NEBRASKA

Good Life. Great Journey.

DEPARTMENT OF ROADS

NDOR Roadside Vegetation Establishment and Management

This document supersedes previous versions of this document and NDOR's Chemical Usage Guidelines, Seeding Handbook and Mowing Guidelines.

2017

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Document Development

Developing this document began as an effort to combine several of the Nebraska Department of Roads' (NDOR) handbooks, guidebooks, and other documents pertaining to roadside vegetation. During development, we reviewed several documents prepared by other state departments of transportation, federal agencies, and other entities. Through this process, information was discovered that complements and expands upon the information originally planned for this document. The contents of this document were gathered from the following websites and agency publications, in addition to NDOR's own:

Executive Order 13112 Invasive species. February 3, 1999.

http://www.fhwa.dot.gov/environment/020399em.htm

Minnesota Department of Transportation. 2008. Best practices handbook for roadside vegetation management, final report. 156 pages.

http://www.lrrb.org/pdf/200820.pdf

National Cooperative Highway Research Program. 2007. Guidelines for vegetation management. 43 pages.

The White House. 2014. Presidential memorandum – Creating a Federal strategy to promote the health of honey bees and other pollinators. Office of the Press Secretary. http://www.whitehouse.gov/the-press-office/2014/06/20/presidential-memorandum-creating-federal-strategy-promote-health-honey-b.

U.S. Department of Agriculture, Forest Service. 2008. Tree owner's manual for the northeastern and Midwestern United States. 40 pages.

http://na.fs.fed.us/pubs/uf/tom/090202_tom_hr.pdf

University of Nebraska Lincoln Extension. 2015. Guide for weed management in Nebraska. 300+ pages.

http://extensionpublications.unl.edu/assets/pdf/ec130.pdf

Washington State Department of Transportation. 2012. Eastern region, Area 2 integrated roadside vegetation management plan. 56 pages.

http://www.wsdot.wa.gov/Maintenance/Roadside/mgmt_plans.htm

Introduction

The Nebraska Department of Roads' mission statement is supported by several goals, including a commitment to environmental stewardship.

The way that NDOR constructs projects, the post-construction conditions, and the maintenance of the roadside all contribute to fulfilling this commitment. Establishing desirable vegetation and managing roadsides to promote its success, as well as removing undesirable plants, all help to keep NDOR in compliance with environmental commitments. The Roadside Stabilization Unit (RSU) focuses on these activities and is comprised of these staff members:

Ron Poe	Specifications, erosion control, program management
Blayne Renner	Construction environmental compliance
Gabe Robertson	Municipal and post-construction stormwater, BMPs, database tracking
Shane Sisel	Maintenance/Operations environmental compliance
Nick Soper	Erosion control design, landscape design
Tyler Thayer	Construction environmental compliance
Carol Wienhold	Seed mixtures, evaluation of re-vegetation success

The plants that grow along Nebraska's roadsides may occur naturally, may have been intentionally planted, or may have been carried there by wind, water, wildlife, or a passing vehicle. Roadside vegetation performs functions that benefit people and their environment. In part, those benefits include:

- **Safety** Low-growing vegetation on highway shoulders maintains sight distances free of physical obstructions and visibility problems. Hazard-free zones for errant vehicles are vegetated by grasses and other appropriate vegetation. Roadside vegetation also can reduce the effects of blowing and drifting snow on highways.
- **Economic** Presence of grasses is especially effective in minimizing erosion around culvert pipes and other highway facilities and structures. Properly maintained vegetation extends the life of and protects highway features (e.g., culvert pipes, box culverts, and field driveways) by reducing costly erosion events on roadsides. In addition, the appearance of roadsides is a significant part of a visitor's experience. Tourists that have a good traveling experience are more likely to return, thus aiding local economies.
- **Erosion Control** Vegetation is the most effective and efficient form of erosion control. When effectively established and maintained, vegetation can protect shoulders, ditches and slopes by reducing erosion and increasing general stability.
- **Environmental** Water quality is improved by vegetation's abilities in trapping sediment and increasing water infiltration. Roadside corridors constitute a

significant area of land, offering production of oxygen and a trap for carbon dioxide. Roadsides offer forage and habitat for pollinating organisms, which are crucial to sustainability of human food production and environmental health. In addition, a good stand of roadside vegetation doesn't leave spaces for noxious or invasive weeds to thrive.

- **Aesthetic** Healthy vegetation appropriate for the area gives an attractive appearance to the roadway. Use of native grasses, flowers, shrubs and trees aid the permanence of the look. The traveling public gauges what they're getting for their money in part by what they see in the roadside.

NDOR's roadside seed mixtures are composed primarily of native plant species, and are based on information in NDOR's "Plan for the Roadside Environment." NDOR favors the use of native species because of the deep root systems (benefits include anchorage, soil erosion prevention, and drought tolerance) that are characteristic of native species. A native species planting is a more self-sustaining and stable community, and is beneficial to pollinating organisms. These plant species are adapted to the area's climate and physical conditions, and so are more likely to succeed over the long term. However, fortifying the seed mixtures for highway shoulders and other erodible areas with small amounts of perennial ryegrass and/or Kentucky fescue affords certainty that if native species don't provide cover quickly enough, then the introduced species will fill the ecological opening and hold the soil during initial stabilization. A regulatory team of Nebraska state agencies and federal agencies, together with NDOR, have set a general conservation condition to guide the species composition of NDOR's seed mixtures.

Roadside re-vegetation (after construction or as a maintenance action) requires reliable, rapid establishment of plant cover, not only for roadside aesthetics, but also to stabilize disturbed soils and to minimize maintenance requirements. Roadside soils typically are nutrient-poor and compacted, posing an inhospitable environment for seed germination and seedling establishment. This condition sometimes makes it more difficult to keep desirable, resilient plants growing on highway rights-of-way.

The tools and materials used in roadside stabilization projects must be selected with priority given to quick, permanent, and reliable vegetation cover. NDOR desires the seeded native species to be the long-term vegetation community on its roadsides. However, since the native species need substantial time to become established, use of non-native, quicker-establishing species in small amounts may be required to attain post-construction soil stabilization.

Non-native (also known as introduced) species used in NDOR's seed mixtures are included for their abilities to become established rapidly and reliably in the roadside environment. The term "introduced" should not automatically be equated with "invasive" or "noxious." Introduced species originated in another setting (many are from Europe or Asia), and then were moved to their present location, either intentionally or inadvertently, and currently exist as part of the local flora.

Invasive species are a grouping of plants that have invasive traits to the point that they are monitored for expansion into new areas and for their effect on their surroundings. Plants on this list may be on an adjoining state's weed list or may be affecting agriculture or ecosystems in Nebraska. The list contains numerous species, but does not include perennial ryegrass, Kentucky fescue or any other species currently used in NDOR's seeding program.

Listed noxious weeds have been determined to pose a serious threat to the economic, social, or aesthetic well-being of the residents of the state. Noxious weeds compete with pasture and crops, reducing yields substantially. Some noxious weeds are poisonous or injurious to people, livestock, and/or wildlife. The losses resulting from noxious weed infestations can be significant, costing residents millions of dollars due to lost production. Nebraska's Noxious Weed list includes several plant species, but does not include species currently used in NDOR's seeding program.

NDOR's Plan for the Roadside Environment is a guide for designing roadsides that can better overcome the disturbances of construction, withstand the rigors of climate and perform the landscaping objectives that contribute to safe and maintainable roadsides. The Plan incorporates highway type (urban/rural and corridor classification) with location within the state, nearness to scenic features, and more in order to assist in selecting appropriate species for roadside use. The Plan can be accessed at:

http://www.nebraskatransportation.org/environment/roadside-plan.html

Establishing roadside plant cover commonly begins with road construction or maintenance projects. Managing roadside vegetation reduces weeds, improves motorist safety, and protects roadway facilities.

Roadside Stabilization Practices

Highway maintenance or construction work usually concludes with disturbed areas being seeded and protected from erosion. Seeding grasses and flowers, and planting shrubs and trees as a part of road projects can be the beginning of a functional and attractive roadside. Equally as important, protecting against soil erosion helps project proponents comply with National Pollutant Discharge Elimination System (NPDES) regulations.

Types of Soil Erosion:

Soil erosion can occur by a number of processes. Those of greatest concern are primarily caused by water as splash, sheet, and rill erosion on slopes, and channel erosion in concentrated flow areas.

Splash Erosion occurs when raindrops dislodge exposed soil particles. These particles settle in soil pores and when dry, form a crust, which reduces infiltration during subsequent rain events.

Sheet Erosion occurs in heavier rain events on uniformly smooth soil surfaces. Dislodged particles become suspended and are transported downslope.

Rill Erosion occurs when slight differences in soil surface elevation cause runoff to concentrate and form a pattern of cuts or rills. It is more likely to occur than sheet erosion since slopes are rarely uniformly smooth.

Channel Erosion occurs in concentrated flow areas and is caused by downward scour due to flow shear stress. Roadside ditches may act as conduits for concentrated flow.

Planning to Prevent Soil Erosion

Erosion control objectives should be considered in the planning stage of each road project. Many factors affect a site's erosion potential. Some also affect how quickly vegetation will establish and provide stabilization. The following interconnected factors should be analyzed to determine what erosion control practices are necessary:

- Time of year (how long will soil be exposed?)
- Soil type and fertility
- Slope length, grade and aspect (slope faces north, west, etc.)
- Off-site surface flow onto the project area
- Weather forecast

Additional considerations include the consequences of failure and the presence of sensitive areas (like wetlands, sensitive waterways, or designated critical habitat for endangered species).

Construction Stormwater Best Management Practices (BMPs) are structural and non-structural measures implemented during and after road work, to manage soil erosion,

sedimentation (the deposition of soil particles), and stormwater pollution. Erosion control measures are directed at preventing soil particles from moving. Sedimentation control measures stop soil particles that have become mobile.

While these practices represent approaches that comply with environmental permit requirements, they also represent the first stages of roadside vegetation establishment. In other words, vegetation planted during the project's construction phase becomes the initial roadside vegetation community.

Construction and maintenance practices that are important to establishing roadside vegetation include:

1. Minimizing soil disturbance – preserving existing plant cover in areas that don't need to be disturbed reduces the likelihood of soil erosion.
2. Phasing seeding activities to be concurrent with construction – seed areas as the finish grading is completed. This way, disturbed soils are exposed for the least possible amount of time.
3. Using erosion and sediment control techniques and products:
    - Vegetated Buffers – intercept rainfall, promote infiltration, and process stormwater runoff.
    - Topsoil Storage and Placement – removing and storing topsoil from a project area allows it to be returned during the final construction phases. Topsoil is a valuable commodity for plant growth because it contains organic matter, soil microbes, and nutrients for plant growth.
    - Rolled Erosion Control Products – soil preparation, fertilizer application (if specified), and seeding is required prior to erosion control blanket installation.
    - Mulch Application – after seeding, placement of mulch helps retain soil moisture for seed germination.
    - Planting Permanent and Temporary Seed Mixtures – vegetation is the most effective, long-term form of erosion control. NDOR's Roadside Stabilization Unit specifies the seed mixtures for all portions of its construction projects, based on regional growing conditions.
4. Tree Protection During Construction – trees or shrubs that appear to be part of an intentional landscaping design should not be cut, removed, injured, or destroyed without consulting the Roadside Stabilization Unit.

Protected Species and Sensitive Resources in the Right of Way

Even though roadsides have been disturbed for construction and are populated with plant species from a seed mixture, they also can serve as habitat for populations of plant species of special interest. For generations, biologists have searched roadsides and railroad grades for plants that are characteristic of the area's historic flora.

Habitat destruction is the primary reason that species come to need legal protection. Where these distinctive species and plant communities occur on its right-of-way, NDOR can modify its vegetation management practices to comply with protection laws and to help these natural resources to survive.

Above: Western prairie fringed orchid (Plantanthera praeclara) Photo by: Carol Wienhold, NDOR

Above: Small white lady's slipper (Cypripedium canididum) Photo by: Eric Zach

Nebraska's Protected Plant Species

Above: Saltwort (Salicornia rubra) Photo by: Steve Duecker

Above: Blowout penstemon (Penstemon haydenii) Photo by: Department of Agronomy and Horticulture, University of Nebraska-Lincoln

Above: Ginseng (Panax quinquefolium) Photo by: Tom Harville, NCNPS

Above: Colorado butterfly plant (Gaura neomexicana coloradensis) Photo by: Tyler Abbott

Above: Ute ladies' tresses (Spiranthes diluvialis) Photo by: **Teresa Prendusi, US Forest Service Regional Botanist, Intermountain Region**

Federal or state-protected plant species have been identified along NDOR right-of-way segments, especially the western prairie fringed orchid and the small white lady's slipper. NDOR's Environmental Section staff members also check some locations for saltwort, Colorado butterfly plant, blowout penstemon, ginseng, and Ute lady's slipper.

Killing or damaging the plants can result in fines and other penalties under federal laws and/or state laws from the agencies that protect these species. Mowing or spraying where these species occur must be coordinated through NDOR's Environmental Section. Photographs of the species to watch for are included in this section. Contact these NDOR staff if you find the plant species in NDOR right-of-way:

Melissa Marinovich	(402) 479-3546	melissa.marinovich@nebraska.gov
Zach Cunningham	(402) 479-4464	zach.cunningham@nebraska.gov
Carol Wienhold	(402) 479-3917	carol.wienhold@nebraska.gov

Example: Along Highway 13 in District 3, small white lady's slipper plants occur in the right-of-way. NDOR has posted these areas with signs reading "MOWING PROHIBITED". The mowing contractor is aware of the special situation, and mowing is delayed in these areas. Through this coordination, the plants are left to grow, bloom, and produce seed before the roadsides are mowed. The Nebraska Game and Parks Commission was helpful in assisting NDOR in determining the extent of the areas that needed to be posted, and in working out when vegetation management is okay to perform.

Native Prairie Remnants are the last remaining bits of the prairie that historically covered the state. Where a portion of a remnant occurs on NDOR ROW, NDOR has the ability to let those plants complete their life cycles before carrying out vegetation management actions there. The grassland plants growing in the prairie remnant generally are genetically different than those used in Nebraska's roadside seed mixtures. Unfortunately, spraying these plants or mowing them at the wrong time of year can wipe out a bit of our prairie heritage. Mowing these areas before the plants produce seeds can make the prairie remnant's future uncertain. Allowing the grasses and flowers in a prairie remnant to complete their life cycles prior to mowing or spraying should be a priority. Don't mow or spray these areas until October 1 or after.

To find out whether a location is identified as a native prairie remnant, contact

Melissa Marinovich	(402) 479-3546	melissa.marinovich@nebraska.gov
Zach Cunningham	(402) 479-4464	zach.cunningham@nebraska.gov
Carol Wienhold	(402) 479-3917	carol.wienhold@nebraska.gov

In your message, please provide the nearest reference post and on which side of the highway (north, south, east, or west) the potential native prairie occurs.

Seeding

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Seeding

Introduction

Establishing vegetation in a disturbed area is a key tool in reducing soil erosion and controlling sediment. Selecting the most appropriate complement of plant species and implementing the right seeding method, amendments, and follow-up improves the likelihood of successful re-vegetation.

This chapter provides recommendations for seeding disturbed areas, especially areas affected by road maintenance projects. Recommendations for fertilizing, mulching, inspection, and management are given for increasing the success of vegetation establishment. The information in this chapter supersedes that given in the 2005 Nebraska Department of Roads (NDOR) handbook and previous versions of this document (2012 and 2014).

Erosion control planning is required prior to disturbing the soil. The "Erosion Control Products" section (see page 20) provides NDOR's website locations to help you design the project to minimize erosion, and to select erosion control products for your project.

This document emphasizes the use of plant species native to Nebraska. However, small quantities of the introduced species Kentucky fescue and perennial ryegrass are included in seed mixtures for shoulders and where erosion control blanket is used.

Native species evolved in North America. Species native to Nebraska are adapted to withstand temperature extremes, drought conditions, day length, wind, and being covered with snow. Natives belong here and are preferred for use in NDOR's mixtures. The deeper root systems of native plants hold soil more effectively and can harvest water from soils in drought (allowing the plants to survive in drought conditions). Generally, NDOR specifies commercially-available cultivars of species that are native to our state.

Introduced species were brought to the continent, either on purpose or by accident. NDOR may include small quantities of introduced species in some of its mixtures (on shoulders and in highly erosion-prone areas) because of its need for rapid, reliable establishment of grass cover. These species are primarily used to assist with shoulder re-vegetation due to the difficulties with establishing vegetation in these locations.

Seeding Practices for Optimizing Results

NDOR promotes the use of native plant species that are most likely to thrive in a particular region of the state. This practice encourages permanent, diverse, productive plant cover on the state's roadsides. Selecting suitable species and planting the appropriate mixture are critical to successful roadside stabilization.

1. **Seed mixtures designed for the purpose**

   No single plant species has the ability to thrive in every setting. However, each species has qualities that can be put into service where needed. NDOR designs

seed mixtures that include species with complementary traits in order to stabilize roadsides and other right-of-way areas (suggested seed mixtures are included in the Appendix of this chapter, pages 23-32), as well as to create a roadside environment that exhibits the traits of the various landscape regions of the state.

Benefits to this approach include

1. Increased likelihood of the seeded plants germinating
2. Increased durability and permanence of the vegetation
3. Active plant growth throughout the growing season
4. Increased control of soil erosion
5. Lower maintenance and mowing costs
6. Planted areas blend with the natural context of the surrounding area

NDOR recognizes that the plant species present on a site will change as the project's vegetation becomes established and matures. Species in the permanent seed mixtures are selected based upon many factors, some of which include speed of establishment and permanence. Some species are selected based on their ability to become established quickly, then fade away as other species that take longer to establish become part of the stand.

Areas typically seeded for highway maintenance are unique both in their site conditions (for example, soil type and slope) and in the type of vegetation that will perform best in that setting. Typical settings are described below:

- **Rural Highway Shoulders** seeding is appropriate for the median areas and for a width of approximately 16 feet adjacent to the edge of the pavement or surfaced shoulder of roadways and ramps. Within NDOR, this area is typically referred to as "Type B" seeding.

  Species included in the shoulder seed mixture are generally short-stature and durable. The roadway shoulder may be impacted by straying vehicles, snow removal equipment, repeated mowing, or chemical treatments. Establishing vegetation in this harsh environment is a challenge, even with good soil and moisture conditions.

- **Urban Roadsides and Lawns** usually receive a seed mixture of grasses selected to give a manicured appearance and tolerate frequent mowing. In addition to being seeded on shoulders, city boulevards, urban interchanges, rest areas, and NDOR lawn areas may receive this mixture. In addition to seeding, appropriate sod types are used in urban areas as well for quick establishment and roadside aesthetics.

- **Foreslopes, Ditches, and Backslopes (FDB)** seeding is recommended on most non-shoulder areas within the limits of the project, except areas designated with specialty mixtures. Within NDOR, this area is also referred to as “Type A” seeding.

  FDB areas generally extend from 16 feet away from the pavement edge out to the right-of-way boundary. Use of taller species is acceptable and inclusion of flowers is a priority in these locations. FDB seeding usually is on slopes, increasing the importance of year-long living vegetation cover. Seeding several species on these disturbed slopes helps to ensure vegetation cover during all seasons. FDB areas are not intended to be mowed except as specified in Part 4 (Mowing) of the Managing Roadside Vegetation chapter.

  FDB areas may contain areas of densely planted wildflower seed. NDOR refers to these areas as “wildflower islands” and are intended to develop into habitat for pollinating organisms. Mowing and maintenance of these areas are described in the Mowing portion of the Managing Roadside Vegetation section.

- **Wetland** seeding usually is performed at NDOR wetland mitigation sites or mitigation bank sites. Species used in the mixture(s) must tolerate soil moisture. Sprigs and saplings may also be part of the planting plan. Species are selected from categories of moisture tolerance - inundated, saturated, and moist soils.

  When possible, planting the wetland seed mixture with a seed drill is preferred. However, if the site is too wet, seed may be broadcast over the area. Following the broadcast seeding, measures to improve seed-to-soil contact are encouraged. This may include dragging chains or a segment of chain-link fence over the seeded area.

- **Buffer Areas** sometimes are specified next to a wetland or waterway. Usually a buffer area is on a slope, so selecting species that grow deep root systems is a priority. Plant species selected here are bunch-grasses and sod-forming native grasses. Legumes and flowers may also be included, depending on the setting. Buffer areas are not meant to be mowed, unless specified in the vegetation management plan for that location. Buffer areas are typically planted with a Type A mixture similar to foreslope, ditch and backslope areas, and may contain wildflower islands. However, these locations may have a specific mixture based upon any project-specific environmental commitments.

- **Other Right-of-Way Areas** may include bike or pedestrian paths, or special scenic planting areas, possibly within a rest area. Each of these settings has factors to be considered when choosing the species to be seeded. Bicycle/pedestrian pathways generally will include a larger proportion of flowers, along with grasses for stabilization. Generally, a rest area will have a lawn-type sod or seed mixture with areas of trees, shrubs, flowers or ornamental grasses.

- **Temporarily Idle Areas** may need vegetation that begins growing rapidly to control erosion, and is needed for only a short time during the restoration or construction of a site.

  Cover Crop is intended for disturbed areas that will not be worked on again for 14 days or more. The seeding usually is limited to one species of a cereal grain. The plant cover grows quickly and lasts up to 1 year. The species to use depends on the time of year that seeding will occur.

  Temporary Cover is intended for areas needing vegetation for 1-4 years. Examples of this seeding include stockpiles, shoo-flies, and graded areas that will be worked on again in the future. Keeping the cost low and providing fast grass cover are priorities. Temporary cover mixtures will include fewer species than other mixtures.

2. Seeding Materials and Methods

a. Acquiring Seed

The NDOR Districts determine the total seed requirement for the areas where seeding is to occur and supplies the seed company with the area (acres or square yards) to be seeded, as well as the seed mixture to be used.

Suggested seed mixtures for shoulders and FDB for all regions in the state are provided in the Appendix. Select the seed mixture for the Nebraska region in which the project occurs (see the map on page 24). NOTE: The "Foreslope, Ditch and Backslope" mixture for each region contains four species of wildflowers (listed just above the oats or rye cover crop on pages 25-30). As an alternative to the suggested seed mixtures, the Environmental Section's Roadside Stabilization Unit (RSU) will provide site-specific seed mixtures for unique situations.

