to our survey. The Missouri *Engineering Policy Guide* recommends spraying teasel in early spring or late fall. According to the MODOT *Engineering Policy Guide* "late fall applications with Perspective™ have proved effective to eliminate active rosettes and also address seeds germinating the following spring" (MODOT 2020). IDOT District 4 mows before applying herbicides (Brittany Gavin, pers. comm., March 14, 2025). This is a combination of strategies that is not mentioned in the INPC recommendations for these species or other resources but may be a strategy worth further investigation.

Management Scenario: Other Invasive Species Present

Wild parsnip (*Pastinaca sativa*), crownvetch (*Coronilla varia*), sweet clovers (*Melilotus alba* and *Melilotus officinalis*), Canada thistle (*Cirsium arvense*), Queen Ann's lace (*Daucus carota*), and sericea lespedeza (*Lespedeza cuneata*) are other invasive species that commonly invade ROW grassland habitats. These species present unique management challenges and are best controlled through a variety of approaches. INPC Vegetation Management Guidelines for these species will be helpful for effective control. Canada thistle, lespedeza, and crownvetch all require integrated management approaches with multiple strategies of treatment. Each is best controlled with a treatment that damages the plant (mowing or burning) followed by herbicide application (at least in heavy infestations), though the timing and specifics vary. Prescribed burning is especially effective for lespedeza and sweet clover because it can force their long-persisting seeds to germinate, allowing for control methods the following spring to target the entire population of that species. Wild parsnip and Queen Ann's lace are best controlled through mechanical control and herbicide treatment (MNDOT 2025a). We have encountered anecdotal reports of success with earlier season mowing in successive years when plants are blooming.

Wetlands

We estimated 70.1 square miles (44,900 acres) of SMAs near IDOT ROWs are primarily wetland habitat, and an additional 16.1 square miles (10,300 acres) have wetlands as a codominant habitat type. Wetlands present unique management challenges because of their physical attributes and the suite of aggressive invasive species encountered.

Baseline Recommendations

Some wetlands may be difficult to access with machinery, complicating mowing and other management actions. In these situations, IDOT policy recommends that roadside managers seed with native plants to eliminate the need for frequent mowing (IDOT 2022a); however, aggressive wetland invasives usually will need to be controlled before seeding will be effective. Many common herbicide types and formulations are restricted near wetland areas (or should be). This may complicate the management of invasive plants in wetlands. For teasel, the INPC recommends the use of glyphosates

near standing water when mechanical plant removal is not possible; 2,4-D amine, triclopyr, or clopyralid are recommended in other settings but not near standing water. When applying glyphosate, wetland-specific formulations (e.g., Rodeo) should be used. Similarly, when applying triclopyr over standing water, the Garlon 3A formulation should be used rather than the Tahoe 3A formulation.

When mowing for invasive control is possible, extra caution is needed for some species. Common reed (*Phragmites australis*) and purple loosestrife can both reproduce vegetatively from plant fragments, which can be spread by mowing at any time of the year. Wetland-associated invasive species are generally best controlled using herbicides in successive years. After initial control, native seeding can be used to re-introduce native communities (e.g., through "warrior sedges") that outcompete invasive plant populations (Scheiwiller 2022). A helpful resource for Illinois-specific guidance on wetland invasives in different scenarios can be found in the INPC Vegetation Management Guidelines and Herbicide Reference Tool.

Management Scenario: Blanding's Turtle Present

Blanding's turtle (*Emydoidea blandingii*) records are frequently encountered near IDOT ROW (74 occurrences within 0.25 miles). Blanding's turtle is a state-endangered species most associated with wetland habitats. As with any T/E species, roadside managers should coordinate with the district environmental manager to create a plan that avoids the illegal take of Blanding's turtles (Illinois Endangered Species Act 2022). The most straightforward way to avoid take is by halting terrestrial management activities when the species is active. Blanding's turtles are susceptible to mowing, burning, and heavy equipment during their active season, because they traverse terrestrial habitats (especially in spring). Blanding's turtles are active when water temperature is above 10°C (50°F), which corresponds approximately to mid-March through mid-November. Care should be taken near all sites known to have Blanding's turtles, as females can travel 1 km when ready to nest. Blanding's turtles overwinter in wetland bottoms.

Management Scenario: Reed Canary Grass Present

Reed canary grass (*Phalaris arundinacea*) is a wetland-associated grass that is a common invasive in IDOT ROW. Effective control approaches for sensitive habitats include 5–6 years of repeated prescribed fire (native seeds should be present in seed bank for fire to be effective), hand pulling a few times per year for several years in very small infestations, and spot application with sethoxydim or clethodim herbicides (application of sethoxydim over standing water is prohibited by the label) (INPC 2017d). For more disturbed sites, managers can use an integrated strategy of burning in late spring and applying glyphosate in both June and September. Multiple years of burning and spraying may be necessary for this strategy. Rodeo (a formulation of glyphosate preferred in wetlands) should be applied in spring when most native wetland species are still dormant. Dalapon is a grass- and monocot-specific herbicide that can also be used with this strategy. Managers should reseed with native seeds after control measures, timing seed application carefully to avoid the effects of herbicides.

Management Scenario: Phragmites Present

Common reed (*Phragmites australis*) is a wetland-associated grass that is a common invasive in IDOT ROW. All Illinois roadside managers surveyed reported frequently encountering this species. Mowing is not recommended for this species, since it can spread plant fragments that can reproduce vegetatively and individuals rebound due to subterranean rhizomes (INPC 2017e). Herbicide application can be used to control for common reed. When sensitive native species are not present, foliar spray of glyphosate (best from August–October) or isopropylamine salt of imazapyr (tradename Habitat) for several years can be effective. When sensitive species are present, hand wicking of stems (cut or uncut) is recommended to keep impacts localized. Mechanical cutting at the end of July can also be effective, though stems with panicles should be removed prior to cutting. For more disturbed sites, cutting in early summer plus covering with plastic mulch for 3–10 days is moderately effective.

Management Scenario: Purple Loosestrife Present

Purple loosestrife (*Lythrum salicaria*) is a wetland-associated forb that is a common invasive in IDOT ROW. Mowing is not recommended for this species (INPC 2017f). Mowing equipment can spread purple loosestrife seeds and fragments that can reproduce vegetatively. The INPC recommends pulling or digging plants when feasible. In sensitive habitats, triclopyr is a broadleaf-specific herbicide that can effectively control purple loosestrife when it is applied to purple loosestrife near the root mass in the bud to early flower stage. During the late flower stage, glyphosate can be easily applied to the tops of purple loosestrife, which tends to be taller than surrounding vegetation. Glyphosate is best avoided in sensitive habitats, and as with all spot herbicide application, applicators should only apply enough herbicide to wet the target plant without dripping onto non-target species. An additional precaution in sensitive habitat is to apply herbicides to stems (cut or uncut) by hand-wicking.

PRIORITIZATION OF SPECIAL MANAGEMENT AREAS

With over 8,000 SMAs near IDOT roadways, it is important to prioritize efforts. The resources available for management plan development and execution, or habitat establishment, cannot cover the total area of roadside that is associated with SMAs. Below, we propose a scheme for prioritizing SMAs and the roadsides associated with them for management.

Our prioritization approach has two parts. First, we assign a score to each SMA based on the type, legal protection, indications of habitat quality and diversity, habitat or species rarity, proximity to IDOT roadways, and habitat size. Second, we take the sum of the SMA scores for each section of roadway, where areas with higher scores are recommended as higher priorities for management. In this section we provide the rules for assigning scores to each SMA. The summed scores for each stretch of IDOT roadway are provided in a spatial dataset accompanying this report.

Tier 1 SMAs

The SMAs with the strongest legal protections, greatest potential for diversity, and that are most associated with IDOT roadways are categorized into the highest tier for prioritization. These SMAs include INPC lands, SMAs associated with T/E species, INAI lands, and remnant roadside prairies.

We created two versions of the prioritization scores. One includes T/E species because they have legal protection; another version excludes T/E species because habitat management plans generally focus on habitat types rather than species. SMAs associated with T/E species recognized by the Illinois Natural Heritage Database are included because they include rare and legally protected species. In the version of the score that included T/E species, we assigned 10 points to SMAs associated with federally protected species, and seven points for Illinois state T/E species. Rare habitat EOs do not receive points because they are included in the INAI rare habitat inventory (see below). Federally listed species received a higher score because of increased legal protection and typically greater rarity. If a single area has multiple SMAs associated with T/E species or habitats, the score of that area is the sum of all the scores assigned to those records.

INPC lands are included in the highest tier because of strong legal protections and tendency to include areas with high biological diversity, rare species, or rare habitats. We assign 10 points to Nature Preserves, five points to Land and Water Reserves, and five points to Natural Heritage Landmarks. Nature Preserves received a higher score because they are protected in perpetuity and tend to have more valuable or rare biological resources.

INAI lands are included in the highest tier because they are associated with high-quality natural areas and rare communities. We assign 10 points to Category I INAI sites (high-quality nature communities), five points to Category IV sites (outstanding geological features), and five points to Category VI sites (unusual concentrations of flora and/or fauna). Category I sites received a higher score because they are associated with greater diversity, rarer communities, and the sites of highest quality. No points are assigned to Category II sites because they overlap with SMAs associated with T/E species, and we do not want to double count this category. For the same reason, no points are assigned to Category III sites because they overlap with INPC lands.

Two group of Elements of Occurrence that do not designate T/E species are included in the Tier 1 SMAs. We are treating large forested patches (> 500 acres) and heron rookeries similarly to Category VI INAI sites, because they are “unusual concentrations of flora/fauna.” Unlike some other EO types, these two categories of EOs do not overlap with INAI sites. We assign five points to each of these EO types, like the Category VI INAI sites.

Roadside prairies are included in the highest tier because they often include high diversity, rare remnant prairie communities, and are frequently on (rather than adjacent to) IDOT property. We assign points based on the quality grades determined by Illinois Natural History Survey scientists. When a single stretch of prairie has multiple quality grades, the highest grade is used for calculating the score. We assign 10 points to roadside prairies with a quality class of 1 (INAI grade of A/B), three points to roadside prairies with a quality class of 2 (INAI grade of C), and one point to roadside prairies with a quality class of 3 (INAI grade of D).

Tier 2 SMAs

The second tier of SMAs tend to have moderate levels of diversity or are associated with habitats that are biologically valuable but less rare than the communities in the highest tier. Often (though not always) SMAs in the second tier are forested, grassland reconstructions, or restorations of highly

disrupted grasslands. These SMAs include federal lands (e.g., US Forest Service), IDNR lands (e.g., State Natural Areas, State Parks), county parks (e.g., forest preserves), and conservation areas owned or managed by NGOs oriented toward conservation (e.g., The Nature Conservancy). We assign four points to all SMAs in the second tier.

Tier 3 SMAs

The lowest tier for prioritization includes SMAs that are less likely to have high-quality natural areas, are marginal natural areas, or tend to be smaller. Conservation easements and municipal parks are in this tier. We assign one point to all SMAs in the third tier.

Additional Factors in Prioritization

We include two additional criteria that can increase the score for an SMA. The first criterion is based on proximity. If an SMA is within 50 feet of the IDOT road centerline, we assign it an additional 10 points. If it is within 200 feet of a centerline, we assign it an additional two points.

Second, large SMAs were given higher priority scores. If the area of an SMA is in the top quartile (25th percentile or larger) of all SMA areas, we assign it an additional two points. If the area of an SMA is in the second quartile (between the 25th and 50th percentiles), we assign it one additional point.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

IDOT stakeholders commonly encounter SMAs. Over 8,000 of them are within 0.25 miles and approximately 4,500 are within 250 feet from an IDOT roadway centerline, representing hundreds of square miles of lands that may be impacted by IDOT activities. Historically, IDOT has conducted management activities on an ad hoc basis, which can have unfavorable implications for IDOT objectives and project timelines. This project utilizes a combination of methods and efforts to identify SMAs and understand BMPs for many on-the-ground contexts of these special biological resources. While there is not a "one-size-fits-all" approach when encountering SMAs, we suggest our research is an important step to standardize and improve their management.

Mowing, herbicide application, tree/brush cutting or trimming, native seeding, mapping, and communication of management guidelines (or limitations) might be considered key practices when IDOT manages SMAs. Other more niche practices are also important tools to consider. Stakeholders from both IDOT and other DOTs have described various opinions, successes, and challenges of their utilization. Challenges often describe the impact of invasive species, or suboptimal levels of funding or equipment access. These challenges are important to improve upon for the future of IDOT roadside management. We suggest the decision tool for BMPs is, at minimum, the beginning of a useful screening resource for IDOT stakeholders who encounter SMAs in their work. These efforts may be used to create an IRVM framework or highlight other critical areas needing research by IDOT.