1. NDOR District staff should provide the seed dealer with 1) the NDOR seed mixture selected and 2) the area (usually number of acres or square yards) to be seeded.
2. The seed dealer will furnish a laboratory analysis of each type and lot of seed proposed for use. The analysis is performed by an accredited seed laboratory, and provides complete information on the seed as required by State and Federal seed laws. These records should be kept on file.
3. The minimum percentage of purity for seed included in the mixture shall be as specified. Varieties of seeds and their proportions required in the mixtures shall be as specified. The seed shall be mixed, bagged and tagged at the seed company. Only the seed company is allowed to attach the tags to the bags.
4. Small/light seed shall be bagged separately from large/fluffy seed when called for in the specifications for the project.

5. The seed shall be delivered to the project or Operations facility with the NDOR tags attached to the bags. The seed shall not be used until the District's NDOR representative collects the tags from the bag immediately prior to use.
6. Seed proposed for use shall not be planted without the prior approval of the District or the RSU.

Adapting NDOR's Roadside Seed Mixture for Local Site Conditions

Demands on NDOR's roadside seed mixtures have become more rigorous. Plantings must stabilize disturbed soils and withstand poor soil conditions and repeated mowing. Researchers evaluated roadside seeding segments statewide to 1) determine what species from the seed mixture are currently represented and/or what volunteer species occur, and 2) use that information to develop site-specific seed mixtures that will succeed in stabilizing the disturbed roadside. The goal is to improve NDOR's seed mixtures to grow in regional environmental conditions.

b. When to Plant

Prior to planting any roadside seed mixture, install all erosion control Best Management Practices (BMPs) that require earth moving, such as sediment basins, dikes and berms, in the area to be seeded.

Seeding operations shall be performed only during the periods March 15 to June 15, and August 1 to September 15. If conditions allow, dormant seeding may occur from November 1 through March 14. However, the RSU recommends against seeding highway shoulders between November 1 and March 14, because of the potential impact of snow removal operations on the newly-seeded area.

The reasoning behind prohibiting seeding in late June and July is that the soil is too hot and rain generally is too infrequent in mid-summer to give newly-planted seeds what they need for germination and initial seedling growth. Resuming seeding operations when the soil temperature is cooler and rain is more likely gives the roadside seed mixture a better chance of growing.

No seeding shall be performed when the ground is frozen, wet or otherwise untillable, or when even distribution of materials cannot be attained.

If seed mixtures need to be stored until planting conditions are right, keep the seed cool and dry (temperature + humidity should total less than 100).

c. Seedbed Preparation

1. The seed bed shall be prepared not more than 5 days prior to seeding.
2. In heavily vegetated areas to be seeded, mow existing vegetation growth that cannot be disked under. Rake and remove the mowing residue if it cannot be acceptably tilled into the seedbed. Till existing weed stubble, small weeds, and other vegetation into the soil during seedbed preparation.
3. Seedbed preparation culminates in loosening the soil to a depth of not less than 3 inches with a disk, harrow, rake, or by other approved means. Several passes may be required, depending on soil conditions, to provide a satisfactory seedbed. Disking, harrowing, and raking shall be done parallel to the land contour.
4. When salvaged topsoil is available for use or composted manure is specified, disking after spreading the materials will reduce large clumps and evenly distribute the soil.
5. Extreme care shall be exercised to avoid injury to trees and shrubs that have been designated to be preserved.
6. Seedbed preparation should not be performed when soils are excessively wet.

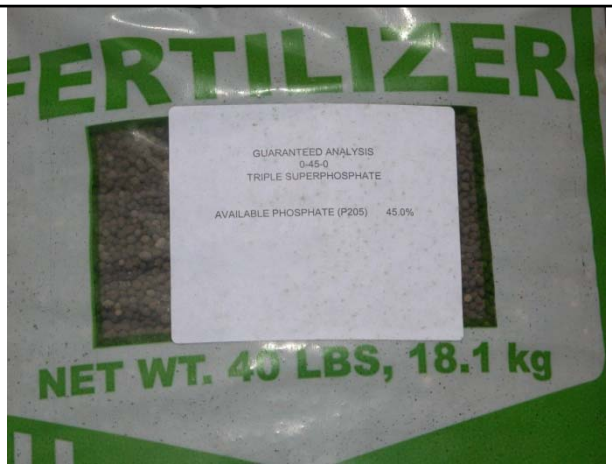
d. Fertilizer

Where a top-dressing of composted manure or salvaged and re-spread topsoil is used, commercial fertilizer should not be applied. However, when topsoil is not salvaged or when the RSU has concerns about soil nutrients, then fertilizer is used to promote the growth of quick-germinating grass species.

Based on recent research results, NDOR has adjusted its usage of fertilizers. Phosphorus was found to provide minimal benefit to newly-seeded backslope areas, and will not be routinely used there. However, phosphorus fertilizer is appropriate for use with shoulder seeding (rate is 92 or 96 lb/ac or 23 or 24 lb/1000 SY). Nitrogen is recommended at 19 or 36 lb/ac or 4 or 9 lb/1000 SY for any new seeding. If another formulation is proposed for use, contact the RSU (Ron Poe at (402) 479-4499) for approval.

All fertilizers shall be checked and approved by the District or the RSU for acceptability prior to their use. The District or RSU may approve immediate use of any commercial inorganic fertiizer that is registered for sale in Nebraska. Fertilizer formulations 11-52-0, 18-46-0 and 16-48-0 are routinely used in NDOR operations. Any of these three formulations may be used on NDOR projects. If another formulation is proposed for use, contact the Roadside Stabilization Unit (Ron Poe at 402-479-4499) for approval.

Fertilizer Effects on Attaining Roadside Vegetation Requirements



NDOR conducted research to define fertilizer types and application rates that increase the success of re-vegetation on construction projects. This study examined vegetation establishment from a seed mixture, using various fertility treatments. Treatments included incremental rates of phosphorus and nitrogen, with added-topsoil and no added-topsoil substrates as an additional variable. Use of mycorrhizae as a soil amendment was also studied. The study helped NDOR decide to refine phosphorus use in its fertilizing procedure and highlighted the potential benefits of including mycorrhizae as a soil amendment.

Fertilizer shall be a synthetic organic or inorganic product of an approved commercial type, containing nitrogen (N), phosphoric acid (P), and potash (K) in a recognized plant nutrient form, and shall be guaranteed to comply with the minimum requirements of these specifications.

Fertilizer shall be furnished and delivered in standard bags or bulk. If distributed in bulk, a written or printed statement of the weight and formulation information shall accompany delivery and be supplied to the District.

The grade and the guaranteed analysis of a fertilizer express the minimum total nitrogen (N) content, and the minimum phosphorus content (P) and the minimum potassium/potash content (K) in that order. For example, 18-46-0 grade fertilizer contains 18 percent total nitrogen, 46 percent available phosphorus (as phosphoric acid), and zero percent water soluble potassium/potash.

<u>If composted manure or topsoil is NOT being used as a top dressing, use 100 lb/acre of either 16-48-0 or 11-52-0</u>. However, <u>if the special provision for seeding specifies 0 pounds of fertilizer, then those seeding areas should not receive fertilizer</u>.

Any grade or mixture of grades of nitrogen and phosphoric acid fertilizer may be used in order to provide the minimum pounds per acre of nitrogen, available phosphoric acid, and water soluble potash, <u>in conformance with the special provisions</u>.

Fertilizer may be blended before delivery to the site.

The fertilizer shall be applied with approved mechanical spreaders or with a hydraulic seeder at the rate specified with the seed mixture and shall uniformly cover the entire area.

Fertilizer shall be incorporated into the soil before or during the seeding operation.

e. Planting the Seed Mixture

Seed may be planted by using a seed drill. Broadcast seeding is allowed only in areas where erosion control blanket will be placed over the seed. This

method is used where slopes generally are too steep for seeding machinery to be operated safely or in areas requiring unique seeding operations.

1. Seed Drills:
    a. Seed drills shall be equipped with press wheels or drag chains. The seed delivery system shall space rows no greater than 8 inches apart and shall be capable of metering seed at the rate specified in the special provisions.
    b. Planting depth is critical to good germination. If planted too shallow, the seeding will dry out and if too deep, the seedlings will not emerge. Seed shall not be planted greater than ½ inch deep. In sandy soil, plant at ½ inch depth or shallower, because the movement of sand particles may bury the seed.
2. Broadcast Seeders:
    a. After seeding with a broadcast seeder the area shall be harrowed or raked, except where slopes are too steep to operate equipment, as determined by the Project Manager.
    b. Seeded areas should be soil-packed to reduce evaporation and provide good soil-seed contact.

Post-Seeding Treatments

Mulch

This work shall consist of providing, placing and securing mulch on newly-seeded areas.

Mulch shall be dry cured native prairie hay, native grass hay from seed growing operations, native grass hay from planted warm season grass stands, OR threshed grain straw.

Brome hay is not allowed.

Rushes, cattails, reed-canary grass and other wide-bladed or invasive species are not allowed.

Hay or straw in a stage of decomposition so advanced as to “powder” in the mulch blower will be rejected.

Straw shall be from threshed oats, wheat, or rye. Rye straw shall not be used in any wheat-growing area. The straw shall be baled before the seasonal growth of annual weeds.

Both native hay mulch and straw mulch shall be CERTIFIED NOXIOUS WEED FREE (certification can be performed by the county weed superintendent, the RSU, or other authorized agents approved by the RSU) and relatively free from seeds of other weeds.

Apply the mulch within 24 hours after planting the seed. The mulch shall be applied uniformly over tilled areas with a mulch blowing machine.

The mulch shall be loose enough to allow some sunlight to penetrate and air to circulate, but thick enough to shade the ground, reduce water evaporation and reduce wind and water erosion.

The mulch application rate is 2 tons per acre for dry cured native hay.

Immediately following the spreading of the mulch, the material shall be disk-anchored to the soil by a mulch crimper with approximately 6 inch cleats or other approved equipment with perpendicular, dull disk blades.

All mulch shall be crimped the same day it is applied. More than one crimping pass may be necessary.

Hydromulch

Hydromulches are applied with or on top of seed to conserve soil moisture and, depending on type, prevent splash, sheet or rill erosion. No hydromulch product is suitable to withstand the shear stress of concentrated-flow situations. Most commonly, bonded fiber matrix is used. This is a wood fiber mulch, usually with elongated fibers.

This work shall consist of furnishing, hauling, placing and securing hydromulch on areas shown in the plans or specifications.

Hydromulches shall be as shown in the plans and selected from the Approved Products list.

Bonded Fiber Matrix (BFM) is a hydraulically-applied matrix containing organic defibrated fibers and cross-linked insoluble hydro-colloidal tackifiers to provide erosion control and facilitate vegetation establishment on 3:1 slopes and ditches less than 2.5%. The products are designed to be functional for a minimum of 6 months.

The hydromulch shall be delivered to the site in packaging that clearly states the manufacturer's name and product. The packaging shall also clearly state the weight per bag.

Obtain the necessary water required for the hydromulching operation. The contractor shall notify the responsible party as to where he/she proposes to obtain the water.

Apply the mulch within 24 hours after planting the seed, for best results. The mulch shall be applied uniformly over tilled areas with a hydromulch machine.

Apply BFM at 1.75 tons per acre.

Refer to the mulch manufacturer's recommendations for appropriate mulch to water ratios.

The mulch shall be applied in a manner to ensure uniform coverage. Generally this requires spraying from two different directions.

The weight of hydromulch is measured in tons (megagrams).

The weight of hydromulch applied is calculated by multiplying the measured area times the combined weight of the number of bags used.

Establishing Permanent Vegetation after Highway Construction (Compost Study)

NDOR investigated the use of composted yard waste as a soil amendment to improve establishment of roadside vegetation. Composted yard waste was either spread as a "blanket" or tilled into plots as a soil amendment. The vegetation response and amount of soil loss were compared against the results from plots treated with erosion control blanket, bonded fiber matrix, or crimped straw. The study found that a 1-inch layer of composted yard waste (tilled or not) produced the best plant establishment. Soil movement did not differ among treatments.

Erosion Control Products

NDOR must comply with state and federal stormwater management and other requirements. Information on the erosion control products used by NDOR is available on NDOR's Approved Products website.

http://www.nebraskatransportation.org/mat-n-tests/index.htm

Additional information pertaining to designing stormwater management and erosion control features is available in Chapter 2 of NDOR's "Drainage Design and Erosion Control Manual," available on the internet:

http://www.transportation.nebraska.gov/roadway-design/dd-ec-manual.htm

In addition, NDOR's "Construction Stormwater Best Management Practices" booklet, also known as "The Pocket Guide" contains detailed information about commonly used BMPs for erosion and sedimentation control. Access it using this link:

http://www.nebraskatransportation.org/environment/guides/Const-Strmwtr-Pocket%20Guide.pdf

Maintenance and Inspection

During vegetation establishment, the seeded area should be inspected regularly. If areas of erosion or "bald spots" in the seeded areas are noted during an inspection, the area should be repaired immediately.

On-going environmental commitments frequently are attached to a construction project's letting documents. The applicability of the commitments may extend beyond the project's conclusion, and must be continued. For example: a uniform perennial vegetation cover with 70% density (compared to the vegetation prior to project construction) is required to close the stormwater permit. Compliance with this permit is documented in each project's Stormwater Pollution Prevention Plan (SWPPP).

Mowing of any newly seeded area may be necessary if weed infestation or shading of the planted seedlings by tall weeds occurs. NDOR promotes mowing as necessary to control weeds during the establishment period (see the Mowing chapter, beginning on page 131).

Year 1 Evaluation:

Cover crop grows within 2 weeks of planting (except late fall or dormant plantings).

Seedlings should be apparent within the drill rows.

Native grass seedlings may only be 4-6 inches tall.

Mow as necessary if a flush of growth of weeds occurs (pigweed, sunflower, etc.).

Spot-spray thistles and other noxious weeds.

Year 2 Evaluation:

Cover crop may return in smaller amounts the second year.

Seeded grasses are apparent in drill rows.

Some seeded flowers should bloom this year.

If the vegetation stand is inadequate for erosion control, overseed and apply mulch.

Mow as necessary if a flush of growth of weeds occurs (pigweed, sunflower, etc.).

Spot-spray thistles and other noxious weeds.

Appendix
Suggested Seed Mixtures for Nebraska Roadsides

NDOR has developed a plan to promote the use of native plant species that are most likely to thrive in the different regions of the state. Conditions such as climate, soils, and topography differ among regions across the state. For example, rainfall varies from about 16 inches annually in the northwest at Harrison to 34 inches annually in the southern part of the state at Falls City.

NDOR's roadside seeding mixtures include cool- and warm-season grasses, legumes, and flowers. Species are selected for inclusion in roadside seed mixtures according to the landscape region in which the project occurs. Additional information is available in NDOR's "Discover Nebraska's Roadside Flowers and Grasses" brochure on the web at:

www.transportation.nebraska.gov/docs/flowers

and the "Plan for the Roadside Environment" document on the web at:

http://www.nebraskatransportation.org/environment/roadside-plan.html

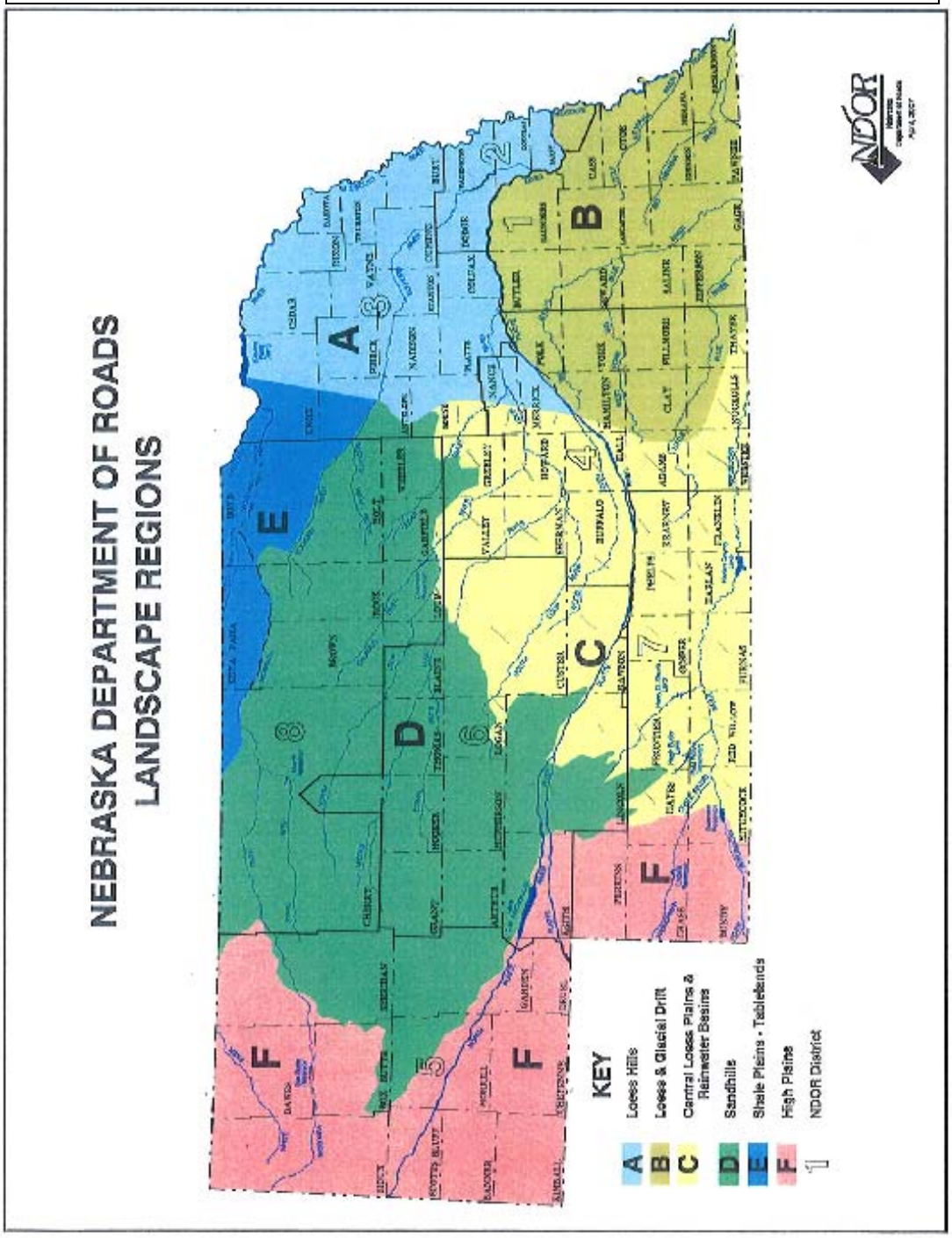
To select a seed mixture to use for a roadside maintenance project, first determine in which region your project occurs, using the map below. Seed mixtures suggested for each region follow the map. Specialized mixtures for rural highway shoulders and foreslope, ditch, and backslope are provided for each region.

Seed mixtures suitable for urban roadside areas and lawns statewide, for wetlands statewide, and buffer areas statewide are also provided in the Appendix. These mixtures contain species that occur statewide, are native, and are commonly used in NDOR seeding projects. However, the wetlands and buffer areas mixtures are simplified versions of the usual mixtures that the Roadside Stabilization Unit creates. To request a more customized seed mixture that would include flowers and more regionally-specific grasses, contact the Roadside Stabilization Unit (contact information is given below).

Please contact NDOR's Roadside Stabilization Unit if you have questions regarding roadside seeding.

Ron Poe	Ronald.Poe@Nebraska.gov	(402) 479-4499
Carol Wienhold	Carol.Wienhold@Nebraska.gov	(402) 479-3917

Appendix: Suggested Seed Mixtures for Nebraska Roadsides



Seed Mixtures for Nebraska Region A

Loess Hills (see the map on page 24)

Rural Highway Shoulder Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Perennial ryegrass – Linn, Amazon, Norlea	85	7
Western wheatgrass – Flintlock, Barton	85	6
Slender wheatgrass	85	5
Kentucky fescue	85	4
Blue grama – NE, KS, CO, MN, SD	30	1.5
Buffalograss – Cody, Bison, Sharp's Improved, Texoka	80	3.5
Sideoats grama – Butte, Trailway	75	2.5
Sand dropseed (Sporobolus cryptandrus)	90	0.3
Oats/Wheat (wheat in the fall)	90	17

Foreslope, Ditch & Backslope Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Canada wildrye – Mandan, Nebraska native	85	4
Slender wheatgrass	85	3
Western wheatgrass – Flintlock, Barton	85	4
Indiangrass – Oto, Nebraska-54, Holt	75	2
Switchgrass – Pathfinder, Blackwell, Shawnee, Trailblazer	90	1
Big bluestem – Pawnee, Roundtree, Bonanza	60	3
Little bluestem – Aldous, Blaze, Camper, Nebr. native	60	2.5
Sand lovegrass – Nebraska-27, native	90	0.5
Purple prairie clover – Kaneb, inoculated ***or*** Partridge pea - inoculated	90	0.2 or 0.2
Black-eyed Susan (Rudbeckia hirta)	85	0.4
Blue flax (Linum lewisii)	85	1
Plains coreopsis (Coreopsis tinctoria)	85	0.3
Mexican red hat (Ratibida columnifera, red)	85	0.5
Oats/Wheat (wheat in the fall)	90	10

PLS (pure live seed) is a term used in the seed industry to describe the percentage of a quantity of seed that will germinate. It is a tool for comparing the quality of seed lots.

Seed Mixtures for Nebraska Region B

Loess & Glacial Drift (see the map on page 24)

Rural Highway Shoulder Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Perennial ryegrass – Linn, Amazon, Norlea	85	7
Western wheatgrass – Flintlock, Barton	85	5
Slender wheatgrass	85	5
Kentucky fescue	85	5
Blue grama – NE, KS, CO, MN, SD	30	1.5
Buffalograss – Cody, Bison, Sharp's Improved, Texoka	80	3.5
Sideoats grama – Butte, El Reno, Trailway	75	3
Sand dropseed (Sporobolus cryptandrus)	90	0.4
Oats/Wheat (wheat in the fall)	90	17

Foreslope, Ditch & Backslope Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Canada wildrye – Mandan, Nebraska native	85	4
Slender wheatgrass	85	3
Western wheatgrass – Flintlock, Barton	85	4
Indiangrass – Oto, Nebraska-54, Holt	75	2
Switchgrass – Pathfinder, Blackwell, Trailblazer	90	1.0
Big bluestem – Pawnee, Roundtree, Bonanza	60	3
Little bluestem – Aldous, Blaze, Camper, Nebraska native	60	2.5
Sideoats grama – Butte, El Reno, Trailway	75	4
Illinois bundleflower – inoculated ***or*** Partridge pea – inoculated	90	0.2 or 0.2
Black-eyed Susan (Rudbeckia hirta)	85	0.4
Blue flax (Linum lewisii)	85	1
Rocky Mountain bee plant (Cleome serrulata)	85	0.3
Grayhead prairie coneflower (Ratibida pinnata)	85	0.25
Oats/Wheat (wheat in the fall)	90	10

PLS (pure live seed) is a term used in the seed industry to describe the percentage of a quantity of seed that will germinate. It is a tool for comparing the quality of seed lots.