In summary, we highlight some major recommendations from our work:

- **Mowing Practices:** It would benefit grasslands and the animals that depend on them to adjust the timing of mowing, shift as much as possible to outside of the growing season (prioritizing areas with sensitive species). Current mowing timing aligns poorly with recommendations for monarch butterflies. We recommend shifting the timing of maintenance mowing away from the current July 1 to August 14 window. It would be preferable to spread the mowing across the growing season, avoiding early-season mowing in areas where nesting grassland birds or rusty patched bumble bees are known to occur on/near roadsides. Additionally, we recommend that IDOT maintains a multi-year rotational mowing schedule. The rotational mowing approach effectively balances conservation and roadside management logistics.

- **Communication and Mapping Tools:** IDOT survey respondents shared that the current mowing and herbicide guidance maps are confusing, difficult to use, and lead to adverse accidental disturbance to sensitive habitats. We recommend creating a web-based GIS map like those used by Ohio DOT and Wisconsin DOT. We anticipate that this would improve communication of conservation priorities with equipment operators and roadside managers working in the field. It may also be beneficial to avoid terminology like "restriction," because that has been interpreted as no management in some places, which leads to domination by invasive species and the loss of grassland habitat to woody succession. Changing wording from "restriction" to "limitation" or "guidance" on some policies and resources may be helpful in eliminating confusion and maintaining roadside habitat.

- **Training and Resources for Staff:** Survey respondents generally desired that more informational resources and training be made available to field staff. Examples from other organizations give insight into how this can be done. Possibilities included investing in herbicide applicator licensure for staff (see Texas DOT herbicide licensure program for a good example), making easily accessible vegetation management guides/materials/apps available to staff (see WDNR 2010), and providing educational opportunities for staff to learn why conservation and invasive species management are important. If feasible, hiring staff that specialize in managing the most valuable SMAs can ameliorate the work burden on other IDOT stakeholders and build institutional capacity for future IRVM development.

- **Tree Trimming and Branch Removal:** IDOT currently does not allow trees or brush to be removed between October 1 and March 31 due to the potential impacts to summer-roosting endangered bat species. However, no similar restrictions are in place around trimming and branch removal. IDOT could consider a minimum approach of requiring pre-inspections for bat or bird nests if tree trimming must occur between April 1 and September 30, as in Minnesota (Beer 2024).

- **Coordinated Invasive Species Control Plan:** Teasels were widely acknowledged as invasive species of major concern for roadside vegetation. Teasels are spread by mowing, especially when it occurs in the late summer. Districts currently operate independently when setting their invasive management strategies. We recommend a statewide policy that avoids mowing of teasel-infested areas after seed heads form (approximately late July), and shifts the emphasis to herbicide application, manual removal, and mowing shortly before flowering. Coordinated statewide strategies for other common invasive species are also warranted. Effective plans may include guidelines for early detection and action to prevent establishment, and specific instructions on the use of targeted herbicides in different situations.

- **Prioritization of Effort:** Prioritize invasive species removal, brush control, and native seeding near the most valuable sensitive natural areas. Further prioritization can target the highest quality habitat areas. Once invasive or woody plants encroach on an SMA, they become more difficult to control.

- **Exploring Partnerships:** Survey respondents desired to form more partnerships with organizations outside of IDOT to work together on vegetation management. We suggest that IDOT stakeholders seek partnerships with local and regional conservation organizations to reduce the management burden on IDOT, especially in areas near SMAs.

- **Native Seed Mixes:** Continue to develop the use of native seed mixes and increase their utilization. Native seed mixes have benefits for wildlife conservation and in the right context require less maintenance. Work to improve current practices around native seed mixes should focus on reducing costs, improving early establishment, and selecting species with reliable supply.

- **Prescribed Burning:** When possible, utilize prescribed burning as a management approach for remnant prairies and other high-quality areas with fire-adapted habitat. Several respondents

to our survey, especially outside of Illinois, have prescribed burn programs and could serve as models in developing a prescribed burning program across IDOT.

- **Develop an Integrated Roadside Vegetation Management (IRVM) Plan:** IDOT may consider developing a formal IRVM plan to create more standardized, consistent management practices, especially for SMAs or IDOT property near SMAs. A formal IRVM plan would ideally provide a clear and adaptable framework for addressing both conservation concerns and operational needs.

    - The effort to develop an IRVM plan is more feasible if it is mandated by a formal policy, and likely requires funding allocated to the effort. As an example, the Highways for Habitat program in Minnesota is associated with a 2024 state statute (Minnesota Statute § 160.2325), requires the establishment of an IRVM with mandated standards, and appropriates $1,000,000 to the development of the plan (MNDOT 2025b).

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APPENDIX A: SUMMARY OF HABITAT CLASSIFICATION RULES USED FOR SPECIAL MANAGEMENT AREAS

1. Used existing INAI Community Class habitat classifications for Roadside Prairies and INAI sites, when available

    a. Prairies --> Grassland
    b. Savanna --> Savanna
    c. Forest --> Forest
    d. Wetland --> Wetland
    e. Cave --> Geological Feature
    f. River --> Wetland
    g. Open water --> Wetland

2. Assigned all Biologically Significant Streams to BSS Streams

3. Matched SMAs to habitat type using name filtering

    a. 'Savanna' or 'Barren' --> Savanna
    b. 'Meadow' or 'Prairie' or 'Grassland' --> Grassland
    c. 'Forest' --> Forest
    d. 'Fen' or 'Marsh' or 'Wetland' or 'Bog' or 'Swamp' or 'Sedge Meadow' --> Wetland

4. Assessed dominant habitat by manually inspecting satellite imagery of vegetation within SMA boundaries

    a. Open forests (~50% canopy cover) --> Savanna
    b. Closed forests --> Forest
    c. Grassland vegetation with few to no trees --> Grassland
    d. Open water or wetland vegetation with few to no trees --> Wetland
    e. Agricultural crops --> Cropland
    f. Mowed lawn or built structures --> Developed
    g. Bare ground --> Barren

APPENDIX B: IDOT SURVEY

This appendix includes the survey sent to staff within IDOT.