Seed Mixtures for Nebraska Region C

Central Loess Plains & Rainwater Basins (see the map on page 24)

Rural Highway Shoulder Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Perennial ryegrass – Linn, Amazon, Norlea	85	7
Western wheatgrass – Barton, Flintlock	85	6
Slender wheatgrass	85	5
Kentucky fescue	85	4
Blue grama – NE, KS, CO, MN, SD	30	1.25
Buffalograss – Cody, Bison, Sharp's Improved, Texoka	80	4
Sand lovegrass – Nebraska-27, Bend, native	90	0.75
Sand dropseed (Sporobolus cryptandrus)	85	0.25
Oats/Wheat (wheat in the fall)	90	16

Foreslope, Ditch and Backslope Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Canada wildrye * – Mandan, Nebraska native	85	4
Virginia wildrye – Omaha, Cuivre River, Nebraska native	85	3
Slender wheatgrass	85	3
Western wheatgrass – Barton, Flintlock	85	4
Indiangrass – Holt, Nebraska-54, Oto	75	2
Switchgrass – Blackwell, Nebraska-28, Trailblazer	90	1
Big bluestem – Pawnee, Kaw, Bonanza, Champ	60	3
Little bluestem – Aldous, Blaze, Camper, Cimarron, Pastura, Nebraska native	60	2.5
Sideoats grama – Butte, Trailway	75	3
Sand lovegrass – Nebraska-27, native	90	0.5
Purple prairie clover – inoculated ***or*** Partridge pea – inoculated	90	0.5 or 0.25
Maximilian sunflower (Helianthus maximiliani)	85	0.5
Rocky Mountain bee plant (Cleome serrulata)	85	0.3
Upright prairie coneflower (Ratibida columnifera)	85	0.5
Mexican red hat (Ratibida columnifera, red)	85	0.5
Oats/Wheat (wheat in the fall)	90	12

* Don't include Canada wildrye in mixtures for Frontier, Hitchcock, or Red Willow Counties

PLS (pure live seed) is a term used in the seed industry to describe the percentage of a quantity of seed that will germinate. It is a tool for comparing the quality of seed lots.

Seed Mixtures for Nebraska Region D

Sandhills (see the map on page 24)

Rural Highway Shoulder Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Thickspike wheatgrass – Critana	85	4
Slender wheatgrass	85	6
Western wheatgrass – Rodan, Rosana, Barton, Flintlock	85	6
Perennial ryegrass – Linn, Amazon, Norlea	85	7
Blue grama – NE, KS, CO, MN, SD	30	2
Sideoats grama – Butte, Pierre	75	3
Sand dropseed (Sporobolus cryptandrus)	90	0.2
Sand lovegrass – Nebraska-27, native	90	0.75
Little bluestem – Cimarron, Pastura, Camper	60	0.5
Oats/wheat (wheat in the fall)	90	20

Foreslope, Ditch and Backslope Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/Acre
Canada wildrye * – Mandan, Nebraska native	85	4
Western wheatgrass – Rodan, Rosana, Barton, Flintlock	85	2.5
Slender wheatgrass	85	4
Thickspike wheatgrass (western sandhills) – Critana	85	3
Switchgrass – Nebraska-28, Pathfinder, Trailblazer, Blackwell	90	1
Sand bluestem – Gold Strike, Garden County, Champ	60	3
Little bluestem – Camper, Cimarron, Pastura, Nebraska native	60	2
Prairie sandreed – Goshen, Pronghorn	40	0.75
Sand lovegrass – Nebraska-27, native	90	0.5
Purple prairie clover – inoculated	90	0.5
Blue flax (Linum lewisii)	85	1
Upright prairie coneflower (Ratibida columnifera)	85	1
Plains coreopsis (Coreopsis tinctoria)	85	0.3
Rocky Mountain bee plant (Cleome serrulata)	85	0.3
Oats/wheat (wheat in the fall)	90	15

* Don't include Canada wildrye for mixtures in Frontier, Hayes, Keith, or Lincoln Counties

PLS (pure live seed) is a term used in the seed industry to describe the percentage of a quantity of seed that will germinate. It is a tool for comparing the quality of seed lots.

Seed Mixtures for Nebraska Region E

Shale Plains & Tableland (see the map on page 24)

Rural Highway Shoulder Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Perennial ryegrass – Linn, Amazon, Norlea	85	7
Thickspike wheatgrass – Critana	85	3
Slender wheatgrass	85	5
Western wheatgrass – Rosana, Rodan, Barton, Flintlock	85	6
Kentucky fescue	85	3
Blue grama – NE, KS, CO, MN, SD	30	1.5
Buffalograss – Bison, Cody, Sharp's Improved, Texoka	80	3.5
Sideoats grama – Butte, Pierre, Trailway	75	2.5
Sand dropseed (Sporobolus cryptandrus)	90	0.3
Oats/Wheat (wheat in the fall)	90	16

Foreslope, Ditch & Backslope Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Canada wildrye – Mandan, Nebraska native	85	4
Green needlegrass (Nassella viridula) – Lodorm	75	2
Western wheatgrass – Rosana, Rodan, Barton, Flintlock	85	5
Switchgrass – Blackwell, Nebraska-28, Pathfinder, Trailblazer	90	1.5
Big bluestem – Champ, Bonanza, Pawnee, Roundtree	60	3
Sideoats grama – Butte, Pierre, Trailway	75	4
Little bluestem – Camper, Blaze, Pastura, Nebraska native	60	2.5
Purple prairie clover – inoculated	90	0.5
Black-eyed Susan (Rudbeckia hirta)	85	0.5
Blue flax (Linum lewisii)	85	1
Upright coneflower (Ratibida columnifera)	85	0.5
Mexican red hat (Ratibida columnifera, red)	85	0.5
Oats/Wheat (wheat in the fall)	90	10

PLS (pure live seed) is a term used in the seed industry to describe the percentage of a quantity of seed that will germinate. It is a tool for comparing the quality of seed lots.

Seed Mixtures for Nebraska Region F

High Plains (see the map on page 24)

Rural Highway Shoulder Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Thickspike wheatgrass – Critana	85	4
Slender wheatgrass	85	6
Western wheatgrass – Arriba, Barton, Flintlock, Rodan, Rosana	85	7
Perennial ryegrass – Linn, Norlea, Amazon	85	5
Kentucky fescue	85	3
Blue grama – NE, KS, CO, MN, SD	30	2
Sideoats grama – Butte, El Reno, Pierre	75	3
Sand dropseed (Sporobolus cryptandrus)	90	0.25
Sand lovegrass – Nebraska-27, native	90	0.5
Little bluestem – Cimarron, Pastura, Camper	60	1
Oats or wheat (wheat in the fall)	90	18

Foreslope, Ditch & Backslope Mixture

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Canada wildrye * – Mandan, Nebraska native	85	4
Slender wheatgrass	85	4
Thickspike wheatgrass – Critana	85	4
Western wheatgrass – Arriba, Barton, Flintlock, Rodan, Rosana	85	4
Little bluestem – Camper, Cimarron, Pastura, Nebraska native	60	2.5
Blue grama – NE, KS, CO, MN, SD	30	0.75
Buffalograss – Bison, Cody, Sharp's Improved, Texoka	80	2
Sideoats grama – Butte, Pierre, El Reno	75	4
Sand dropseed (Sporobolus cryptandrus)	90	0.3
Purple prairie clover – inoculated	90	1
Blue flax (Linum lewisii)	85	1.5
Rocky Mountain bee plant (Cleome serrulata)	85	0.5
Upright prairie coneflower (Ratibida columnifera)	85	1
Mexican red hat (Ratibida columnifera, red)	85	1
Oats or wheat (wheat in the fall)	90	14

PLS (pure live seed) is a term used in the seed industry to describe the percentage of a quantity of seed that will germinate. It is a tool for comparing the quality of seed lots.

Wetlands – contact the RSU for a detailed mixture. Here are basic species and rates:

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Big bluestem – Bonanza, Champ, Pawnee, Roundtree	60	2
Switchgrass – Nebraska-28, Trailblazer	90	1
Prairie cordgrass (Spartina pectinata)	85	1
Fox sedge (Carex vulpinoidea)	85	0.25
Short-beaked sedge (Carex brevior)	85	0.75
Swamp milkweed (Asclepias incarnata)	75	0.15
Arrowhead (Sagittaria cuneata or Sagittaria latifolia)	85	4
Water plantain (Alisma triviale)	85	0.5

Buffer Areas

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Canada wildrye – Mandan (see note below)	85	4
Slender wheatgrass	85	4
Thickspike wheatgrass (see note below)	85	3
Western wheatgrass – Barton, Flintlock	85	4
Sand lovegrass – Nebraska-27, native	90	0.25
Big bluestem – Bonanza, Champ, Pawnee, Roundtree	60	3
Prairie cordgrass (Spartina pectinata)	85	0.6
Switchgrass – Nebraska-28, Trailblazer	90	1
Indiangrass – Holt	75	2.5
Sideoats grama – Butte (Trailway is suitable in all except Region F and western Region D)	75	3
Little bluestem – (Regions A,B,C use Blaze or Camper, Regions D,E,F use Cimarron or Pastura)	60	2.5
Oats or wheat (wheat in the fall)	90	Oats 12 Wheat 19

*(**Canada wildrye** should not be included in Perkins, Chase, Dundy, Hayes, Frontier, Hitchcock, or Red Willow Counties)*

*(**Thickspike wheatgrass** is appropriate in Region D (western portion) and Region F)*

Urban Roadsides and Lawns

Species	Minimum Purity	Broadcast Application Rate in lb. of PLS/Acre	Approved Mechanical Drill Application Rate in lb. of PLS/Acre
Turf type perennial ryegrass	90	30	22.5
Turf type tall fescue	90	528	396
Kentucky bluegrass	90	42	31.5

Temporary Cover – usually persists for 3-5 years

Species	Minimum Purity (percent)	Lbs. of PLS/acre
Perennial ryegrass – Linn, Norlea, Amazon	85	8
Slender wheatgrass	85	4
Western wheatgrass – Barton, Flintlock (statewide) Rodan, Rosana (Sandhills and Panhandle only)	85	3
Kentucky fescue	85	2.5
Sideoats grama – Butte, El Reno, Pierre	75	4
Redtop (Agrostis stolonifera)	90	0.5
Oats or wheat (wheat in the fall)	90	14

Cover Crop – usually persists for one year

Cover Crop Seed and Seeding Dates	Minimum Purity (%)	Minimum Germination (%)	Approved Broadcast Application Rate	Approved Mechanical Drill Application Rate
Oats Jan. 1 to Aug 31	90	80	140 lbs/acre (157 kg/ha)	70 lbs/acre (78 kg/ha)
Foxtail Millet May 2 to July 15	85	80	30 lbs/acre (33 kg/ha)	15 lbs/acre 16 kg/ha)
Winter wheat Sept. 1 to Dec. 31	90	80	160 lbs/acre (179 kg/ha)	80 lbs/acre (89 kg/ha)
Annual Rye Jan. 1 to Dec. 31	85	80	50 lbs/acre (55 kg/ha)	25 lbs/acre (28 kg/ha)

Installing and Maintaining Sod

NDOR may elect to install sod in construction areas within a town or city. Success of the sod depends on factors both during and after installation. Much of the outcome depends on frequent, thorough watering for the first several weeks.

Prior to installation, areas to be sodded must be cleared of debris and dead vegetation. Eroded areas shall be filled and loose earth firmed before laying the sod. Consider watering the installation area immediately prior to sod installation to cool the soil, thereby preventing or minimizing root damage from heat. Installation of sod should not be performed:

- between June 1 and September 1,
- when ground is frozen, or
- when weather conditions are not favorable for growth (flooding or drought, for example).

If topsoil is specified, it shall be spread and tilled into the soil by disking or other methods to the depth shown in the construction plans or the project specifications.

Lay the sod over the area, with the strips edge-to-edge in a compact mass. The sod should be laid approximately 1 inch below adjoining ground surfaces and flush with the adjoining sod. Sod laid on slopes steeper than 1 vertical to 3 horizontal and in ditch bottoms shall be adequately staked to prevent slippage. The stakes should be wood lathe at least 8 inches in length. Drive the stakes so the broad face of the lathe is facing the slope. The lathe should be driven flush with the sod surface.

Type and amount of fertilizer and pre-emergent weed control chemicals shall be as shown in the special provisions. Application should occur immediately after laying the sod and before it is watered. Pre-emergent chemical is not required on sod laid after September 1.

The sod should be watered immediately after placing fertilizer and/or pre-emergent herbicide. Watering may also be required during the installation to cool the sod. The sod must receive regular and thorough watering for the first 30 days. Watering several times a day is necessary to ensure survivorship. In addition, frequent watering will help the sod's root system to grow, thus crowding out weed growth. Water the sod to saturation 3-4 times daily for the first 4 weeks.

If sod is not living after 30 days, the sod should either be replaced or over seeded with a lawn/urban seed mixture (see the mixture for Urban Roadsides and Lawns in the Seeding section's Appendix).

Sod may be mowed beginning 10-14 days after installation. Using a sharp blade in the mower will prevent the grass from being pulled as it is cut. Set the mower blade so that no more than 1/3 of the leaf blade is being removed.

Buffalograss sod may be planted at any time during the growing season. It characteristically turns brown about 5 days after installation, but still must be watered several times a day during the first month. When buffalograss sod turns brown, don't assume it is dead - - this is merely a stress reaction. With watering, the sod will turn green again in 3-4 weeks. A month after installation, mow the buffalograss sod to 2 inches.

Planting and Maintaining Trees

Planting Trees

The U.S. Forest Service's publication Tree Owner's Manual for the Northeastern and Midwestern United States" has helpful diagrams that illustrate the following instructions.

http://na.fs.fed.us/pubs/uf/tom/090202_tom_hr.pdf

Before planting trees check above and below the planting site:

- ABOVE – the tree will get taller, so look for overhead wires that may be close to or may touch the tree in the future.
- BELOW – call the underground utilities (One-Call service in your area) at least 72 hours prior to your planting day. Cutting utility lines can be deadly.

Moving and handling the tree on the way to the planting site:

- Carry the tree by its root package (ball or container) – not by the trunk! Steady it by holding the lowest part of the trunk.
- Large containerized trees may be tipped onto the bottom edge of the container and rolled.
- For balled-and-burlap-wrapped trees, place tarps or ropes under the root ball as a sling. A dolly or hand cart may be used, as well.

At the planting site:

- Remove the packaging on the trunk and branches. Leave the root packaging in place until just prior to planting.
- Prune only branches that are broken or dead. Competing leaders can be removed, if present. Minimize pruning at the time of planting, so the tree can more easily recover from planting shock.
- Remove the top of the root ball packaging. Cut any twine from around the trunk, taking care not to nick the bark. Then bend the wire basket back off the top of the ball. Leave the rest of the wire basket in place until the tree is put in the planting hole, then remove the wire basket.
- If the tree is containerized, remove the entire container.
- Gently remove the soil from the top of the root ball until the top of the main root system is exposed. There should be several roots at least as big around as a pencil, extending in opposite directions from the trunk. You may have to remove 2-4 inches of soil before finding the main roots.
- If the tree is bare root, there is no soil or root packaging to remove.
- Remove all small roots above the main root system with a sharp hand pruner.
- Examine the main root system for roots that extend out but then turn to the side or back toward the trunk. Prune these roots at the point where they turn.

- Measure the height of the remaining root ball. This is how deep the hole should be dug for planting the tree.
- Measure the approximate width of the root ball or root system. Multiply this by 2, or if your soil is hard (clay or compacted), by at least 3. This is how wide the hole should be dug.
- The dimensions of the hole are very important in determining the survival of your tree. Dig the hole ONLY as deep as the root system (no deeper).
- Put the tree in the hole. If the tree has a heavy root ball, slide it into the hole and straighten the trunk.
- For balled-and-burlapped trees, remove the root ball packaging. Without loosening the root ball, cut, peel back, and remove as much of the wire basket and burlap as possible (at least the top third). A root ball should remain a root ball. If it starts to fall apart as you take off the wire and burlap, backfill the hole with enough soil to stabilize it. Then carefully remove the wire and burlap, and backfill as you go to keep the root ball intact.
- Make sure the trunk is straight. Put the original soil back in the hole, breaking up large clods and working it in with your hands or gently with a shovel.
- Water the root ball and the entire backfilled area.
- Put a 2-4 inch layer of mulch over the backfilled area. Pull mulch away from the trunk so that none touches the bark. Placing more than 4 inches of mulch may prevent the roots from getting the necessary oxygen for survival and growth.
- Stake the tree only if the root ball is unstable or the trunk is bending. Use wide nylon or canvas straps, wrapped around one side of the trunk. The tree should not be tied tightly. Remove stakes after 1-2 years.

Maintaining Newly-Planted Trees

Watering newly-planted trees is important to their survival. The trees should be watered during the first year after installation to assure survival and vigor. Additional watering may be necessary during the summer months in subsequent years to ensure the future success of the plantings.

Pruning means 1) cutting out dead or diseased wood, and 2) clipping back live wood when necessary for environmental reasons or shaping the tree into the desired form.

- Larger trees that are too big to be pruned using no more than a step ladder should be pruned by a certified arborist. Contact the Nebraska Forest Service or visit their website at www.nfs.unl.edu. The Nebraska Arborist Association also maintains a list of certified arborists on their website at www.nearborists.org.
- Pruning method and tools are recommended in the U.S. Forest Service document mentioned at the beginning of this section:

  http://na.fs.fed.us/pubs/uf/tom/090202_tom_hr.pdf

- Prune beginning 2 years after planting, but prune only lightly every other year. Do not remove more than 25 percent of the tree's live branches at any time.
- Winter is the best time of year to prune because branches are easy to see, diseases cannot be spread, and there is minimal stress to the tree.

Treatment of Cuts and Wounds **-** The current recommendation for treatment of cuts or wounds **does not** include painting or covering of the wound. Trim any jagged edges and let the wound heal itself, or hire a certified arborist to do the work.

Monitoring Trees

Inspect trees (and shrubs) periodically for insect pests and diseases. When an infestation of insects or dying branches is observed, identification of the problem is necessary before it can be treated. The local County Extension office or District Forester can assist in identifying the problem and can recommend treatment.

Pine wilt kills mostly Scotch pine trees, but can also kill other types of pine when they are stressed. The disease is spread by Sawyer beetles, and can kill a tree in weeks. If pine trees on the right-of-way are observed with browning needles and continue to worsen over several weeks, contact the District Forester to verify the disease. Trees infected with pine wilt must be cut down and removed as soon as practical to limit the spread of the disease. Trees may be chipped, burned or disposed of in a landfill. DO NOT use any wood from infected trees for fireplace or home heating. Beetles will overwinter under the bark and lay eggs that will hatch when the weather warms in the spring. Therefore, disposal should be done before warm weather begins in the spring, before May 1.

Managing Roadside Vegetation

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Managing Roadside Vegetation

Introduction: The Importance of Roadside Vegetation Control

Keeping Nebraska's highways safe for travelers includes the careful control of roadside vegetation. ("Vegetation" as referenced here includes grasses, flowers, shrubs, vines, brush, and trees.) This includes, but is not be limited to, vegetation in the "clear zone" area, that part of the right of way that must remain free of obstructions. Some examples of problem vegetation:

- Vegetation that hinders the visibility of traffic approaching any intersection.
- Vegetation overhanging or encroaching upon a right of way.
- Noxious weeds and other weed species.

Note: The State has the right to cut vegetation overhanging its right-of-way to protect the traveling public. In the event that a tree trunk on private property has limbs overhanging state right of way, limb removal may be done without the consent of the private owner, since the limb encroaches upon State right-of-way.

Safety is foremost in our roadside vegetation management and design. Placement and/or maintenance of vegetation should be performed so that safety hazards are not created or allowed to continue, once noted.

Part 1 – NDOR Protocol for Integrated Vegetation Management

Integrated vegetation management means using a variety of management tools and ecological principles to establish and maintain right-of-way vegetation. The tools available include seeding and planting native species, preventing disturbances to existing vegetation, timely mowing, hand removal of individual weed plants, and wise application of herbicides. The most important of these tools is establishment of a desirable plant community to minimize weed invasion.

Safety of NDOR employees and the environment are concerns that have influenced the methods and choice of chemicals recommended in this document. If an effective alternative to a restricted use pesticide is available, that is preferred to a restricted use product. Since many of the soils in Nebraska are porous and groundwater is a limited resource, pesticides least likely to contaminate groundwater or surface water are preferred to those that pose such a risk. Better still, <u>if an alternative to use of herbicides is available, that alternative is preferred over spraying chemicals</u>.

In general for all weed populations, a management strategy that combines control methods over 4-5 years is recommended. Alternatives may include:

- <u>competition</u> vigorous grass growth makes weed species much less competitive,
- <u>mechanical control</u> physical removal of plant material through grazing (NDOR has used goats successfully), spading, disking, mowing, plowing, cutting and treating stumps, or burning. Not all of these treatments are effective on every weed. Mowing thistles when they have produced seed will spread the thistle

population, but digging (spading) individual thistle plants is acceptable at any time, with care given to capturing all seeds. Chopping up root material MAY result in a more dense stand because of re-growth abilities of the plant species. Read the information in the links provided in the "Noxious Weed Control" section, beginning on page 113.

- biological control specific insects known to impact weed species as hosts are released into weed populations,
- chemical control timing of herbicide application is important.

Spraying, mowing and brush removal operations must comply with the Migratory Bird Treaty Act and the Endangered Species Act. NDOR's procedures are included in its Avian Protection Plan, available at:

http://www.nebraskatransportation.org/environment/guides-plans-hndbks.html

Which Plants Must Be Controlled and Why

Like any other property owner in Nebraska, *NDOR is required by law* to control populations of listed noxious weeds to comply with the state's Noxious Weed Control Act (Nebraska statute 2-952). Listed noxious weeds have been determined to pose a serious threat to the economic, social, or aesthetic well-being of the residents of the state. Noxious weeds compete with pasture and crop plants, reducing yields substantially. Some noxious weeds are poisonous or injurious to people, livestock, and/or wildlife. The losses resulting from noxious weed infestations can be significant, costing residents millions of dollars due to lost production.