Start of Block: Intro

The Illinois Natural History Survey, in collaboration with the Illinois Center for Transportation and the Illinois Department of Transportation, are conducting a study on roadside vegetation best management practices. We seek your feedback on current vegetation management practices at your district/management unit for inclusion in our final publicly-available report. This survey will require approximately 20 minutes to complete. For all open-response text boxes, **please feel free to share links** to policy documents when that is easier than providing a written summary. **There will be an opportunity to attach files throughout the survey**. Those files can be used to clarify or further explain your responses. Please keep your answers **brief and specific**. All questions may be left blank as needed.

Please provide your contact information below

- o Name (1) _____
- o Email address (2) _____
- o Phone number (3) _____
- o What IDOT District(s) does your work occur in? (4) _____
- o Job title or role (6) _____

Can we contact you with further questions?

▼ Yes (1) ... No (2)

End of Block: Intro

Start of Block: Challenges

How significant are these Right-of-Way vegetation challenges for IDOT Operations in your District(s)?

	Significant challenge (1)	Minor challenge (2)	Not a challenge (3)	Unknown/No opinion (4)
Invasive species (1)	o	o	o	o
Mowing restrictions (2)	o	o	o	o
Management of protected resources (3)	o	o	o	o
Brush/woody plant encroachment (4)	o	o	o	o
Other: Comment/explain (7)	o	o	o	o

How significant are these Right-of-Way management challenges for IDOT Operations in your District(s)?

	Significant challenge (1)	Minor challenge (5)	Not a challenge (2)	Unknown/No opinion (4)
Having insufficient funding to complete management activities (1)	o	o	o	o
Having insufficient staff or equipment to complete management activities (2)	o	o	o	o
Logistical constraints (3)	o	o	o	o
Legal requirements (4)	o	o	o	o
Adjacent roadside stakeholders (5)	o	o	o	o
Roadside features as obstacles to vegetation management (for example steep	o	o	o	o

	Significant challenge (1)	Minor challenge (5)	Not a challenge (2)	Unknown/No opinion (4)
slopes, overpasses, bridges) (6)				
Safety concerns (7)	o	o	o	o
Lack of clarity on how technical reports, instructional memos, and other written guidance translate to on-the-ground management practices (8)	o	o	o	o
Lack of skills/expertise to implement management guidelines (10)	o	o	o	o
Difficulty in identifying suitable partnerships with outside organizations (11)	o	o	o	o
Conflicting management needs (12)	o	o	o	o
Other (9)	o	o	o	o

End of Block: Challenges

Start of Block: Conservation Strategies 1

To your knowledge, does your District(s) or IDOT have specific conservation policies or restrictions in place for the following management activities?

	Yes (1)	No (2)	Unsure (3)
Mowing (1)	o	o	o
Brush control and tree trimming (2)	o	o	o
Herbicide application (3)	o	o	o
Insecticide/pesticide application (4)	o	o	o
Mulching and seeding (5)	o	o	o
Erosion control (6)	o	o	o

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mowing [Yes]

What policies/practices are in place for mowing? Please explain and/or provide links to relevant policies.

_____

_____

_____

_____

_____

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mowing [Yes]

Attach mowing policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mowing [Yes]

Are the conservation management policies relating to mowing flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mowing [Yes]

Are the conservation management policies relating to mowing complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Brush control and tree trimming [Yes]

What policies/practices are in place for brush control and tree trimming? Please explain and/or provide links to relevant policies.

_____

_____

_____

_____

_____

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Brush control and tree trimming [Yes]

Attach brush control and tree trimming policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Brush control and tree trimming [Yes]

Are the conservation management policies relating to brush control and tree trimming flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Brush control and tree trimming [Yes]

Are the conservation management policies relating to brush control and tree trimming complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Herbicide application [Yes]

What policies/practices are in place for herbicide application? Please explain and/or provide links to relevant policies.

_____

_____

_____

_____

_____

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Herbicide application [Yes]

Attach herbicide policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Herbicide application [Yes]

Are the conservation management policies relating to herbicide application flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Herbicide application [Yes]

Are the conservation management policies relating to herbicide application complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Insecticide/pesticide application [Yes]

What policies/practices are in place for insecticide/pesticide application? Please explain and/or provide links to relevant policies.

_____

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Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Insecticide/pesticide application [Yes]

Attach insecticide/pesticide policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Insecticide/pesticide application [Yes]

Are the conservation management policies relating to insecticide/pesticide application flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Insecticide/pesticide application [Yes]

Are the conservation management policies relating to insecticide/pesticide application complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mulching and seeding [Yes]

What policies/practices are in place for mulching and seeding? Please explain and/or provide links to relevant policies.

_____

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Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mulching and seeding [Yes]

Attach mulching and seeding policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mulching and seeding [Yes]

Are the conservation management policies relating to mulching and seeding flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Mulching and seeding [Yes]

Are the conservation management policies relating to mulching and seeding complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Erosion control [Yes]

What policies/practices are in place for erosion control? Please explain and/or provide links to relevant policies.

_____

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Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Erosion control [Yes]

Attach erosion control policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Erosion control [Yes]

Are the conservation management policies relating to erosion control flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your District(s) or IDOT have specific conservation policies or restricti... = Erosion control [Yes]

Are the conservation management policies relating to erosion control complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

End of Block: Conservation Strategies 1

Start of Block: Conservation Strategies 2

In practice, how often are conservation priorities incorporated into the following management activities in your District(s)?

	Almost always (1)	Sometimes (2)	Rarely (3)	Never (4)	Unsure (5)
Mowing (1)	o	o	o	o	o
Brush control and tree trimming (2)	o	o	o	o	o
Herbicide application (3)	o	o	o	o	o
Insecticide/pesticide application (4)	o	o	o	o	o
Mulching and seeding (5)	o	o	o	o	o
Erosion control (6)	o	o	o	o	o

Page Break

The following questions ask about natural features that occur in adjacent properties outside of the highway Right-of-Way. These are typically owned by entities other than IDOT, such as a nonprofit, the Illinois Department of Natural Resources, or a private landowner.

Does your District(s) have specific policies/procedures in place when Right-of-Way management occurs near adjacent legally protected natural areas?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your District(s) have specific policies/procedures in place when Right-of-Way management occ... = Yes

Please explain and/or provide links to relevant policies.