Nebraska's list of invasive species is a grouping of plants that have invasive traits to the point that they are monitored for expansion into new areas and for their effect on their surroundings. Plants on this list may be on an adjoining state's weed list or may affect agriculture or ecosystems in Nebraska.

Nebraska Department of Agriculture Noxious Weed Program

For information on noxious weeds in Nebraska or in specific counties contact:

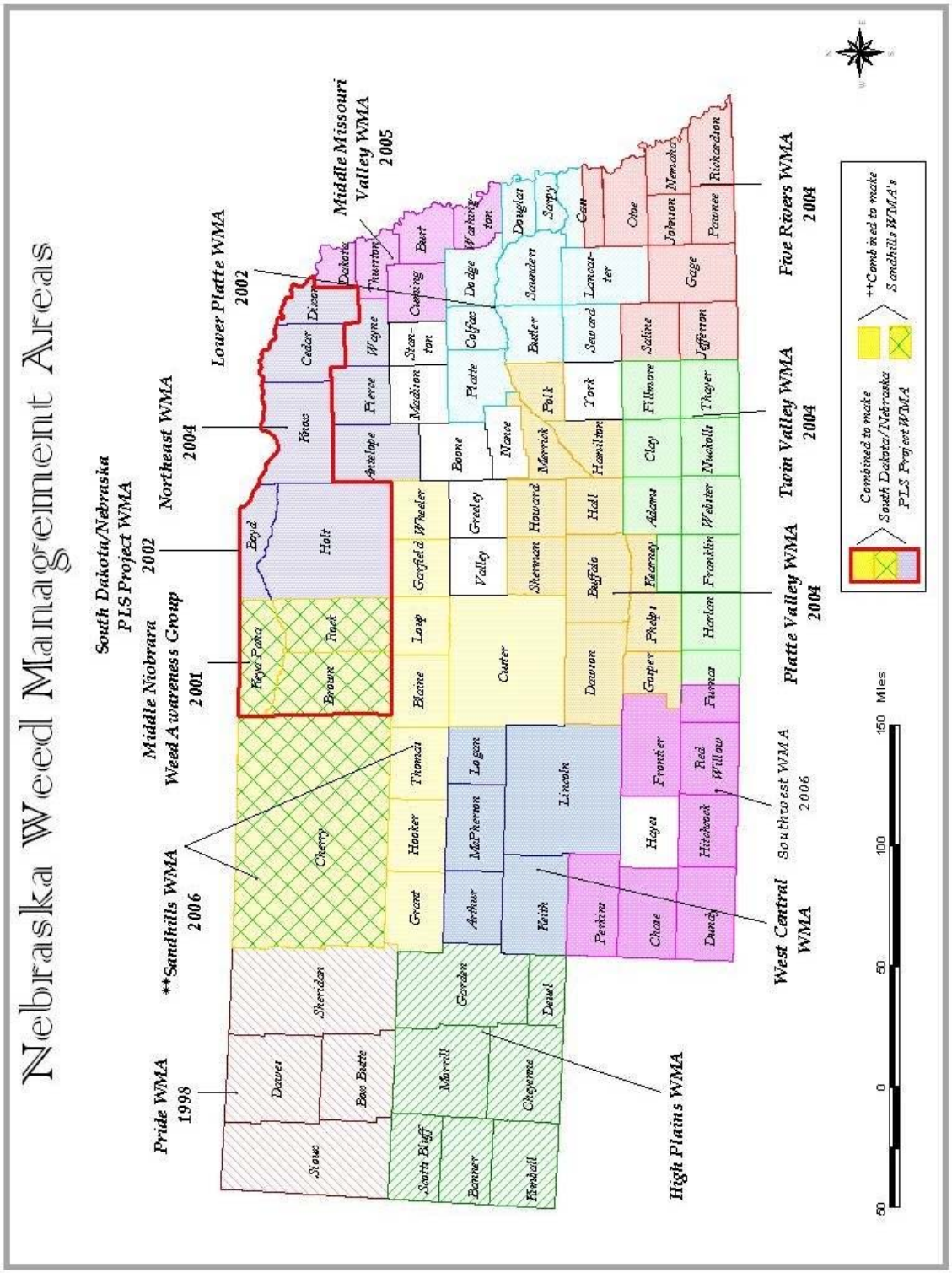
Mitch Coffin, Program Manager
Nebraska Department of Agriculture
Bureau of Plant Industry
Noxious Weed Program
PO Box 94756, Lincoln, NE 68509
Office: 402-471-6844
mitch.coffin@nebraska.gov

The program's webpage is found at:

http://www.nda.nebraska.gov/plant/noxious_weeds/index.html

Most counties in the state are served by a Weed Management District. They frequently sponsor workshops on noxious species found in that area and are a good source of

information on weed issues in that area of the state. See the map of WMAs below. The county weed superintendents also may be helpful.



Vegetation Management Websites

Nebraska Department of Agriculture
http://www.nda.nebraska.gov/plant/noxious_weeds/index.html

Nebraska Weed Control Association ..... www.neweed.org

Nebraska Invasive Species Council ..... http://neinvasives.com/

Invasive Species Information..... www.invasivespeciesinfo.gov

County Extension Offices ..... http://epd.unl.edu/

Pesticide Education Resources..... http://pested.unl.edu/

Part 2 - Compliance with the Pesticide Use General Permit

In 2011, the Nebraska Department of Environmental Quality (NDEQ) instituted a permit process that grants authorization to discharge pesticides (this term includes herbicides) and their residues to, over, or near waters of Nebraska. The permit is part of the National Pollutant Discharge Elimination System *(NPDES)* regulation. The program is described at http://deq.ne.gov/NDEQProg.nsf/OnWeb/NPDES

The permit's goal is to reduce or eliminate pollution to waters of the state caused by the use (discharge) of pesticides. Best Management Practices (BMPs) are required for the areas covered by the permit. Additional requirements exist for areas that include the highest value natural resources. The permit does not apply to pesticide application that does not occur to, over, or near water. However, it is important to understand what the permit considers to be included.

The pesticide general permit sorts waters of the state into three categories:

Group I Waters

- Non-flowing waters;
- An impoundment that is designed to not discharge (let water out);
- A discharging water for which the management authority is able to manage the surface discharge for 24 hours after application of pesticides;
- A wetland or marsh that doesn't discharge for 24 hours after pesticide application;
- Waters of the state where no water is present at the time of application AND no precipitation events are likely to cause a discharge for 24 hours after application.

Group II Waters

- Flowing waters
- Management authority is unable to suspend discharge for at least 24 hours after pesticide application;

Group III Waters

- A State Resource Water (surface waters that are designated as an outstanding natural resource. State Resource Waters are mapped and documented by NDEQ);
- Listed as impaired for ingredients in the pesticide or residuals from the application of pesticide;
- Waters where threatened or endangered species or their federally-designated critical habitats are present in the area targeted for pesticide application AND there is not a standard procedure established to guide the pesticide application, as recommended by the Nebraska Game and Parks Commission;
- Application is planned within 250 feet of the 3 situations above, where direct surface water connection makes flow end up in state resource waters, impaired waters, or threatened or endangered species critical habitat areas;
- Application to or within 250 feet of a surface water intake for public drinking water (5 locations are mapped for the state).

Maps showing areas considered to be Group III waters are included on pages 49-56.

A. Required BMPs (All Groups)

Applying pesticides over, at or near any of the named Groups makes it necessary to fulfill the required Best Management Practices (BMPs) listed below.

- NDOR Operations/Maintenance forces and Contractors shall and all secondary roads project proponents should implement these BMPs:
- BMPs for Groups I, II, and III:
- Identify target pests, non-target plants & animals that could be affected, and limit the impact to the non-targets
- Identify threatened or endangered species and federally-designated critical habitats (may involve NDOR Environmental Section coordination with Nebraska Game and Parks Commission). See the Estimated Current Range maps and Group III Waters maps (following pages).
- Be aware of and document weather conditions prior to and during chemical application events.
- Determine volume of receiving water and its characteristics, and account for these in calculating the pesticide mixing rate. Identify the right timing for application to optimize treatment. (According to NDEQ, to meet this requirement show the calculations for mixing the quantity of chemical that you will need. Use the form entitled “Pesticide Application Report” found in the Appendix.)

- Follow FIFRA (Federal Insecticide, Fungicide and Rodenticide Act) and the Nebraska Pesticide Act directives relating to water quality (compliance with all label application directions, such as application rates, active ingredient concentrations and dilution requirements, buffer zones, application locations, intended targets, protecting threatened or endangered species, times of day, temperature or other application requirements, proper disposal of pesticide residues, and record keeping).
- Application equipment requirements
    - Equipment shall be calibrated at least annually or more frequently if required by the pesticide label or manufacturer.
    - All equipment shall be inspected prior to application and monitored during application for uneven spray, leaks, inoperative nozzles or valves, and repairs shall be made and the equipment shall be recalibrated if necessary before the application continues or takes place.
- Visual monitoring after application within 5 days of the completion of pesticide application. Use the bottom portion of the "Pesticide Application Report" form (found in the Appendix) to document this site visit. Look for:
    - The occurrence of new knowledge of any spills, leaks, contamination, or incident at the target area that could impact water quality
    - Any adverse impact to non-target species or threatened and endangered species, human health, or the environment.
    - Evidence indicating a possible discharge (release) of pesticide into water.
    - Evidence of oil or petroleum product contamination in the pesticide application (e.g., visible oil sheen).
    - Anything that looks or smells like the presence of a pollutant not observed or anticipated before.

<u>Additional BMPs for Group II Waters:</u>

- Apply pesticides to the upstream target area in a manner that lessens the likelihood of compounding effects and adverse impacts to areas downstream of target area
- Minimize effects to waters adjacent to the target area

<u>Additional Requirements for Group III Waters</u>

- Completion of a Notice of Intent (NOI) form
- PUMP (pesticide use management plan)
- BMPs for Groups I and II and III (listed above)

B. Notice of Intent (NOI) Form (Group III waters only)

- The NOI form (included in the Appendix of this chapter) must be completed and sent to the Nebraska Department of Environmental Quality.
  - For NDOR, the Environmental Section will coordinate with the NDOR Districts and provide NDEQ with a NOI form for each NDOR District.
  - Other entities must provide a completed NOI form to NDEQ if pesticides are to be applied over, at, or near Group III waters.
- Pesticide application may commence if the Endangered and Threatened Species Standard Procedures (begins on page 70) are followed for the species ranges. If the application of pesticides cannot be performed within the guidance of the standard procedures, then the application project must be reviewed by the Nebraska Game and Parks Commission. This review is estimated to take 30 days to complete.
- Information requested on the NOI form pertaining to herbicide product names, EPA/FIFRA registration numbers, and active ingredients is provided in the Appendix (pages 153-155).

C. Applying pesticides over, at or near Group III waters makes it necessary to follow a Pesticide Use Management Plan (PUMP)

NDOR Operations/Maintenance forces and Contractors shall implement this PUMP:

1. All BMPs that are listed above for the applicable water designation will be implemented.
2. Documentation of chemical characteristics of receiving waters and determination of the volume of the receiving water will be developed for calculating the mixture and application doses (according to NDEQ, to meet this requirement show the calculations for mixing the quantity of chemical that you will need. Use the form entitled “Pesticide Application Report” found in the Appendix.)
3. EPA Registration numbers and product names for all pesticides used will be documented and retained at the District headquarters.
4. State waters will be improved by NDOR pesticide application by control or removal of noxious weeds and/or invasive plant species. Maintaining a more diverse species composition in the vegetation stand improves filtration, sediment removal, and habitat diversity.
5. Clean Water Act 303(d) impaired waters are called out for atrazine in Nebraska. NDOR does not support the use of atrazine. Application of non-atrazine pesticides for noxious weeds and/or invasive plants will not contribute to the impaired condition. However, pesticide application will maintain or improve water quality and habitat value of State waters by controlling or removing these non-native species.

6. Pesticide application to control or remove noxious weeds and/or invasive plant species will maintain or improve threatened or endangered species or federally-designated critical habitats by improving the species composition of the vegetation community. Habitat needs for shelter, food source, breeding, nesting, and loafing will improve for wildlife species when noxious and/or invasive species are removed or controlled. Native plants will benefit from removal of species that compete for nutrients and water.

   Standard procedures for avoiding impacts to threatened or endangered species by use of herbicides are given in section D "Endangered and Threatened Species Standard Procedures" below.

   "Blanket spray" techniques shall be used only in infrequent cases where spot spraying is not possible. Spot spraying allows targeting only the problem plants, and avoiding or minimizing effects to intended grasses and flowers. Other unintended consequences are also avoided by using only spot-spraying methods. For example, in Lancaster County, blanket spraying weeds may impact an endangered insect, the Salt Creek tiger beetle, where its critical habitat occurs adjacent to highway shoulders.

7. The feature or condition of the target area that categorized it as Group III is indicated on the Notice of Intent form that accompanies the PUMP. "Reason for Submittal of NOI" options consist of:

   a. State Resource Water A

   b. 303(d) listed ingredients or residuals

   c. Threatened and endangered species or federally-designated critical habitat

   d. Flowing stream confluence within 250 feet of state resource water, 303(d) listed water or threatened and endangered species

   e. Public drinking water surface water intake contribution

8. If NDOR proposes to apply pesticide within 250 feet of a surface water intake for public drinking water, NDOR will include with the NOI a copy of the notification letter to the controlling entity of the public drinking water intake.

9. NDOR's alternatives analysis (a description of the alternative methods evaluated, why the proposed method was selected, and how impacts will be minimized is provided on pages 39-40.) NDOR seeks first to control weed populations by plant competition, mechanical control, and biological control (when appropriate.) Use of chemical products is considered after these alternatives are considered or implemented.

10. Records management and retention plan:

    a. Each NDOR District will maintain pesticide application records at the District headquarters.

    b. A completed Pesticide Application Report for each application event will be filed (form is found in the Appendix at the end of this section) at the applicable NDOR District Office and retained for 3 years.

    c. NDOR District Engineers will serve as contacts for information requests regarding pesticide application records. Specific contact information for the Districts is given in the Appendix.

NOTE: The information that follows on the next several pages is NDOR's means of avoiding impacts to important water resources and federal- and state-protected animal and plant species:

- a list of threatened or endangered species,
- maps of Group III waters for all NDOR districts,
- several maps that show where the species occur, and
- text that tells how NDOR and its contractors will apply pesticides where the maps show important resources (Standard Procedures.)

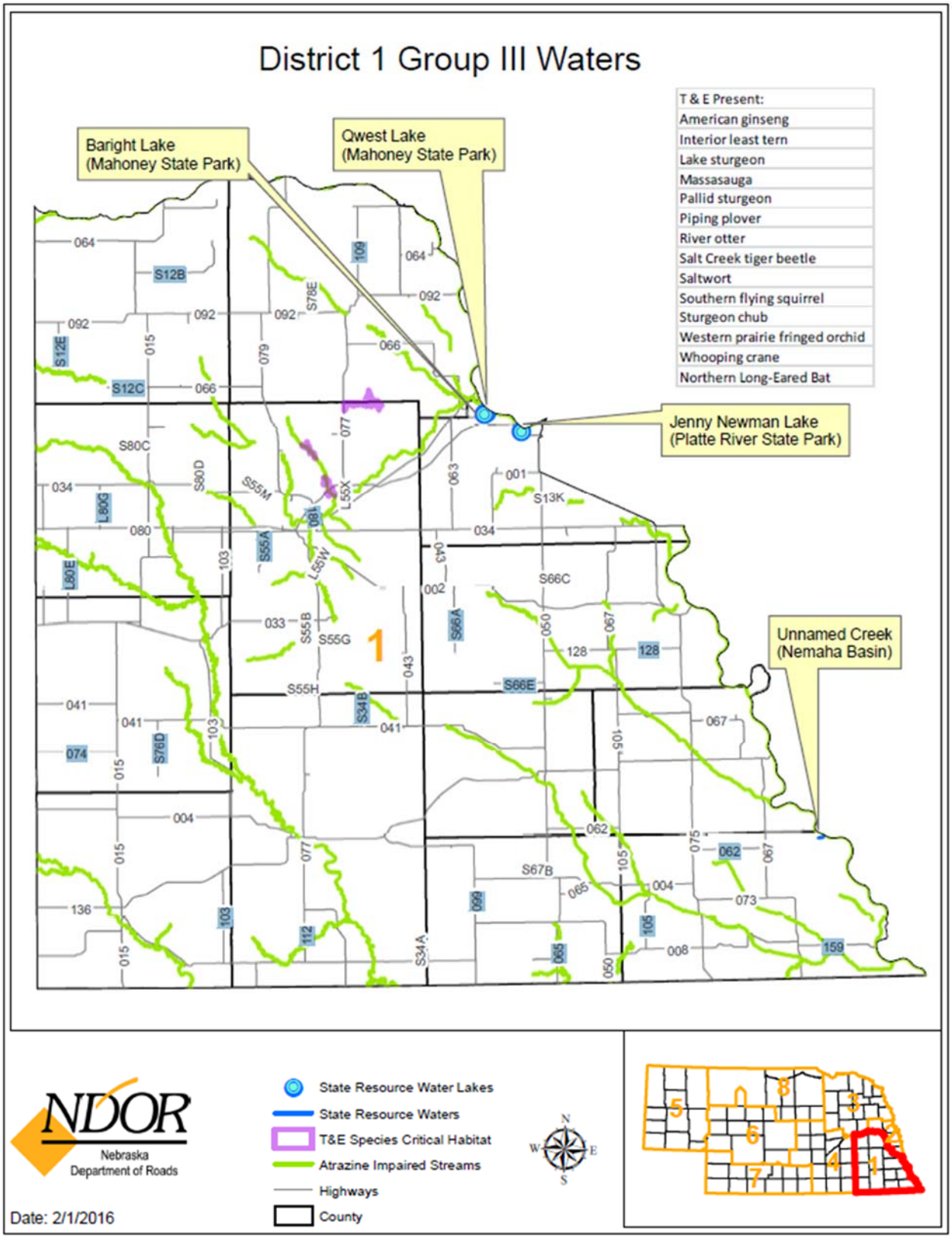
Refer to the maps and Standard Procedures prior to pesticide use to comply with the Pesticide Use General Permit.

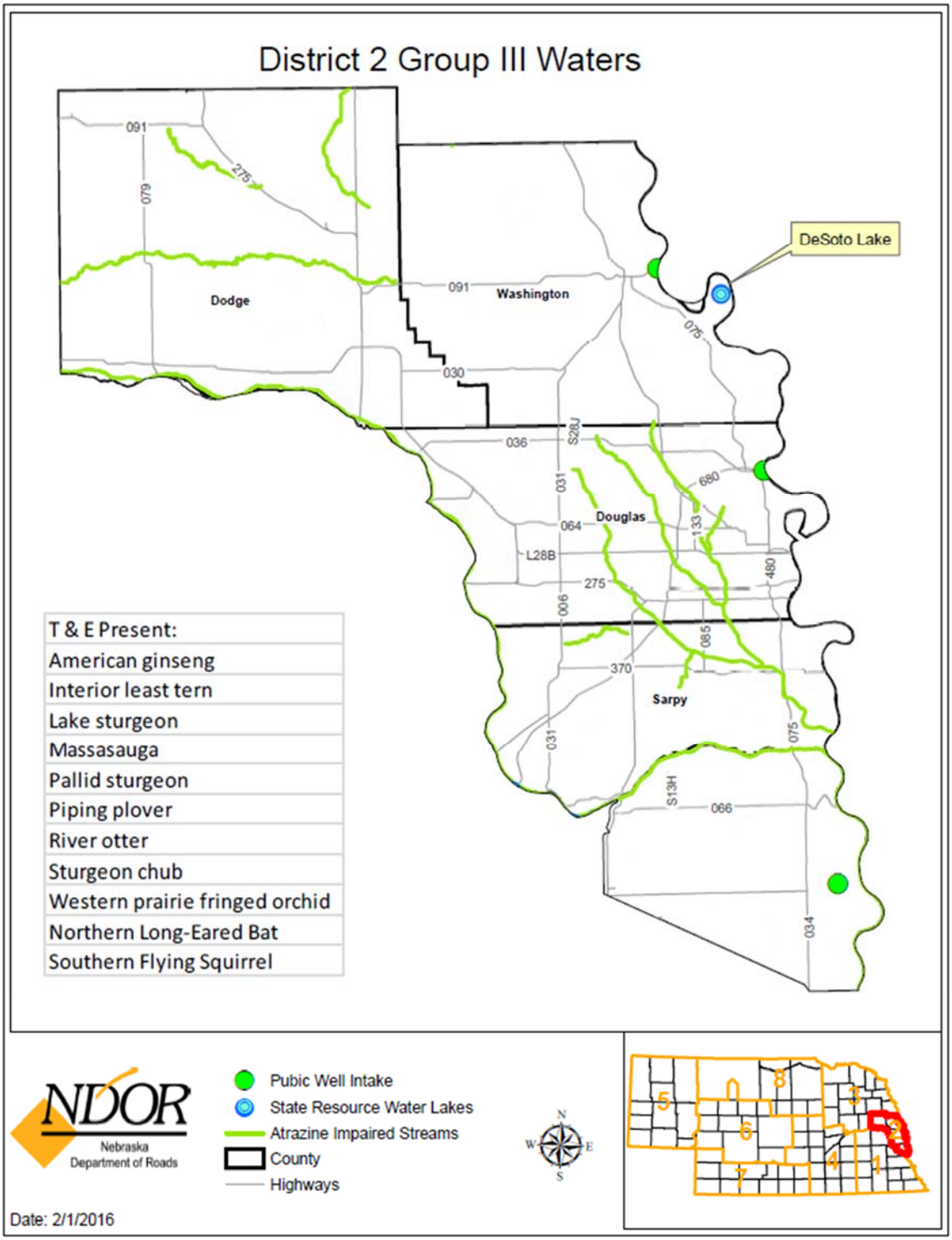
Nebraska's Threatened & Endangered Species