_____

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Does your District(s) have specific policies/procedures in place when Right-of-Way management occurs near adjacent properties with sensitive habitats? (for example wetlands or remnant prairies)

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your District(s) have specific policies/procedures in place when Right-of-Way management occ... = Yes

Please explain and/or provide links to relevant policies.

_____

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Does your District(s) have specific policies/procedures in place when Right-of-Way management occurs near adjacent properties with threatened and/or endangered species present?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your District(s) have specific policies/procedures in place when Right-of-Way management occ... = Yes

Please explain and/or provide links to relevant policies.

_____

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Attach policy documents related to adjacent properties here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Conservation Strategies 2

Start of Block: Conservation Strategies 3

Does your District(s) conduct the following conservation activities in roadside Rights-of-Way?

	Yes (1)	No (2)	Unsure (3)
Prescribed/controlled burning (1)	o	o	o
Native plant seeding/planting (2)	o	o	o
Connecting existing habitat patches (3)	o	o	o
Pollinator habitat management (4)	o	o	o
Invasive species management (5)	o	o	o
Biological control of invasive species (6)	o	o	o
Avoiding impacts to threatened and endangered species (7)	o	o	o
Minimizing impacts when threatened and endangered species impacts are unavoidable (8)	o	o	o
Off-site mitigation when threatened and endangered species impacts are unavoidable (9)	o	o	o
Habitat mitigation or compensatory habitat restoration (for example, wetland mitigation) (10)	o	o	o
Stakeholder engagement (11)	o	o	o
Partnerships with outside organizations (12)	o	o	o
GIS mapping of sensitive areas (13)	o	o	o
Field experiments (14)	o	o	o
Other (15)	o	o	o

Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Prescribed/controlled burning [Yes]

What have been the most important factors in successfully implementing prescribed burning as a Right-of-Way management activity? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Native plant seeding/planting [Yes]

What have been the most important factors in successfully implementing native plant seeding/planting as a Right-of-Way management activity? What have been the biggest challenges?

_____

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Connecting existing habitat patches [Yes]

What have been the most important factors in successfully connecting existing habitats in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Pollinator habitat management [Yes]

What have been the most important factors in successfully implementing pollinator habitat management in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Invasive species management [Yes]

What have been the most important factors in successfully controlling invasive species in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Biological control of invasive species [Yes]

What have been the most important factors in successfully implementing biological control of invasive species in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Avoiding impacts to threatened and endangered species [Yes]

What have been the most important factors in successfully avoiding impacts to threatened and endangered species in Rights-of-Way? What have been the biggest challenges?

_____

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Minimizing impacts when threatened and endangered species impacts are unavoidable [Yes]

What have been the most important factors in successfully minimizing unavoidable impacts to threatened and endangered species in Rights-of-Way? What have been the biggest challenges?

_____

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Off-site mitigation when threatened and endangered species impacts are unavoidable [Yes]

What have been the most important factors in successfully implementing off-site mitigation for threatened and endangered species? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Habitat mitigation or compensatory habitat restoration (for example, wetland mitigation) [Yes]

What have been the most important factors in successfully implementing off-site habitat mitigation and/or compensatory habitat restoration? What have been the biggest challenges?

_____

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Stakeholder engagement [Yes]

What have been the most important factors in successful stakeholder engagement? What have been the biggest challenges?

_____

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Partnerships with outside organizations [Yes]

What have been the most important factors in successfully establishing partnerships with outside organizations? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = GIS mapping of sensitive areas [Yes]

What have been the most important factors in successfully incorporating GIS mapping of sensitive areas into Right-of-Way management? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Field experiments [Yes]

What have been the most important factors in successfully implementing field experiments as a Right-of-Way management activity? What have been the biggest challenges?

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Display this question:

If Does your District(s) conduct the following conservation activities in roadside Rights-of-Way? = Other [Yes]

You listed "${Q51/ChoiceTextEntryValue/15}" as a Right-of-Way conservation activity conducted in your District(s). What have been the most important factors in successfully implementing this as a Right-of-Way management activity? What have been the biggest challenges?

_____

_____

_____

Attach conservation policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Conservation Strategies 3

Start of Block: Conservation Strategies 4

What, if anything, do you think needs to be changed in policy or procedure to improve conservation, safety, and invasive species management outcomes in roadside vegetation management?

_____

_____

_____

_____

Do you have any additional comments about your District's conservation and/or vegetation management strategies? If yes, please elaborate here.

_____

_____

_____

_____

_____

End of Block: Conservation Strategies 4

Start of Block: Other Management

Which invasive plant species do you encounter in your work?

	Frequently (1)	Rarely (2)	Never (3)	Present in my state but not in my district/area (4)	Unsure (5)
Teasel (1)	o	o	o	o	o
Buckthorn (2)	o	o	o	o	o
Bush honeysuckle (3)	o	o	o	o	o
Japanese honeysuckle (4)	o	o	o	o	o
Common reed (Phragmites australis) (5)	o	o	o	o	o
Reed canary grass (Phalaris) (6)	o	o	o	o	o
Canada thistle (7)	o	o	o	o	o
Callery/Bradford pear (8)	o	o	o	o	o
Japanese stiltgrass (9)	o	o	o	o	o
Crownvetch (10)	o	o	o	o	o
Autumn olive (11)	o	o	o	o	o
Other (12)	o	o	o	o	o

Display this question:

If Which invasive plant species do you encounter in your work? [Frequently] (Count) > 0

Or Which invasive plant species do you encounter in your work? [Rarely] (Count) > 0

Or Which invasive plant species do you encounter in your work? [Present in my state but not in my district/area] (Count) > 0

What specific management strategies does you District(s) have for this invasive plant?

	Teasel (1)	Buck-thorn (2)	Bush honey-suckle (3)	Japanese honey-suckle (4)	Common reed (Phragmites australis) (5)	Reed canary grass (Phalaris) (6)	Canada thistle (7)	Callery/ Bradford pear (8)	Japanese stiltgrass (9)	Crown-vetch (10)	Autumn olive (11)	"${Q72/ ChoiceTextEntryValue/12}" (12)
Mowing/not mowing (1)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Herbicide (2)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Burning (3)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Brush removal (4)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hand cutting (5)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (6)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (7)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (8)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Attach invasive species policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

How confident do you feel IDOT Operations workers in your District(s) are with differentiating between invasive species and other plants?

- o 1 (least confident) (1)
- o 2 (2)
- o 3 (3)
- o 4 (4)
- o 5 (most confident) (5)
- o Not applicable (6)

How confident do you feel IDOT Operations workers in your District(s) are with identifying native prairie plants from other plants?

- o 1 (least confident) (1)
- o 2 (2)
- o 3 (3)
- o 4 (4)
- o 5 (most confident) (5)
- o Not applicable (6)

End of Block: Other Management

Start of Block: Support

What roadside vegetation maintenance training does your District(s) offer Right-of-Way maintainers?

_____

_____

_____

_____

What resources from IDOT are available to organize or implement conservation best management practices? Which are desired? (select all that apply)

	Click to write Column 1		Click to write Column 2	
	Available (1)	Not available (2)	Desired (1)	Not desired (2)
Internal technical reports, studies, or written policies (1)	o	o	o	o
Technical reports, studies, or written policies from other state Departments of Transportation (2)	o	o	o	o
Lists of relevant contacts (for example a directory of county roadside managers) (3)	o	o	o	o
DOT-assisted trainings (4)	o	o	o	o
GIS or spatial data set of special areas (5)	o	o	o	o
Formal partnerships with non-DOT stakeholders (6)	o	o	o	o
Other (7)	o	o	o	o

End of Block: Support

Start of Block: Block 10

Thank you for completing this survey. If you have any other comments to share, please do so below or by email (ets@illinois.edu).

Other comments

_____

_____

_____

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_____

Please point to any digital resources you are willing to share about management policies (in your District(s) or for IDOT as a whole) by linking them or attaching them below.

_____

_____

_____

_____

_____

Attach any additional files here. Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Block 10

APPENDIX C: OTHER DOTS SURVEY

The survey sent to staff from departments of transportation outside of Illinois is presented in this appendix.

Start of Block: Intro

The Illinois Natural History Survey, in collaboration with the Illinois Center for Transportation and the Illinois Department of Transportation, are conducting a study on roadside vegetation best management practices. We seek your feedback on current vegetation management practices at your department/management unit for inclusion in our final publicly-available report. This survey will require approximately 20 minutes to complete. For all open-response text boxes, **please feel free to share links** to policy documents when that is easier than providing a written summary. **There will be an opportunity to attach files throughout the survey**. Those files can be used to clarify or further explain your responses. Please keep your answers **brief and specific**. All questions may be left blank as needed.

Please provide your contact information below

- o Name (1) _____
- o Email address (2) _____
- o Phone number (3) _____
- o Organization (4) _____
- o Where do you work? Please specify the state, county, region, district, etc. (5) _____
- o Job title or role (6) _____

Can we contact you with further questions?

▼ Yes (1) ... No (2)

Display this question:

If Can we contact you with further questions? = No

Is there a contact from your state that the Illinois Department of Transportation (IDOT) can reach out to if IDOT has any further questions?

_____

_____

_____

_____

_____

End of Block: Intro

Start of Block: Challenges

How significant are these Right-of-Way vegetation challenges in your region or area?

	Significant challenge (1)	Minor challenge (2)	Not a challenge (3)	Unknown/No opinion (4)
Invasive species (1)	o	o	o	o
Mowing restrictions (2)	o	o	o	o
Management of protected resources (3)	o	o	o	o
Brush/woody plant encroachment (4)	o	o	o	o
Other: Comment/explain (7)	o	o	o	o

How significant are these Right-of-Way management challenges in your region or area?

	Significant challenge (1)	Minor challenge (2)	Not a challenge (3)	Unknown/No opinion (4)
Having insufficient funding to complete management activities (1)	o	o	o	o
Having insufficient staff or equipment to complete management activities (2)	o	o	o	o
Logistical constraints (3)	o	o	o	o
Legal requirements (4)	o	o	o	o
Adjacent roadside stakeholders (5)	o	o	o	o
Roadside features as obstacles to vegetation management (for example steep slopes, overpasses, bridges) (6)	o	o	o	o
Safety concerns (7)	o	o	o	o
Lack of clarity on how technical reports, instructional memos, and other written guidance translate to on-the-ground management practices (8)	o	o	o	o
Lack of skills/expertise to	o	o	o	o

	Significant challenge (1)	Minor challenge (2)	Not a challenge (3)	Unknown/No opinion (4)
implement management guidelines (10)				
Difficulty in identifying suitable partnerships with outside organizations (11)	o	o	o	o
Conflicting management needs (12)	o	o	o	o
Other (13)	o	o	o	o

End of Block: Challenges

Start of Block: Conservation Strategies 1

To your knowledge, does your Department/District/Unit have specific conservation policies (for example mowing windows, restricted plant species, chemical spraying guidelines) in place for the following management activities?

	Yes (1)	No (2)	Unsure (3)
Mowing (1)	o	o	o
Brush control and tree trimming (2)	o	o	o
Herbicide application (3)	o	o	o
Insecticide/pesticide application (4)	o	o	o
Mulching and seeding (5)	o	o	o
Erosion control (6)	o	o	o
Prescribed/controlled burning (7)	o	o	o

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mowing [Yes]

What policies/practices are in place for mowing? Please explain and/or provide links to relevant policies.

_____

_____

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mowing [Yes]

Attach mowing policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mowing [Yes]

Are the conservation management policies relating to mowing flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mowing [Yes]

Are the conservation management policies relating to mowing complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Brush control and tree trimming [Yes]

What policies/practices are in place for brush control and tree trimming? Please explain and/or provide links to relevant policies.

_____

_____

_____

_____

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Brush control and tree trimming [Yes]

Attach brush control and tree trimming policy documents here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Brush control and tree trimming [Yes]

Are the conservation management policies relating to brush control and tree trimming flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Brush control and tree trimming [Yes]

Are the conservation management policies relating to brush control and tree trimming complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Herbicide application [Yes]

What policies/practices are in place for herbicide application? Please explain and/or provide links to relevant policies.

_____

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Herbicide application [Yes]

Attach herbicide policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Herbicide application [Yes]

Are the conservation management policies relating to herbicide application flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Herbicide application [Yes]

Are the conservation management policies relating to herbicide application complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Insecticide/pesticide application [Yes]

What policies/practices are in place for insecticide/pesticide application? Please explain and/or provide links to relevant policies.