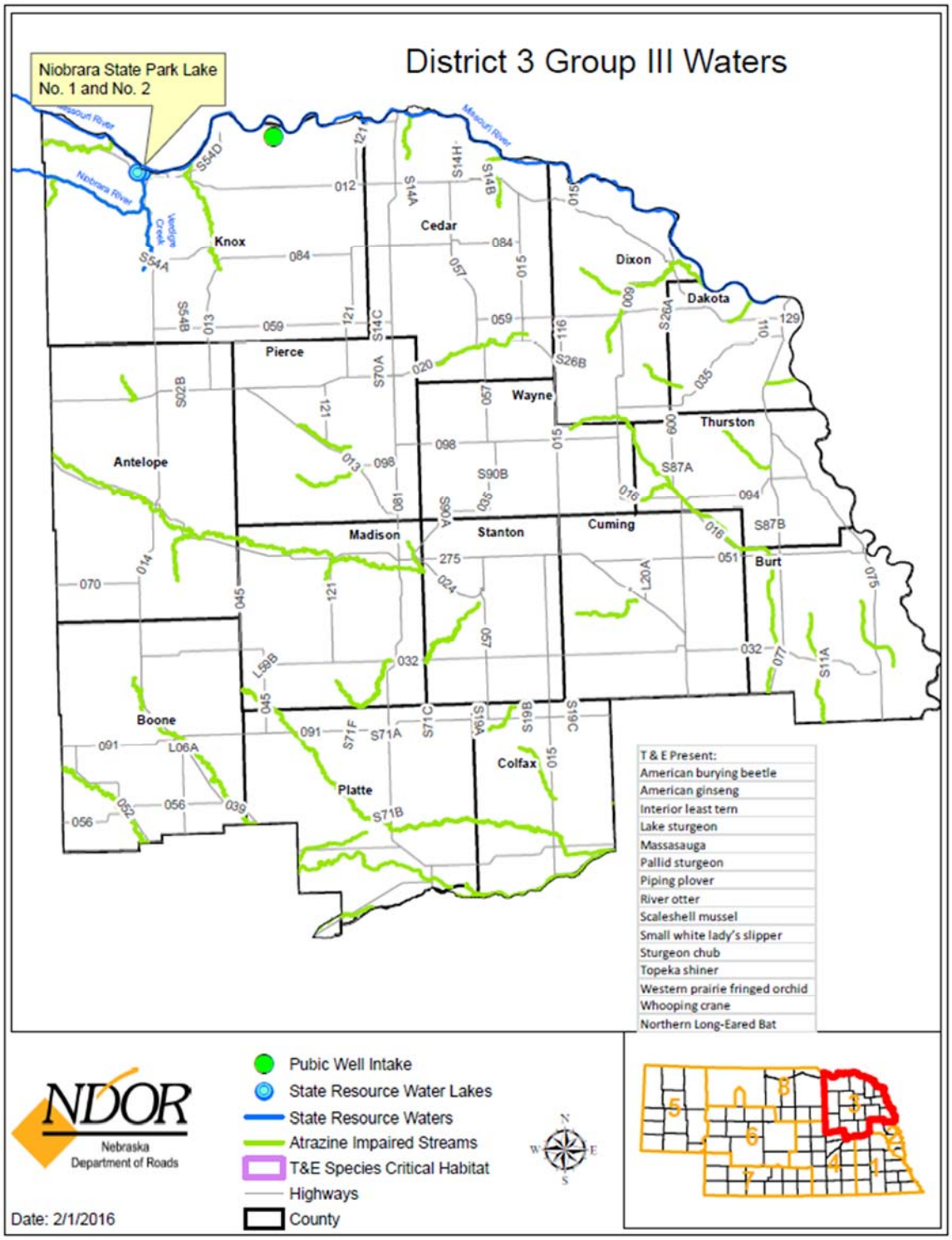
Common Name	Scientific Name	State Status	Federal Status
BIRDS (5 Species)			
Eskimo Curlew*	Numenius borealis	Endangered	Endangered
Whooping Crane	Grus americana	Endangered	Endangered
Interior Least Tern	Sternula antillarum athalassos	Endangered	Endangered
Piping Plover	Charadrius melodus	Threatened	Threatened
Mountain Plover	Charadrius montanus	Threatened	Threatened
MAMMALS (5 Species)			
Black-footed Ferret*	Mustela nigripes	Endangered	Endangered
Swift Fox	Vulpes velox	Endangered	Not listed
Northern Long-Eared Bat	Myotis septentrionalis	Threatened	Threatened
River Otter	Lontra canadensis	Threatened	Not listed
Southern Flying Squirrel	Glaucomys volans	Threatened	Not listed
FISH (7 Species)			
Pallid Sturgeon	Scaphirhynchus albus	Endangered	Endangered
Topeka Shiner	Notropis topeka	Endangered	Endangered
Sturgeon Chub	Macrhybopsis gelida	Endangered	Not listed
Blacknose Shiner	Notropis heterolepis	Endangered	Not listed
Lake Sturgeon	Acipenser fulvescens	Threatened	Not listed
Northern Redbelly Dace	Phoxinus eos	Threatened	Not listed
Finescale Dace	Phoxinus neogaeus	Threatened	Not listed
INSECTS (2 Species)			
American Burying Beetle	Nicrophorus americanus	Endangered	Endangered
Salt Creek Tiger Beetle	Cicindela nevadica lincolniana	Endangered	Endangered
REPTILES (1 Species)			
Massasauga	Sistrurus catenatus	Threatened	Not listed
MUSSELS (1 Species)			
Scaleshell Mussel	Leptodea leptodon	Endangered	Endangered
PLANTS (7 Species)			
Hayden's (Blowout) Penstemon	Penstemon haydenii	Endangered	Endangered
Colorado Butterfly Plant	Gaura neomexicna coloradensis	Endangered	Threatened
Saltwort	Salicornia rubra	Endangered	Not listed
Western Prairie Fringed Orchid	Platanthera praeclara	Threatened	Threatened
Ute Ladies'-tresses	Spiranthes diluvialis	Threatened	Threatened
American Ginseng	Panax quinquefolium	Threatened	Not listed
Small White Lady's Slipper	Cypripedium candidum	Threatened	Not listed

*Species of historical occurrence in Nebraska but no known populations currently exist in Nebraska

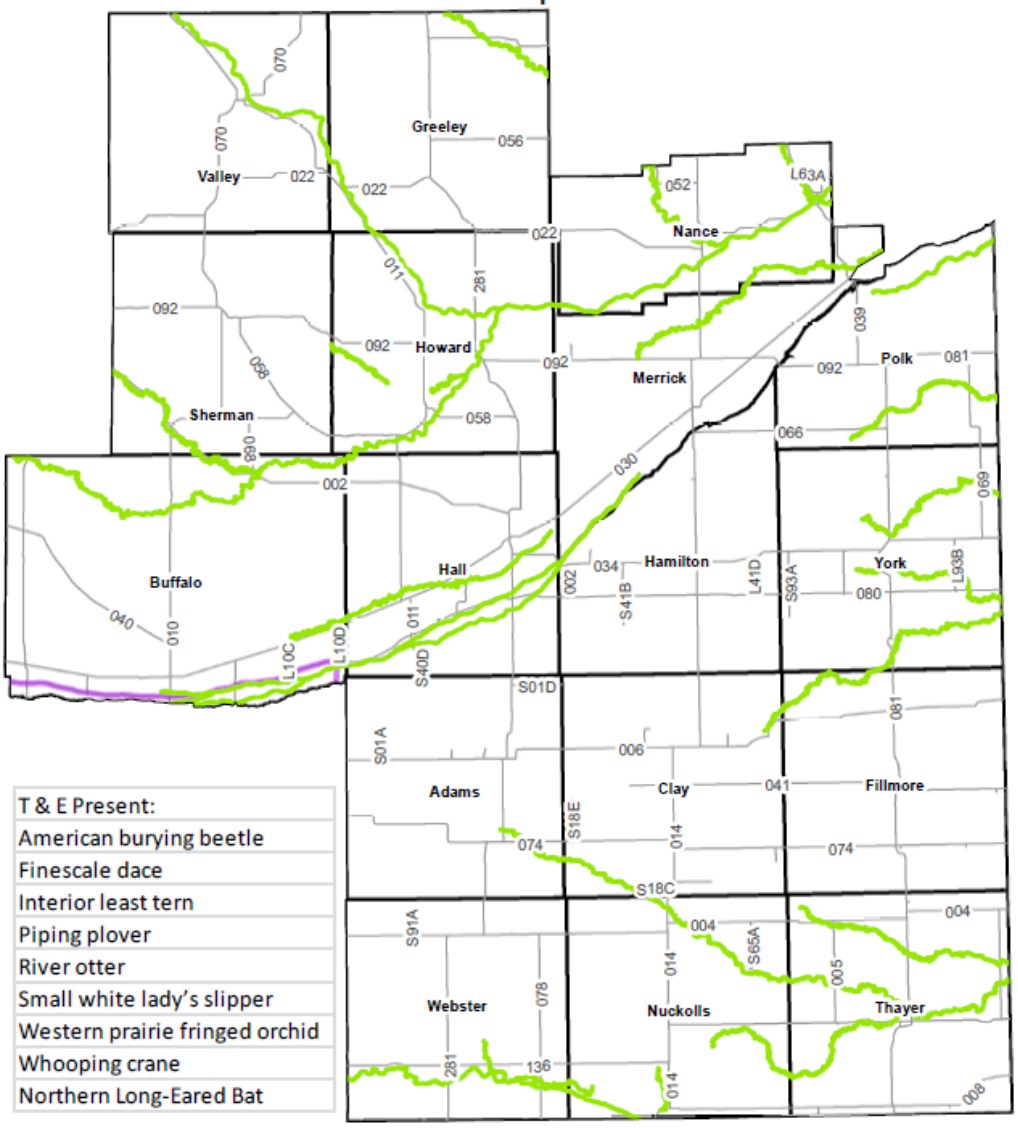
Group III Waters Maps for Each District




District 2 Group III Waters
DeSoto Lake
Dodge
Washington
Douglas
Sarpy
091
079
275
030
036
S26J
031
064
L28B
006
680
133
480
085
370
075
S13H
066
034
T & E Present:
American ginseng
Interior least tern
Lake sturgeon
Massasauga
Pallid sturgeon
Piping plover
River otter
Sturgeon chub
Western prairie fringed orchid
Northern Long-Eared Bat
Southern Flying Squirrel
NDOR
Nebraska Department of Roads
Pubic Well Intake
State Resource Water Lakes
Atrazine Impaired Streams
County
Highways
N
W
E
S
Date: 2/1/2016


District 3 Group III Waters
Niobrara State Park Lake No. 1 and No. 2
Missouri River
Niobrara River
Verdigre Creek
Knox
Cedar
Dixon
Dakota
Pierce
Wayne
Thurston
Antelope
Madison
Stanton
Cuming
Burt
Boone
Platte
Colfax
T & E Present:
American burying beetle
American ginseng
Interior least tern
Lake sturgeon
Massasauga
Pallid sturgeon
Piping plover
River otter
Scaleshell mussel
Small white lady's slipper
Sturgeon chub
Topeka shiner
Western prairie fringed orchid
Whooping crane
Northern Long-Eared Bat
NDOR
Nebraska Department of Roads
Pubic Well Intake
State Resource Water Lakes
State Resource Waters
Atrazine Impaired Streams
T&E Species Critical Habitat
Highways
County
Date: 2/1/2016

District 4 Group III Waters

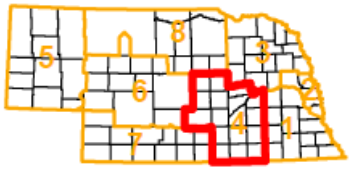


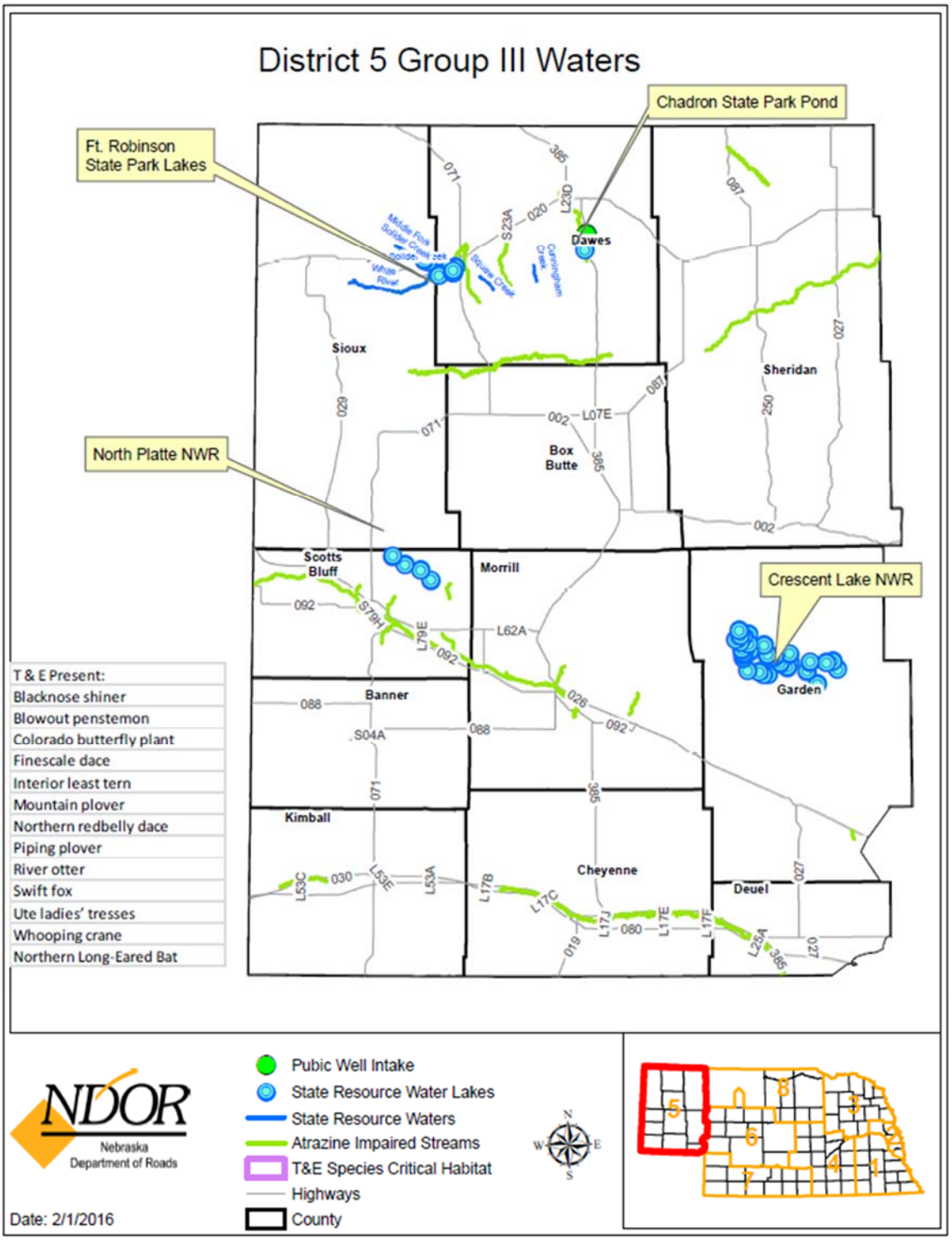
T & E Present:
American burying beetle
Finescale dace
Interior least tern
Piping plover
River otter
Small white lady's slipper
Western prairie fringed orchid
Whooping crane
Northern Long-Eared Bat

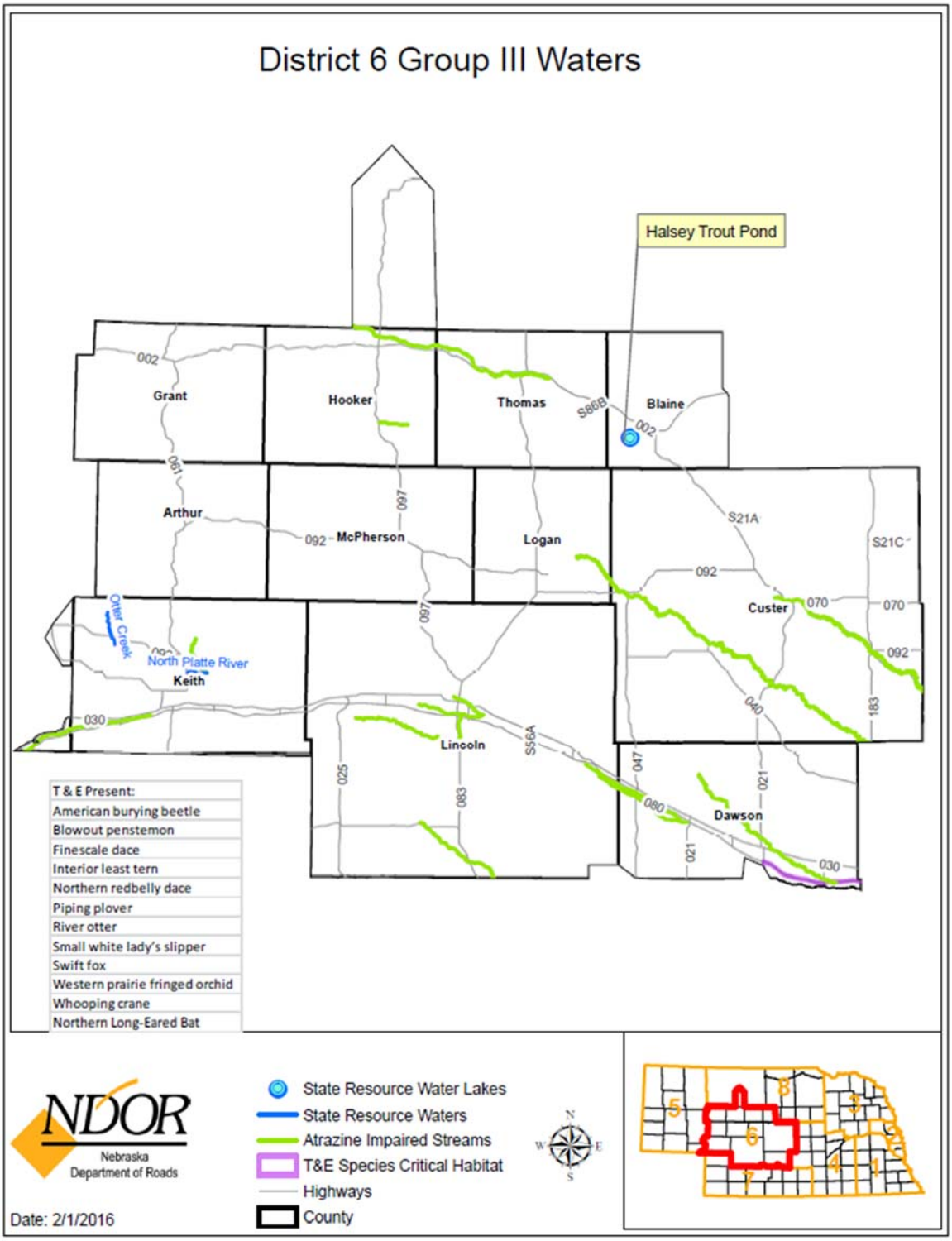
NDOR
Nebraska Department of Roads

Atrazine Impaired Streams
T&E Species Critical Habitat
Highways
County

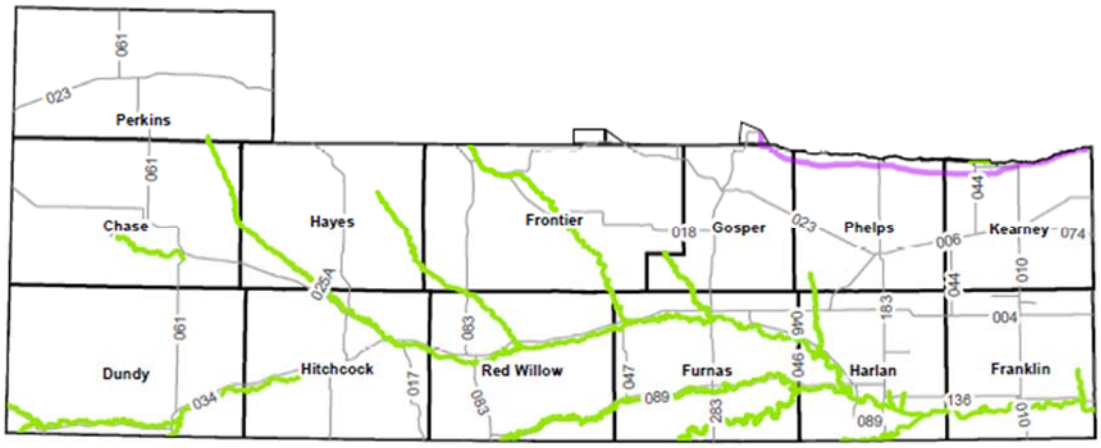
Date: 2/1/2016




District 5 Group III Waters
Chadron State Park Pond
Ft. Robinson State Park Lakes
North Platte NWR
Crescent Lake NWR
Sioux
Dawes
Sheridan
Box Butte
Scotts Bluff
Morrill
Garden
Banner
Kimball
Cheyenne
Deuel
T & E Present:
Blacknose shiner
Blowout penstemon
Colorado butterfly plant
Finescale dace
Interior least tern
Mountain plover
Northern redbelly dace
Piping plover
River otter
Swift fox
Ute ladies' tresses
Whooping crane
Northern Long-Eared Bat
NDOR
Nebraska Department of Roads
Pubic Well Intake
State Resource Water Lakes
State Resource Waters
Atrazine Impaired Streams
T&E Species Critical Habitat
Highways
County
Date: 2/1/2016


District 6 Group III Waters
Halsey Trout Pond
Grant
Hooker
Thomas
Blaine
Arthur
McPherson
Logan
Custer
Keith
Lincoln
Dawson
Otter Creek
North Platte River
002
061
097
092
070
040
183
S21A
S21C
S86B
S56A
030
025
083
047
080
021
T & E Present:
American burying beetle
Blowout penstemon
Finescale dace
Interior least tern
Northern redbelly dace
Piping plover
River otter
Small white lady's slipper
Swift fox
Western prairie fringed orchid
Whooping crane
Northern Long-Eared Bat
NDOR
Nebraska Department of Roads
State Resource Water Lakes
State Resource Waters
Atrazine Impaired Streams
T&E Species Critical Habitat
Highways
County
Date: 2/1/2016