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Insecticide/pesticide application [Yes]

Attach insecticide/pesticide policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Insecticide/pesticide application [Yes]

Are the conservation management policies relating to insecticide/pesticide application flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Insecticide/pesticide application [Yes]

Are the conservation management policies relating to insecticide/pesticide application complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mulching and seeding [Yes]

What policies/practices are in place for mulching and seeding? Please explain and/or provide links to relevant policies.

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mulching and seeding [Yes]

Attach mulching and seeding policy documents here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mulching and seeding [Yes]

Are the conservation management policies relating to mulching and seeding flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Mulching and seeding [Yes]

Are the conservation management policies relating to mulching and seeding complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Erosion control [Yes]

What policies/practices are in place for erosion control? Please explain and/or provide links to relevant policies.

_____

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Erosion control [Yes]

Attach erosion control policy documents here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Erosion control [Yes]

Are the conservation management policies relating to erosion control flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Erosion control [Yes]

Are the conservation management policies relating to erosion control complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Prescribed/controlled burning [Yes]

What policies/practices are in place for prescribed burning? Please explain and/or provide links to relevant policies.

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Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Prescribed/controlled burning [Yes]

Attach prescribed burning policy documents here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Prescribed/controlled burning [Yes]

Are the conservation management policies relating to prescribed burning flexible enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If To your knowledge, does your Department/District/Unit have specific conservation policies (for ex... = Prescribed/controlled burning [Yes]

Are the conservation management policies relating to prescribed burning complete enough?

- o Yes (1)
- o No (2)
- o Unsure (3)

End of Block: Conservation Strategies 1

Start of Block: Conservation Strategies 2

In practice, how often are conservation priorities incorporated into the following management activities in your Department/District/Unit?

	Almost always (1)	Sometimes (2)	Rarely (3)	Never (4)	Unsure (5)
Mowing (1)	o	o	o	o	o
Brush control and tree trimming (2)	o	o	o	o	o
Herbicide application (3)	o	o	o	o	o
Insecticide/pesticide application (4)	o	o	o	o	o
Mulching and seeding (5)	o	o	o	o	o
Erosion control (6)	o	o	o	o	o
Prescribed/controlled burning (7)	o	o	o	o	o

Page Break

The following questions ask about natural features that occur in adjacent properties outside of the highway Right-of-Way. These are typically owned by entities other than a Department of Transportation, such as a nonprofit, a state Department of Natural Resources, or a private landowner.

Does your Department/District/Unit have specific policies/procedures in place when Right-of-Way management occurs near adjacent legally protected natural areas?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your Department/District/Unit have specific policies/procedures in place when Right-of-Way m... = Yes

Please explain and/or provide links to relevant policies.

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Does your Department/District/Unit have specific policies/procedures in place when Right-of-Way management occurs near adjacent properties with sensitive habitats? (for example wetlands or remnant prairies)

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your Department/District/Unit have specific policies/procedures in place when Right-of-Way m... = Yes

Please explain and/or provide links to relevant policies.

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Does your Department/District/Unit have specific policies/procedures in place when Right-of-Way management occurs near adjacent properties with threatened and/or endangered species present?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your Department/District/Unit have specific policies/procedures in place when Right-of-Way m... = Yes

Please explain and/or provide links to relevant policies.

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Attach policy documents related to adjacent properties here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Conservation Strategies 2

Start of Block: Conservation Strategies 3

Does your Department/District/Unit conduct the following conservation activities in roadside Right-of-Way?

	Yes (1)	No (2)	Unsure (3)
Prescribed/controlled burning (1)	o	o	o
Native plant seeding/planting (2)	o	o	o
Connecting existing habitat patches (3)	o	o	o
Pollinator habitat management (4)	o	o	o
Invasive species management (5)	o	o	o
Biological control of invasive species (6)	o	o	o
Avoiding impacts to threatened and endangered species (7)	o	o	o
Minimizing impacts when threatened and endangered species impacts are unavoidable (8)	o	o	o
Off-site mitigation when threatened and endangered species impacts are unavoidable (9)	o	o	o
Habitat mitigation or compensatory habitat restoration (for example, wetland mitigation) (10)	o	o	o
Stakeholder engagement (11)	o	o	o
Partnerships with outside organizations (12)	o	o	o
GIS mapping of sensitive areas (13)	o	o	o
Field experiments (14)	o	o	o
Other (15)	o	o	o

Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Prescribed/controlled burning [Yes]

What have been the most important factors in successfully implementing prescribed burning as a Right-of-Way management activity? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Native plant seeding/planting [Yes]

What have been the most important factors in successfully implementing native plant seeding/planting as a Right-of-Way management activity? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Connecting existing habitat patches [Yes]

What have been the most important factors in successfully connecting existing habitats in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Pollinator habitat management [Yes]

What have been the most important factors in successfully implementing pollinator habitat management in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Invasive species management [Yes]

What have been the most important factors in successfully controlling invasive species in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Biological control of invasive species [Yes]

What have been the most important factors in successfully implementing biological control of invasive species in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Avoiding impacts to threatened and endangered species [Yes]

What have been the most important factors in successfully avoiding impacts to threatened and endangered species in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Minimizing impacts when threatened and endangered species impacts are unavoidable [Yes]

What have been the most important factors in successfully minimizing unavoidable impacts to threatened and endangered species in Rights-of-Way? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Off-site mitigation when threatened and endangered species impacts are unavoidable [Yes]

What have been the most important factors in successfully implementing off-site mitigation for threatened and endangered species? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Habitat mitigation or compensatory habitat restoration (for example, wetland mitigation) [Yes]

What have been the most important factors in successfully implementing off-site habitat mitigation and/or compensatory habitat restoration? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Stakeholder engagement [Yes]

What have been the most important factors in successful stakeholder engagement? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Partnerships with outside organizations [Yes]

What have been the most important factors in successfully establishing partnerships with outside organizations? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = GIS mapping of sensitive areas [Yes]

What have been the most important factors in successfully incorporating GIS mapping of sensitive areas into Right-of-Way management? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Field experiments [Yes]

What have been the most important factors in successfully implementing field experiments as a Right-of-Way management activity? What have been the biggest challenges?