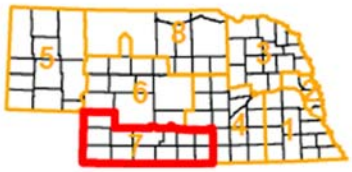
District 7 Group III Waters



T & E Present:
American burying beetle
Interior least tern
Piping plover
River otter
Swift fox
Whooping crane
Northern Long-Eared Bat

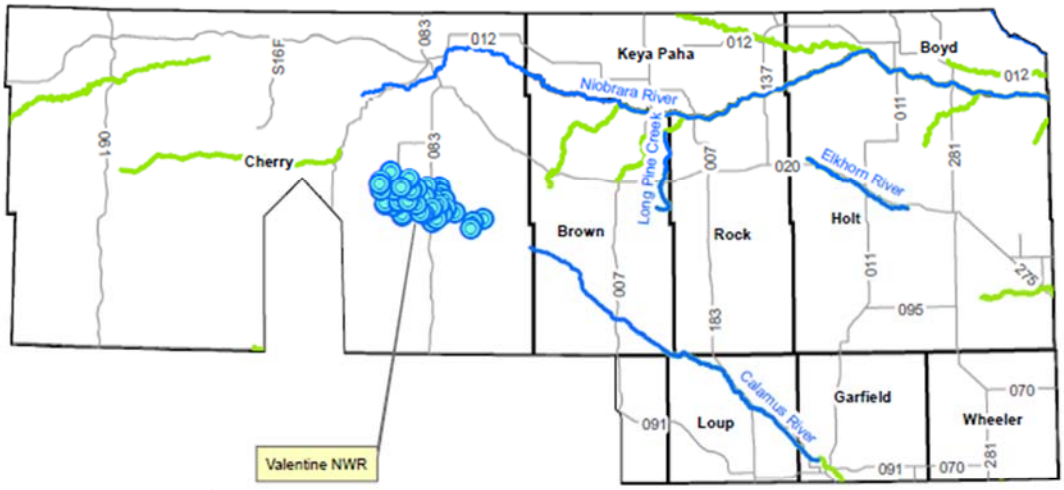
NDOR
Nebraska Department of Roads

Atrazine Impaired Streams
T&E Species Critical Habitat
Highways
County



Date: 2/1/2016

District 8 Group III Waters

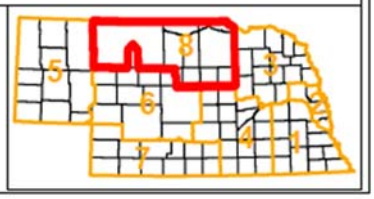


T & E Present:
American burying beetle
Blacknose shiner
Blowout penstemon
Finescale dace
Interior least tern
Northern redbelly dace
Pallid sturgeon
Piping plover
River otter
Small white lady's slipper
Sturgeon chub
Swift fox
Topeka shiner
Western prairie fringed orchid
Whooping crane
Northern Long-Eared Bat
Lake Sturgeon

NDOR
Nebraska Department of Roads

Date: 2/1/2016

State Resource Water Lakes
State Resource Waters
Atrazine Impaired Streams
T&E Species Critical Habitat
Highways
County



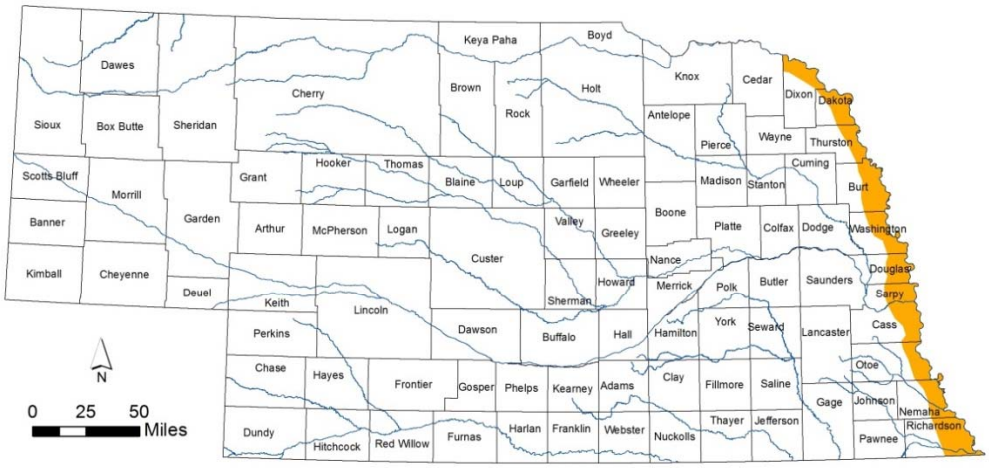
D. Endangered and Threatened Species Range Maps

Estimated Current Range of
American Burying Beetle (*Nicrophorus americanus*)

The Sandhills portion of this range was based largely on a distribution model created using data collected from 2001 through 2011 by various government and non-government organizations. Logistic regression was used to predict probability of occurrence of American Burying Beetle based on data collected in the Sandhills and a number of climate, soil, and land cover variables. The model was created by The US Fish and Wildlife Service, University of Nebraska Kearney, Rainwater Basin Joint Venture, and Nebraska Game and Parks Commission. The Sandhills probability model and range map was combined with other known distribution data to create the overall range map shown here. Work is being undertaken to create comparable models outside of the Sandhills.

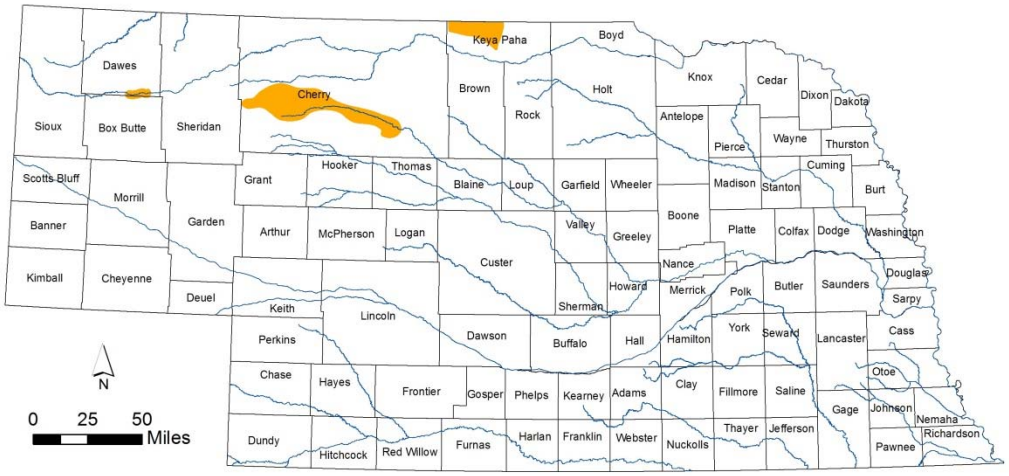
Map produced by the Nebraska Natural Heritage Program, Nebraska Game and Parks Commission, March 2014.

Estimated Current Range of
American Ginseng (*Panax quinquefolius*)



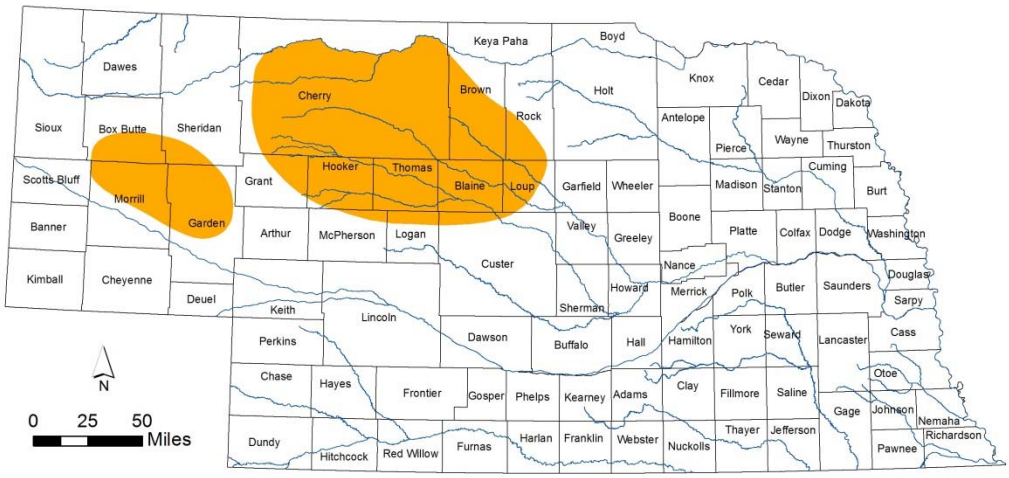
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
June 2015

Estimated Current Range of Blacknose Shiner (*Notropis heterolepis*)



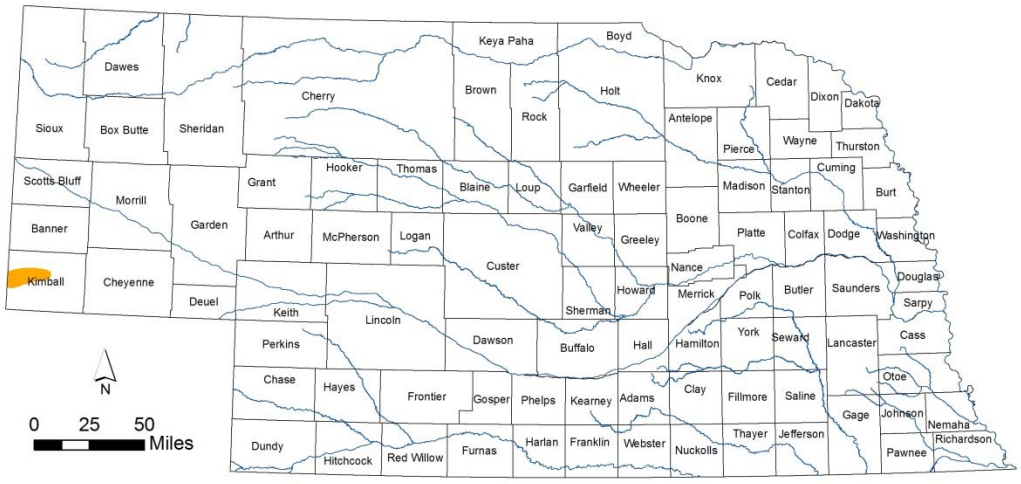
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
December 2012

Estimated Current Range of Blowout Penstemon (*Penstemon haydenii*)



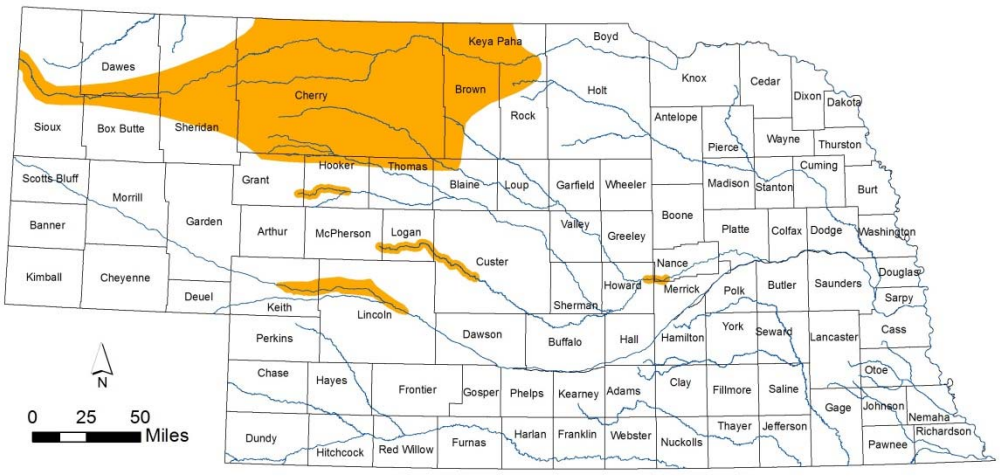
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
September 2012

Estimated Current Range of
Colorado Butterfly Plant (*Gaura neomexicana ssp. coloradensis*)



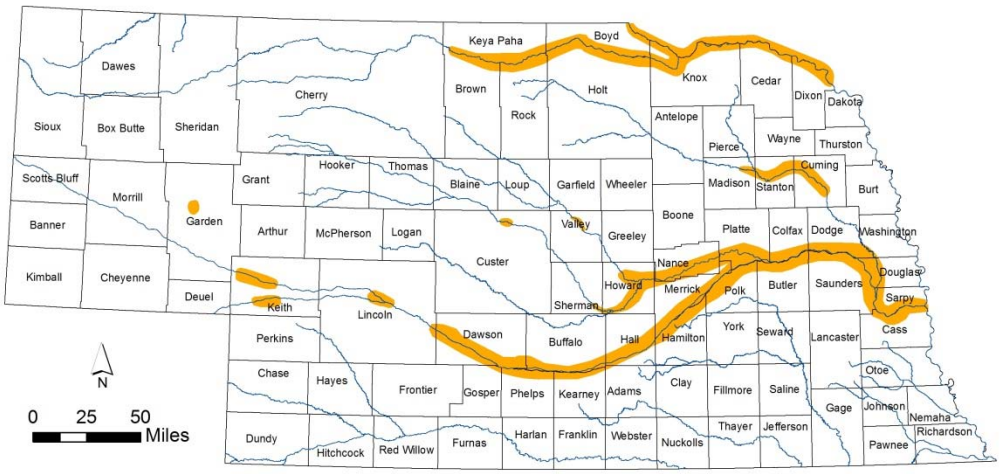
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of
Finescale Dace (*Phoxinus neogaeus*)



Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
December 2012

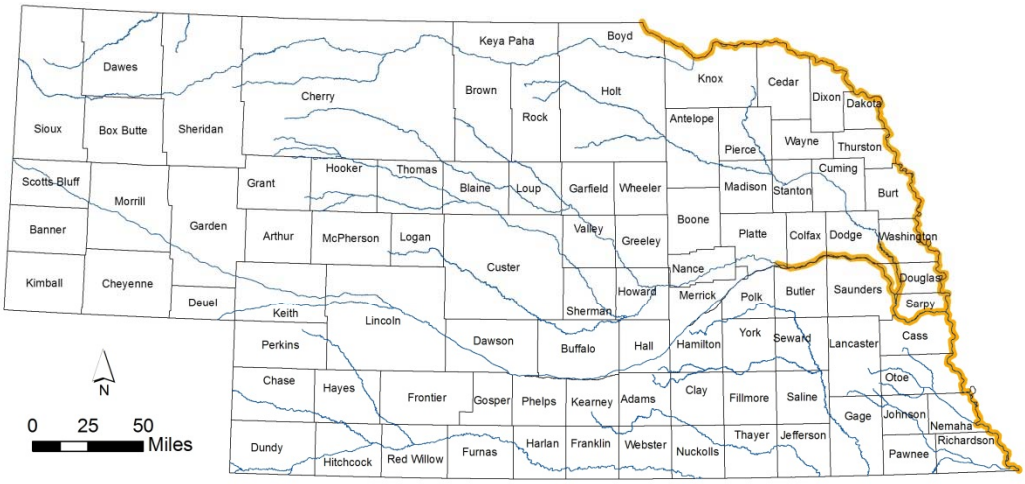
Estimated Current Breeding Range of Piping Plover (*Charadrius melodus*) and Interior Least Tern (*Sternula antillarum athalassos*)



Garden County portion of map pertains to Piping Plover only.

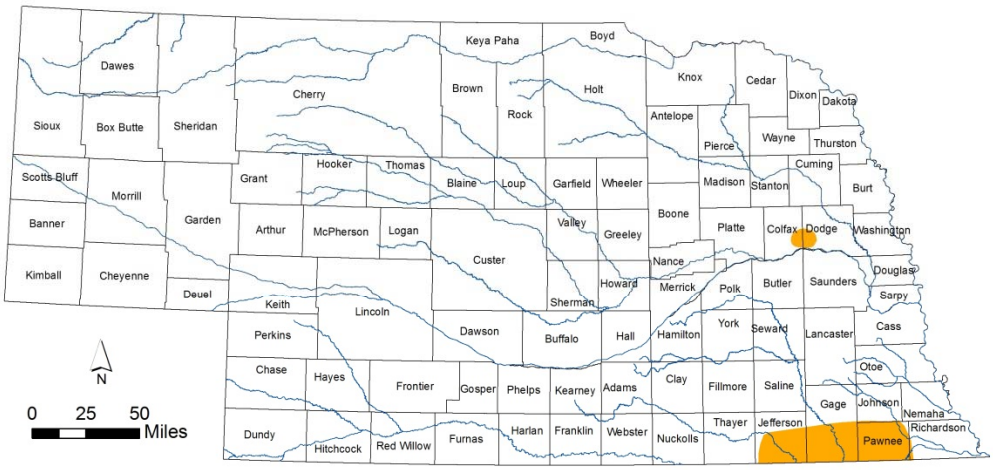
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
August 2011

Estimated Current Range of Lake Sturgeon (*Acipenser fulvescens*)



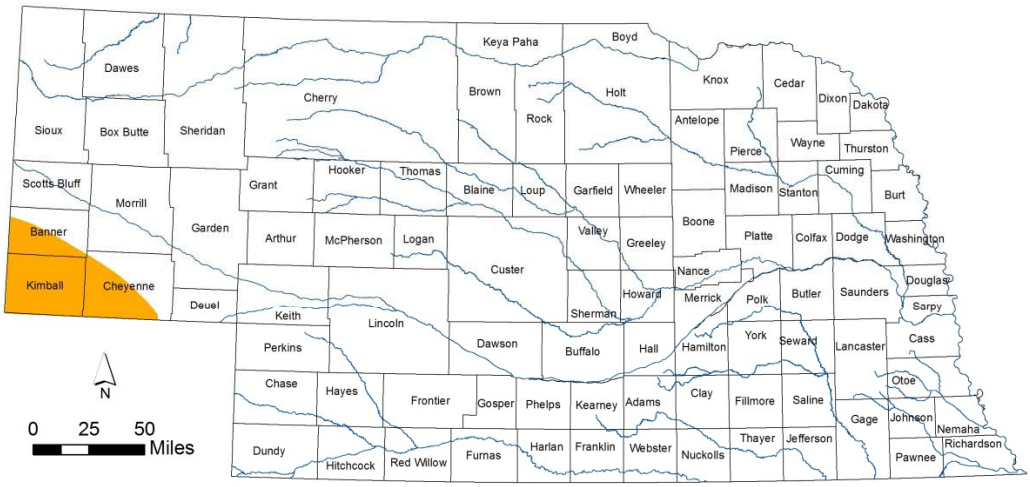
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of Massasauga (*Sistrurus catenatus*)



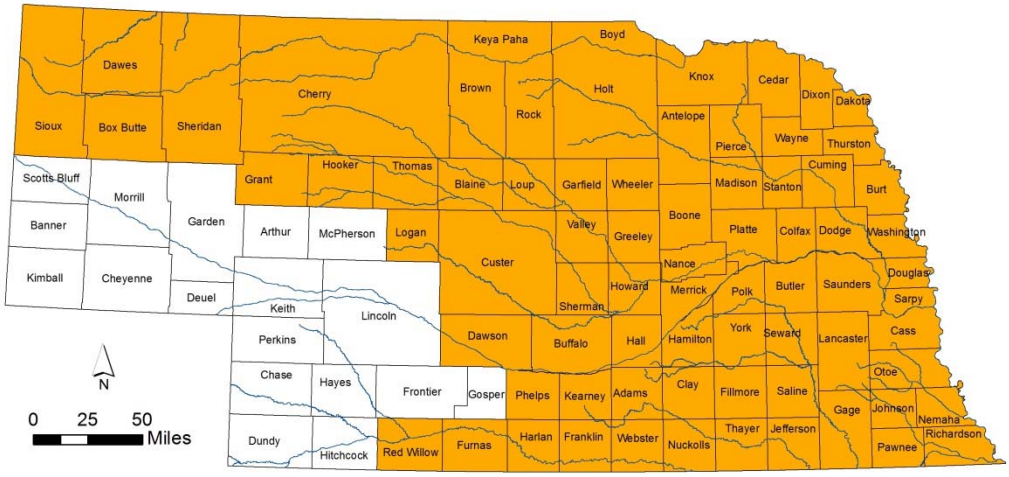
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of Mountain Plover (*Charadrius montanus*)



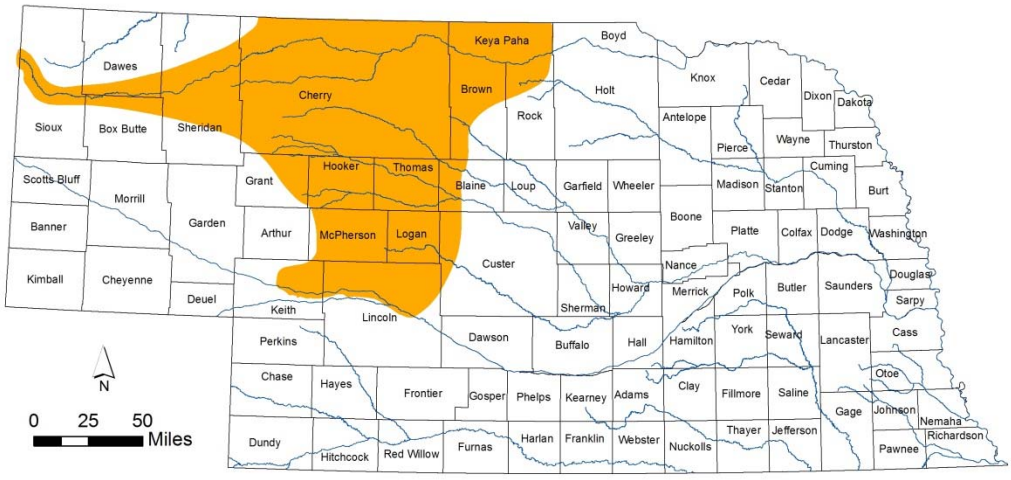
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of
Northern Long-eared Bat (*Myotis septentrionalis*)