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Display this question:

If Does your Department/District/Unit conduct the following conservation activities in roadside Righ... = Other [Yes]

You listed "${Q51/ChoiceTextEntryValue/15}" as a Right-of-Way conservation activity conducted in your State/District/Unit. What have been the most important factors in successfully implementing this as a Right-of-Way management activity? What have been the biggest challenges?

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Attach conservation policy documents here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Conservation Strategies 3

Start of Block: Conservation Strategies 4

What, if anything, do you think needs to be changed in policy or procedure to improve conservation, safety, and invasive species management outcomes in roadside vegetation management?

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Do you have any additional comments about your Department/District/Unit's conservation and/or vegetation management strategies? If yes, please elaborate here.

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End of Block: Conservation Strategies 4

Start of Block: Other Management 1

What special landscapes, ecological resources, management areas, etc. occur on or near Rights-of-Way within your state? (check all that apply)

- ☐ Grasslands/prairies (1)
- ☐ Savannas (2)
- ☐ Forests (3)
- ☐ Wetlands (4)
- ☐ Shrublands (5)
- ☐ Wildlife refuges (6)
- ☐ Other (7) _____

How do you address Right-of-Way infrastructure maintenance needs in/near those special landscapes (for example ecological contractors, site specific best management practices, etc.)?

_____

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Attach policy documents relating to special landscapes here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Other Management 1

Start of Block: Other Management 2

Which invasive plant species do you encounter in your work?

	Frequently (1)	Rarely (2)	Never (3)	Present in my state but not in my district/area (4)	Unsure (5)
Teasel (1)	o	o	o	o	o
Buckthorn (2)	o	o	o	o	o
Bush honeysuckle (3)	o	o	o	o	o
Japanese honeysuckle (4)	o	o	o	o	o
Common reed (Phragmites australis) (5)	o	o	o	o	o
Reed canary grass (Phalaris) (6)	o	o	o	o	o
Canada thistle (7)	o	o	o	o	o
Callery/Bradford pear (8)	o	o	o	o	o
Japanese stiltgrass (9)	o	o	o	o	o
Crownvetch (10)	o	o	o	o	o
Autumn/Russian olive (11)	o	o	o	o	o
Other (12)	o	o	o	o	o

Display this question:

If Which invasive plant species do you encounter in your work? [Frequently] (Count) > 0

Or Which invasive plant species do you encounter in your work? [Rarely] (Count) > 0

Or Which invasive plant species do you encounter in your work? [Present in my state but not in my district/area] (Count) > 0

What specific management strategies does you department/district/unit have for this invasive plant?

	Teasel (1)	Buck-thorn (2)	Bush honey-suckle (3)	Japanese honey-suckle (4)	Common reed (Phragmites australis) (5)	Reed canary grass (Phalaris) (6)	Canada thistle (7)	Callery/ Bradford pear (8)	Japanese stiltgrass (9)	Crownvetch (10)	Autumn/ Russian olive (11)	"${Q72/ ChoiceText EntryValue /12}" (12)
Mowing/ not mowing (1)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Herbicide (2)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Burning (3)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Brush removal (4)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hand cutting (5)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (6)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (7)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (8)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Attach invasive species policy documents here (optional). Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

How confident do you feel Operations workers in your Department/District/Unit are with differentiating between invasive species and other plants?

- o 1 (least confident) (1)
- o 2 (2)
- o 3 (3)
- o 4 (4)
- o 5 (most confident) (5)
- o Not applicable (6)

How confident do you feel Operations workers in your Department/District/Unit are with identifying native plants from other plants?

- o 1 (least confident) (1)
- o 2 (2)
- o 3 (3)
- o 4 (4)
- o 5 (most confident) (5)
- o Not applicable (6)

End of Block: Other Management 2

Start of Block: IRVM

Integrated Roadside Vegetation Management (IRVM) is an approach to Right-of-Way maintenance that incorporates ecological principles to establish and maintain safe and functional roadsides. Illinois Department of Transportation is seeking to develop an IRVM policy.

Does your state/department/unit have an Integrated Roadside Vegetation Management policy?

- o Yes (1)
- o No (2)
- o Unsure (3)

Display this question:

If Does your state/department/unit have an Integrated Roadside Vegetation Management policy? = Yes

At what level is your IRVM policy defined and implemented?

- o State-level policy implemented at the state level (for example by a statewide IRVM coordinator) (1)
- o State-level policy implemented at the district level (for example by district IRVM coordinators) (2)
- o State-level policy implemented at the county level (for example by county road departments) (3)
- o District-level policy implemented at the district level (4)
- o County-level policy implemented at the county level (5)
- o Other (6) _____

Display this question:

If Does your state/department/unit have an Integrated Roadside Vegetation Management policy? = Yes

Is there other important information on how your IRVM policy is implemented? Please explain and/or provide links to relevant policies.

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Display this question:

If Does your state/department/unit have an Integrated Roadside Vegetation Management policy? = Yes

Attach IRVM policy documents here (optional) Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: IRVM

Start of Block: Support

What roadside vegetation maintenance training does your Department/District/Unit offer Right-of-Way maintainers?

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What resources from your Department of Transportation are available to organize or implement conservation best management practices and/or Integrated Roadside Vegetation Management? Which are desired? (select all that apply)

	Available		Desired	
	Available (1)	Not Available (2)	Desired (1)	Not desired (2)
Internal technical reports, studies, or written policies (1)	o	o	o	o
Technical reports, studies, or written policies from other state Departments of Transportation (2)	o	o	o	o
Lists of relevant contacts (for example a directory of county roadside managers) (3)	o	o	o	o
DOT-assisted trainings (4)	o	o	o	o

	Available		Desired	
	Available (1)	Not Available (2)	Desired (1)	Not desired (2)
GIS or spatial data set of special areas (5)	o	o	o	o
Formal partnerships with non-DOT stakeholders (6)	o	o	o	o
Other (7)	o	o	o	o

End of Block: Support

Start of Block: Block 10

Thank you for completing this survey. If you have any other comments to share, please do so below or by email (ets@illinois.edu).

Other comments

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_____

Please point to any digital resources you are willing to share about management policies (in your region/district or for your Department of Transportation as a whole) by linking them or attaching them below.

_____

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Attach any additional files here. Multiple files can be uploaded by compressing them into a ZIP file, or they can be emailed to ets@illinois.edu.

End of Block: Block 10


Illinois Department
of Transportation


ILLINOIS