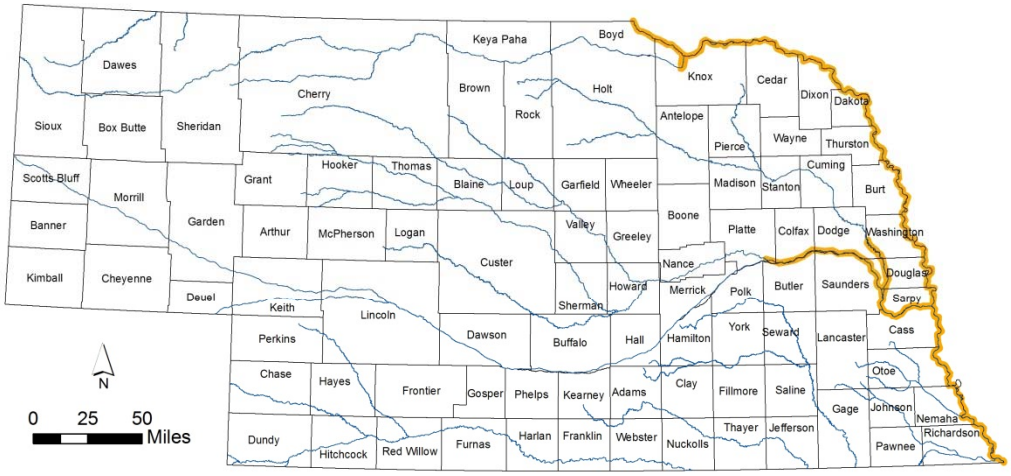
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
June 2015

Estimated Current Range of
Northern Redbelly Dace (*Phoxinus eos*)



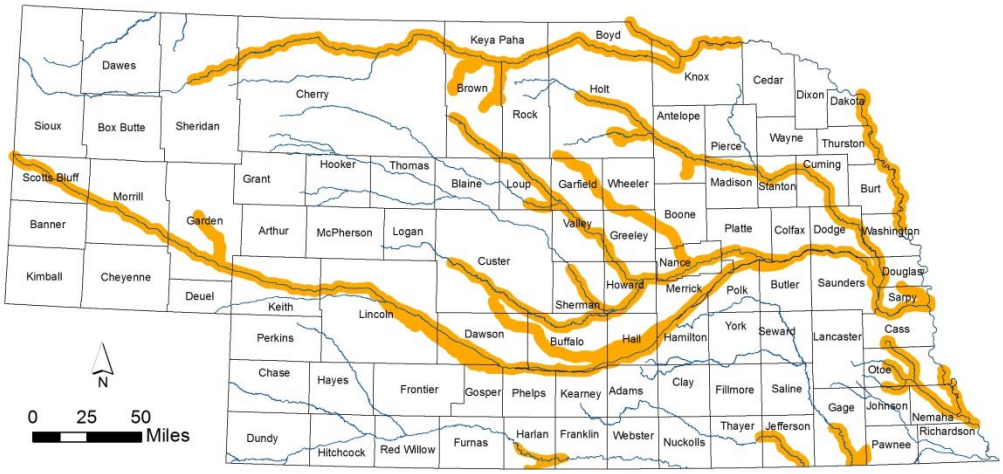
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
March 2011

Estimated Current Range of Pallid Sturgeon (*Scaphirhynchus albus*)



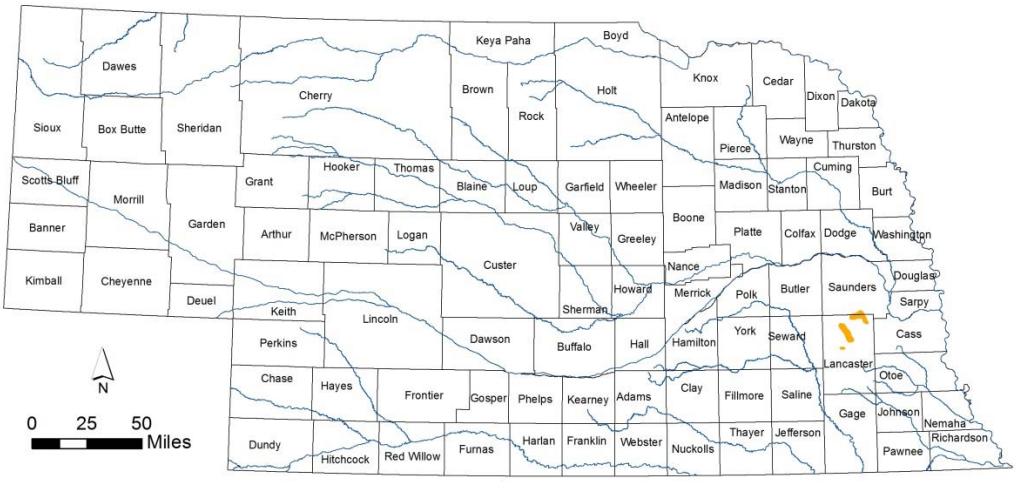
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
August 2011

Estimated Current Range of River Otter (*Lontra canadensis*)



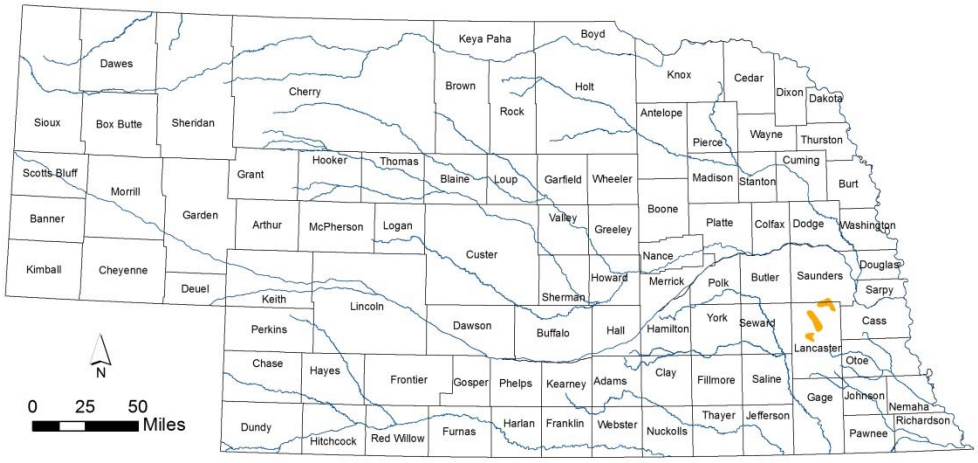
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
June 2015

Estimated Current Range of
Salt Creek Tiger Beetle (*Cicindela nevadica lincolniana*)



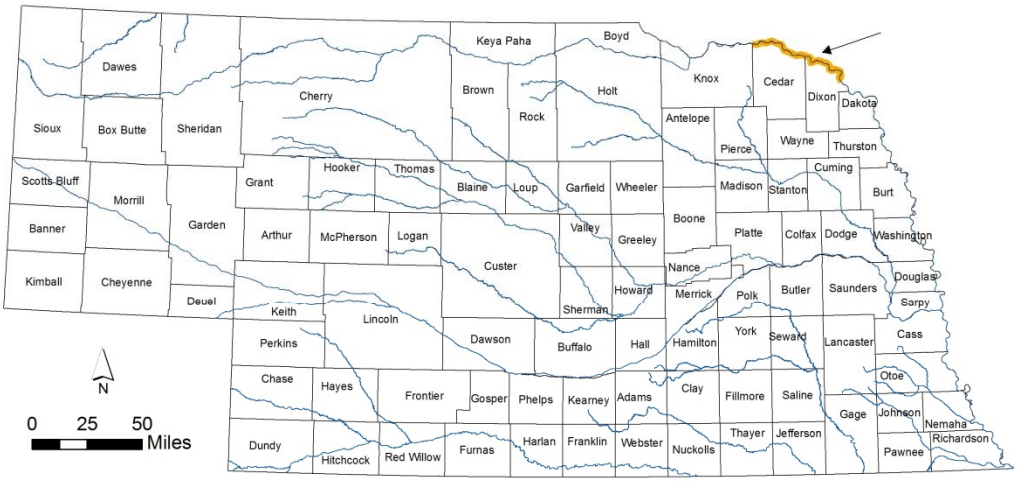
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
February 2014

Estimated Current Range of
Saltwort (*Salicornia rubra*)



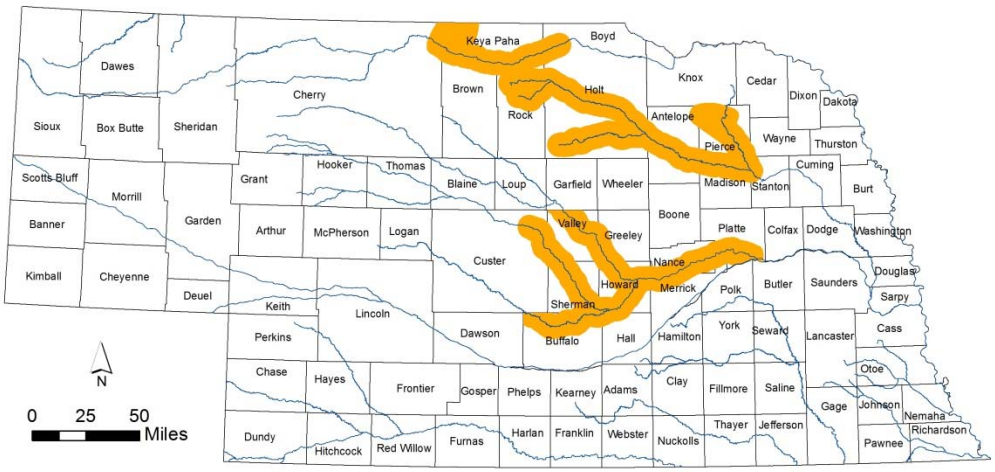
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
February 2014

Estimated Current Range of Scaleshell Mussel (*Leptodea leptodon*)



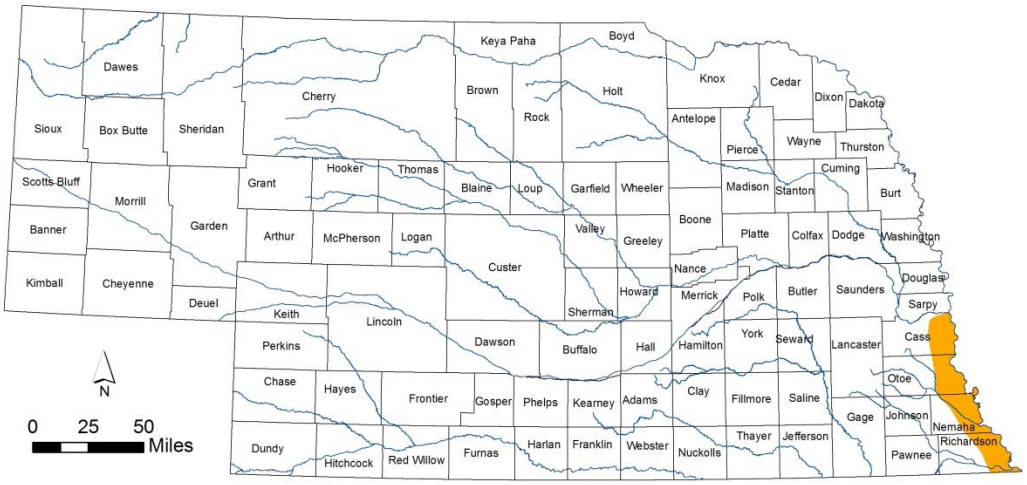
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of Small White Lady's Slipper (*Cypripedium candidum*)



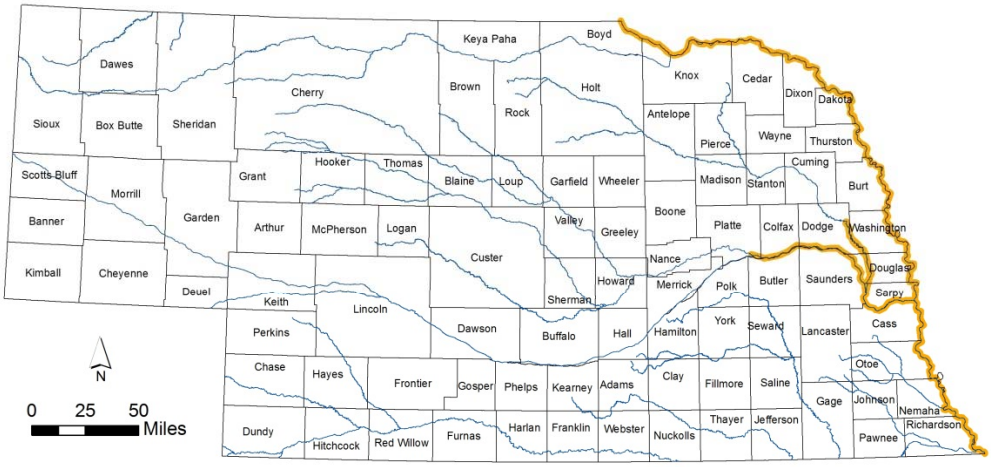
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
February 2014

Estimated Current Range of
Southern Flying Squirrel (*Glaucomys volans*)



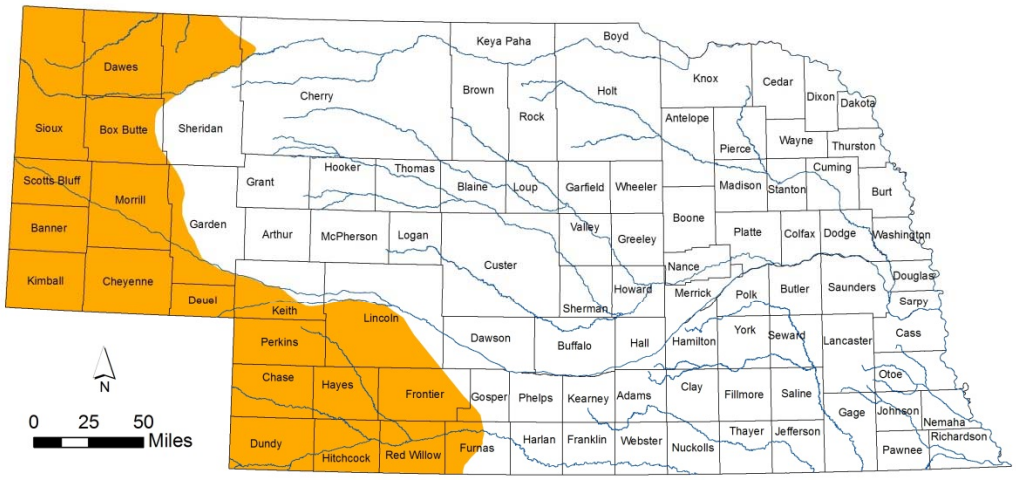
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of
Sturgeon Chub (*Macrhybopsis gelida*)



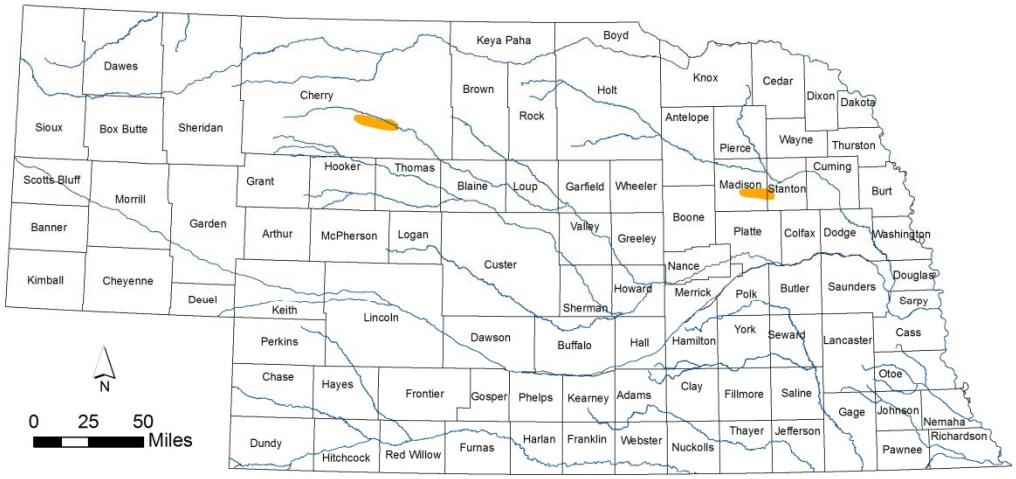
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of Swift Fox (*Vulpes velox*)



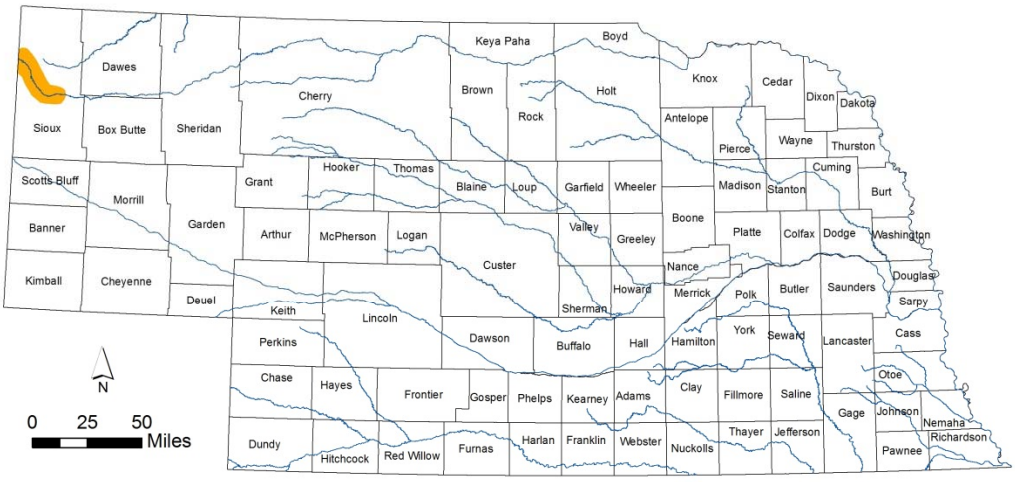
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of Topeka Shiner (*Notropis topeka*)



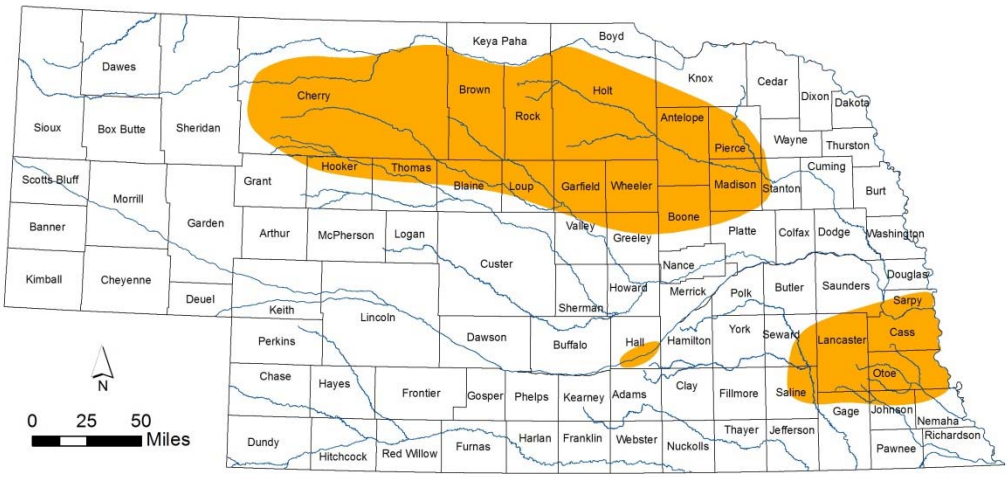
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
March 2011

Estimated Current Range of
Ute Ladies'-tresses (*Spiranthes diluvialis*)



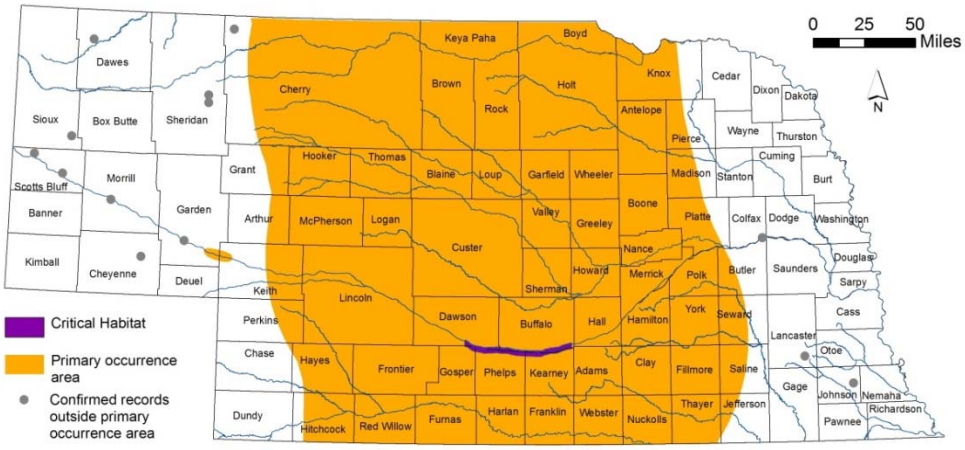
Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
May 2011

Estimated Current Range of
Western Prairie Fringed Orchid (*Platanthera praeclara*)



Nebraska Natural Heritage Program,
Nebraska Game and Parks Commission
September 2012

Whooping Crane (*Grus americana*): Migration Use Area and USFWS-designated Critical Habitat



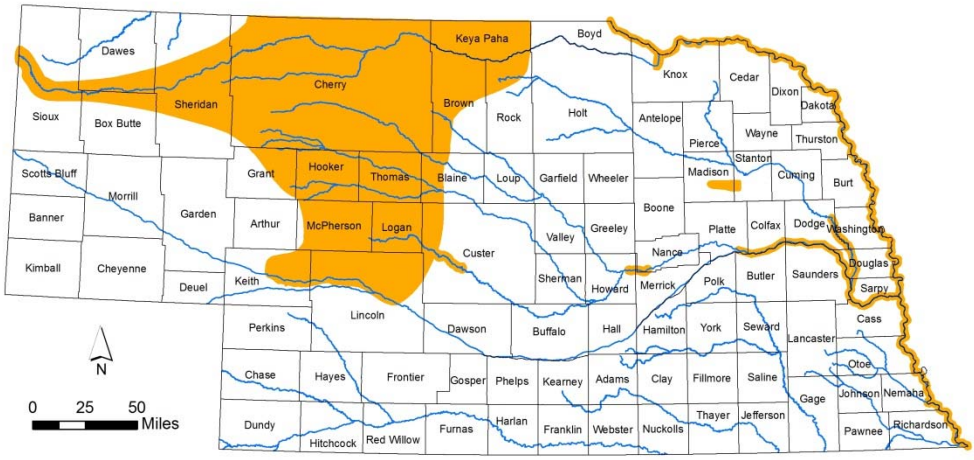
The primary occurrence area is a modification of the area identified by the U.S. Fish and Wildlife Service (USFWS) as encompassing 95% of documented Whooping Crane migratory stopovers between 1975 and 2007. The modification consisted of incorporating additional locations known to have repeated use. Data source: USFWS. State-specific Nebraska flyway for Whooping Crane. Vector digital data Unpublished shapefile received October 27, 2008 from USFWS, Region 6, Grand Island, NE.

Critical Habitat areas are considered essential for the conservation of a listed species. Data source: U.S. Fish and Wildlife Service, Region 2. 2003. Whooping Crane critical habitat. Vector digital data. Downloaded October 29, 2008 from http://crithab.fws.gov.

Confirmed records are current through Fall 2010 (Source: USFWS, Region 6).

Map produced by the Nebraska Natural Heritage Program, Nebraska Game and Parks Commission, July 6, 2011.

Current Estimated Ranges for Nebraska's Listed Fish Species



The map shows the combined ranges of the seven listed fish species in Nebraska. The map was designed for the user to easily see where listed fish may occur, regardless of species.

Nebraska Game and Parks Commission
January 2016

Map produced by the Nebraska Natural Heritage Program

E. Endangered and Threatened Species Standard Procedures

Nebraska Game and Parks Commission (NGPC) has implemented standard procedures for pesticide application (including herbicides) to, over, or near waters of the State of Nebraska, in order to avoid adverse impacts to state listed endangered and threatened species.

If pesticide applicators, including NDOR and its contractors, can follow the standard procedures presented in this section, then individual review and informal consultation with NGPC on the activity is not necessary. ***However, if the standard procedures cannot be followed, then consultation with NGPC is required.*** Individual consultation with NGPC will usually take about 30 days to complete. Application of pesticides/herbicides may not happen until the consultation is complete.

<u>Therefore, NDOR and its contractors shall follow the procedures in this section to avoid individual review and informal consultation for threatened and endangered species impacts.</u>

Instructions for applying pesticides safely in the right-of-way are included in the "Applying Herbicides Safely" section and the "Chemical Control of Weeds" section in this document. The Nebraska Game and Parks standard procedures require the following for all application areas:

- Follow all label instructions.
- Pesticides that could drift should be applied when the wind speed is 10 mph or less.
- Pesticides that could drift should be applied using a large droplet size in order to minimize drift. Nozzles with higher rated flows and using the lowest recommended spray pressure for a nozzle will produce larger droplets.
- Pesticides that could drift should be applied using the appropriate type and orientation of nozzles to minimize the potential for drift.
- Pesticides should not run-off into areas occupied by listed species.
- Pesticides should not affect listed threatened or endangered species.
- Pesticides that are not approved for aquatic use should not run-off into areas with flowing or standing water.

<u>Use of surfactants</u>

- Surfactant use is restricted in selected areas and for certain uses.
- In saline wetlands (within Lancaster and Saunders Counties – see the saltwort range map), surfactants may not be used when applying pesticides (herbicides) to cut stumps or girdled trees.

- Surfactants may not be added to the base pesticide formulation to be applied directly to stream and river reaches of concern, or allowed to run–off to stream or river reaches of concern. See the "Stream and river reaches of concern for Nebraska fish species" map.
- Surfactants added to the basic pesticide (herbicide) formulation should not be applied to, over, or near waters of the state within the range of American burying beetle from June 7 – September 1.

Procedures within saline wetlands, including Salt Creek tiger beetle and saltwort

- When applying herbicide to, over, or near streams or creeks within ½ mile of saline wetlands in Lancaster or Saunders Counties (see the maps for saltwort and the Salt Creek tiger beetle):
- Refer to the map entitled "Estimated current range of saltwort" for approximate wetland locations.
- Use no surfactants when treating cut stumps or girdled trees.
- When treating cut stumps, paint the stumps individually - - do not spray.
- When treating weeds, no herbicide may be applied between May 15 – August 1 without further consultation with the NGPC Environmental Services Division.
- Outside of the restriction time, apply herbicides ***only*** using a backpack sprayer, handheld sprayer, ATV/truck/tractor mounted sprayer with hand operated wand/nozzle. Any other application method should not be used without further consultation with the NGPC Environmental Services Division.
- A survey for saltwort should be conducted during the normal growing season (May 1 – September 30). Staff from NDOR's Environmental Section will perform this survey upon notice from the District that herbicide application is necessary.
- Pesticides intended to kill insects, eggs or their larvae (including those intended to kill mosquitoes) should not be applied without further consultation with the NGPC Environmental Services Division.

Stream and river reaches of concern for fish species

- Refer to the map (page 69) entitled "Current Estimated Ranges for Nebraska's Listed Fish Species" for approximate locations:
- Pesticides that are toxic to fish should not be applied to, over, or near the stream and river reaches of concern for listed fish species.
- Surfactants added to the base pesticide formulation should not be applied directly to stream and river reaches of concern, or allowed to run-off into stream or river reaches of concern without further consultation with the NGPC Environmental Services division.

- Aquatic herbicides with the sole active ingredient imazapyr and labeled for use in aquatic systems are recommended for use to, over, or near the stream and river reaches of concern.

Procedures within the range of American ginseng

- Refer to the map entitled "Estimated current range of American ginseng" for approximate locations.
- If herbicides, defoliants, desiccants, or plant growth regulators need to be applied to, over, or near waters of the state in mature oak woodlands within the range of American ginseng, then a survey for American ginseng should be conducted prior to pesticide application. Surveys should be conducted during the growing season (May – August). If survey results are positive, then further consultation with the NGPC Environmental Services Division will be necessary. If survey results are negative, the pesticide can be applied.

Procedures within the range of blowout penstemon

- Refer to the map entitled "Estimated current range of blowout penstemon" for approximate locations.
- If herbicides defoliants, desiccants, or plant growth regulators need to be applied to, over, or near waters of the state in within the range of blowout penstemon, then a survey for this species should be conducted prior to pesticide application. Surveys should be conducted during the blooming season (June - July). If survey results are positive, then further consultation with the NGPC Environmental Services Division will be necessary. If survey results are negative, the pesticide can be applied.

Procedures within the range of Colorado butterfly plant

- Refer to the map entitled "Estimated current range of Colorado butterfly plant" for approximate locations. The range of this plant is in Kimball County, within ½ mile of Lodgepole Creek from the City of Kimball west to the county line.
- If herbicides defoliants, desiccants, or plant growth regulators need to be applied to, over, or near waters of the state within the range of Colorado butterfly plant, then a survey for this species should be conducted prior to pesticide application. Surveys should be conducted during the blooming season (August). If survey results are positive, then further consultation with the NGPC Environmental Services Division will be necessary. If survey results are negative, the pesticide can be applied.

Procedures within the range of Ute ladies'-tresses

- Refer to the map entitled "Estimated range of Ute ladies'-tresses" for approximate locations of populations. The range of this plant is in Sioux County within ½ mile of the Niobrara River.

- If herbicides, defoliants, desiccants, or plant growth regulators need to be applied to, over, or near waters of the state within the range of Ute ladies-tresses, then a survey for this species should be conducted prior to pesticide application. Surveys should be conducted during the blooming season (August 7-21). If survey results are positive, then further consultation with the NGPC Environmental Services Division will be necessary. If survey results are negative, the pesticide can be applied.

Procedures within the range of American burying beetle

- Refer to the map entitled "Estimated current range of American burying beetle" for approximate locations.
- Within city limits, in row crop fields or alfalfa fields, pesticides can be applied to, over, or near waters of the state within the American burying beetle's range.
- Except for within city limits, row crop fields or alfalfa fields, surfactants added to the basic pesticide formulation should not be used to, over, or near waters of the state within the range of American burying beetle from June 7 – September 1 without further consultation with the NGPC Environmental Services Division.
- Except for within city limits, row crop fields or alfalfa fields, any pesticide intended to kill insects, eggs, or their larvae should not be applied to, over, or near waters of the state within the range of American burying beetle from June 7 – September 1 without further consultation with the NGPC Environmental Services Division.

Procedures within the ranges of interior least tern and piping plover

- Refer to the map entitled "Estimated current nesting range of piping plover and interior least tern" for locations.
- Pesticides may be applied to, over, or near waters of the state within the range of plovers and terns from August 16 – April 14, which is outside of the plover and tern nesting season.
- Aircraft should not be used to apply pesticides to, over, or near waters of the state within the range of plovers and terns during the plover and tern nesting season (April 15 – August 15) without further consultation with the NGPC Environmental Services Division.
- For all other means of applying pesticides during the plover and tern nesting season (April 15 – August 15) other than by aircraft, such as by airboats or by ATV from the bank, then a plover and tern survey should be conducted within ¼ mile of the application area if plover and tern nesting habitat (sandbars, sand pits, sandy beaches, etc.) is present within that area. Surveys should be conducted within 3 days of the pesticide application. If plovers or terns are nesting within ¼ mile of the application area, further consultation with the NGPC Environmental Services Division will be necessary.

- In order to avoid unnecessary duplication of survey efforts and disturbance to nesting birds resulting from survey activities, it is recommended that the applicant contact Michelle Koch (402-471-5438), Environmental Analyst Supervisor, NGPC, prior to conducting a survey. Several segments of river and some sand and gravel pits are monitored weekly for plover and tern use by different agencies/entities, and it is possible that the application area has already been surveyed.

- Bird repellents should not be applied to, over, or near waters of the state within the range of piping plovers or interior least terns during the nesting season (April 15 – August 15) without further consultation with the NGPC Environmental Services Division.

<u>Procedures within the range of western prairie fringed orchid</u>

- Refer to the map entitled "Estimated current range of western prairie fringed orchid."
- Habitat for western prairie fringed orchid includes wet meadows (including hay meadows), sub-irrigated meadows, side-hill seeps in grasslands, and roadsides or ditches adjacent to or across the road from any of the habitats mentioned here.
- If herbicides, defoliants, desiccants, or plant growth regulators need to be applied to, over, or near waters of the state within habitat for western prairie fringed orchid, then a survey for this species should be conducted prior to pesticide application. Surveys should be conducted during the blooming season (June 15 – July 7). If survey results are positive, further consultation with the NGPC Environmental Services Division will be necessary. If survey results are negative, the pesticide can be applied.

<u>Procedures within the range of small white lady's slipper</u>

- Refer to the map entitled "Estimated current range of small white lady's slipper".
- Habitat for small white lady's slipper includes wet meadows (including hay meadows), sub-irrigated meadows, side-hill seeps in grasslands, and roadsides or ditches adjacent to or across the road from any of the habitats mentioned here.
- If herbicides, defoliants, desiccants, or plant growth regulators need to be applied to, over, or near waters of the state within habitat for small white lady's slipper, then a survey for this species should be conducted prior to pesticide application. Surveys should be conducted during the blooming season (May 15 – June 10). If survey results are positive, further consultation with the NGPC Environmental Services Division will be necessary. If survey results are negative, the pesticide can be applied.

Procedures within the range of whooping crane

- Refer to the map entitled "Whooping crane migration use area and USFWS-designated critical habitat."
- If pesticide (including herbicides) application needs to occur during the whooping crane's spring migration (between March 23 and May 10) or during the fall migration (between September 16 and November 16), a whooping crane survey should be conducted according to the survey protocol (below) prior to application that day. If whooping cranes are sighted, the pesticide application should be postponed until the cranes are no longer present within ½ mile of the application area. Pesticides will not likely have direct, adverse impacts on whooping cranes, but human presence and disturbance while applying the herbicides may flush whooping cranes from feeding or roosting areas.
- Bird repellents should not be applied to, over, or near waters of the state within the range of whooping cranes during the spring (March 23 – May 10) or fall (September 16 – November 16) migration seasons without further consultation with the NGPC Environmental Services Division.
- Whooping crane survey protocol – necessary during the spring and fall migration timeframes.
    - Survey the project each day within one hour of the start of the workday, with at least one survey done no later than 10 a.m. Record the start and stop time.
    - Survey the area within 0.5 mile of the project, using binoculars or spotting scope.
    - If whooping cranes are not seen during the morning survey, work may begin after survey completion. If whooping cranes are observed within 0.5 mile of the herbicide application area, do not start work (contact NDOR's Endangered Species Biologists, Melissa Marinovich at (402) 479-3546) or Zach Cunningham at (402) 479-4464.
    - Stop work if cranes are seen at times other than the morning survey. Work can resume if birds move off and are more than 0.5 mile from the application area. Record the sighting, bird departure time, and work start time.

Procedures within ranges of river otter, scaleshell mussel, southern flying squirrel, swift fox

NGPC has published standard procedures for the use of chemical products other than herbicides within the ranges of river otter, scaleshell mussel, southern flying squirrel, and swift fox. Since NDOR and its contractors do not use these products (attractants, molluscicides, antifouling agents, and algicides) on NDOR rights-of-way, they are not covered here.

Procedures within ranges of massasauga, mountain plover or northern long-eared bat

No standard procedures for massasauga, mountain plover or northern long-eared bat are developed at this time.

Procedure for consultation with NGPC

If pesticides (including herbicides) cannot be applied according to the Endangered and Threatened Species Standard Procedures, then the pesticide application project should be submitted for individual endangered and threatened species review and consultation. Please allow 30 days for review. An individual review/consultation is valid for one year.

Please submit the following project information:

- Contact information (name, District office/yard mailing address, phone number, email address)
- Project location (county/counties, township/range/section, or latitude/longitude coordinates)
- Type of pesticide (herbicide) being applied
- Type of surfactant(s) being used
- Purpose of pesticide application
- Projected date(s)/month(s) for pesticide application
- Application method (e.g., hand held sprayer, helicopter, ATV, etc.)
- Map with the application area boundaries noted (unless it is the entire county)
- Other pertinent project information

Submit the project information to:

Melissa Marinovich, Biologist
NDOR
1500 Hwy 2
PO Box 94759
Lincoln NE 68509-4759

Melissa.marinovich@nebraska.gov
(402) 479-3546

OR

Zach Cunningham, Biologist
NDOR
1500 Hwy 2
PO Box 94759
Lincoln, NE 68509-4759

Zach.cunningham@nebraska.gov
(402) 479-4464

Questions regarding the **General NPDES Permit for Pesticides** should be directed to:

Ronald Poe
NDOR
(402) 479-4499
Ronald.Poe@nebraska.gov

Pesticide Effects on Sensitive Crops

Background

Roadside vegetation management within NDOR rights-of-way should not affect adjacent properties. Chemical control of weeds has a potential for unintended effects, especially on sensitive crops that occur adjacent to or near application areas. These effects can impact NDOR through herbicide damage claims and other legal issues.

Agricultural production is an important part of Nebraska's economy. Chemical drift of pesticides (including herbicides) from the application area onto nearby land is especially troublesome when sensitive crops such as vineyards, orchards, and organic farms are affected. Pesticide contamination is a large enough threat that applications to NDOR rights-of-way need to be performed with great care and attention to detail.

Sensitive crops are especially vulnerable to chemical drift effects. Pesticide contamination of **vineyards** can kill grape vines with just a small amount of product drift. The vines can have been perpetuated for generations, and may have no tolerance to herbicides. **Orchards** also may have trees that have been grown and grafted for generations. The value of the produce, combined with the value of the trees, is part of Nebraska's agricultural livelihood. Further, herbicide drift can impact the orchard's pollinator populations, further hampering production of food and hurting agricultural economic health. For **organic farms** to market their crops as organic, no pesticides can be used and crops can be grown only in soil that is free of pesticides. Pesticide contamination can diminish the monetary value of produce grown on organic farms, and can confound the farm's organic designation.

The party that applies herbicide can be sued for crop damages if that herbicide drifts onto crops. Herbicide claims are both difficult and expensive to defend.

Recommendations for Controlling Chemical Drift:

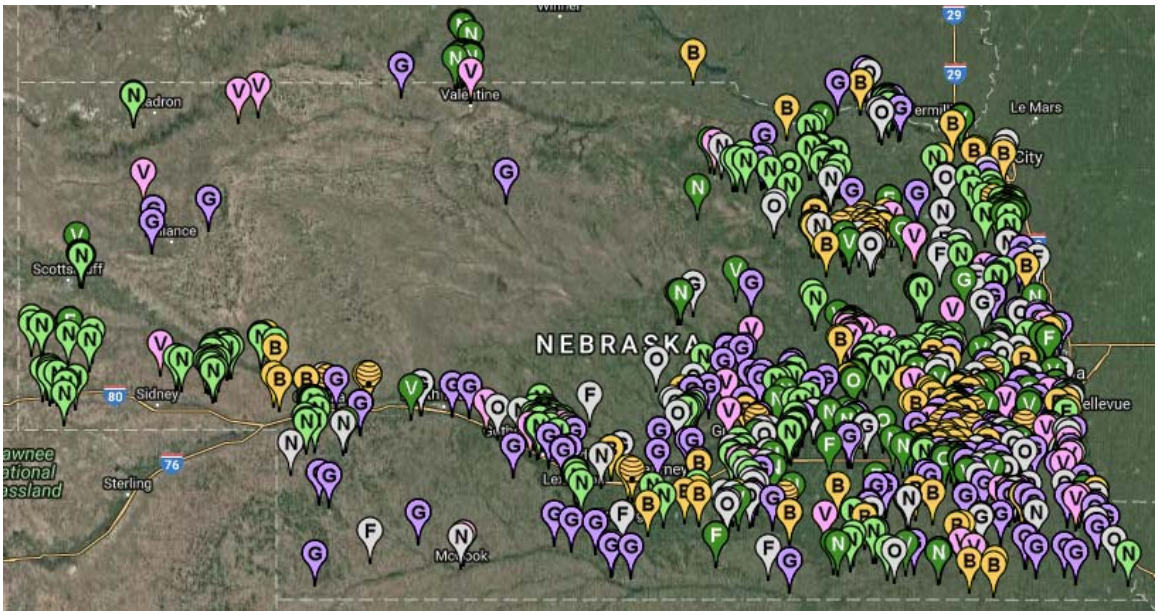
1. Pay attention to detail and follow label instructions for chemicals to be used.
2. Calibrate spray equipment appropriately and to use the largest droplet size appropriate for the situation. Drift can take two avenues: spray drift (droplets in the wind) and vapor drift (evaporated herbicide in the air). Large droplets don't move as readily as fine droplets do. (See page 87 for calibration information.)
3. Orient the spray nozzle to apply herbicide on the intended plants only.
4. Do not spray when wind speed is above **10 miles per hour**.
5. Keep detailed records of each herbicide application (see the "Herbicide Records" Section on page 87.)
6. Consider alternate weed control practices when working adjacent to sensitive crops. When chemical control is warranted, give preference to products other than 2-4,D.

Locations of Sensitive Crops

The Driftwatch link shows the locations of organic farms, agriculturally used bees, and specialty crops. Check the Driftwatch link frequently, since producers and locations change. Have a strategy for controlling noxious weeds in the vicinity of the shown locations.

https://ne.driftwatch.org/map

The image below is purely an example of what you'll see when you open the link. The locations and types of crops documented have certainly changed since this download:



Staff and Contractor Certification for Chemical Application

- Nebraska Department of Roads' employees and contractors who apply pesticides (including general use or restricted use herbicides) in the maintenance of ornamental trees, shrubs, flowers, and turf on roadside rest areas, maintenance facilities and office buildings must be certified as either commercial or noncommercial pesticide applicators in Nebraska.
- Restricted Use Chemicals should be used only after all non-restricted options have been tried and have failed to control the problem. Maintenance personnel and contractors who apply Restricted Use Chemicals must be certified in Right-of-Way Pest Control to apply those chemicals.
- Maintenance personnel and contractors who apply any insect control or chemicals (including fertilizer), to lawns must be certified in ornamental and turf pest control.

- These rules also apply to the contractors that maintain any of our state operated rest areas, offices, maintenance yards, or apply chemicals on any NDOR right of way areas.
- Nebraska Pesticide Applicator Certification and Licensing information and testing dates are available at http://www.agr.state.ne.us/division/bpi/pes/cert.htm

According to the Nebraska Pesticide Act, §2-2638(2), http://www.nda.nebraska.gov/regulations/plant/actbm.pdf "Any person who uses lawn care or structural pest control pesticides on the property of another person in the State of Nebraska for hire or compensation shall be a commercial applicator license holder, regardless of whether such person uses any restricted-use pesticide."

Section 005.02A4 of the TITLE 25 Nebraska Administrative Code Chapter 2 Nebraska Department of Agriculture Pesticide Regulations

http://www.sos.ne.gov/rules-and-regs/regsearch/Rules/Agriculture_Dept_of/Title-25_Bureau_of_Plant_Industry/Chapter-02.pdf defines the Ornamental and Turf Pest Control category as:

" …commercial applicators using or supervising the use of restricted use or general pesticides and noncommercial applicators using or supervising the use of restricted use pesticides to control pests in all lawn care applications, including the maintenance and production of ornamental trees, shrubs, flowers, and turf, including in and around structures, green houses, plant nurseries, golf courses, athletic fields, public or private grounds and turf farms."

Precautions for All Herbicide Applications

READ ALL LABELS BEFORE USING ANY CHEMICALS

The increased emphasis on preventing environmental pollution makes it essential that appropriate chemicals be applied at the appropriate rates by licensed applicators when needed on NDOR property. For additional information regarding chemical usage on NDOR right-of-way, contact the Roadside Stabilization Unit in the Environmental Section of the Project Development Division.

Specific precautions include:

1. MOST IMPORTANTLY, use the highest degree of safety for yourself, your coworkers and the public. See "Handling Herbicides Safely" section below.
2. Always follow label directions. Use the lowest application rate that will give control of the target species.
3. Pay attention to what other plants may be affected by herbicide application. Strive to affect only the target species. This is especially important near crops and residences. See "Applying Herbicides Safely" section below.

4. Choose the right herbicide product for the job, and confirm that the product is compatible with the environment where you are working (in wetlands and waterways especially).
5. Take care in setting up the application equipment. Use high volumes of water and low pressures to **reduce risk of fines and off-target particle drift**. Use drift control agents when operating conventional spray systems. See "Handling Herbicides Safely" section below.

If wind speed is greater than 10 mph, don't spray. The risk of affecting unintended areas is too great.

For information, labels, and Material Safety Data Sheets:

BASF ..... https://www.basf.com/us/en.html
DowAgro ..... www.dowagro.com/prod/index.htm
DuPont ..... http://www.backedbybayer.com/vegetation-management
Monsanto ..... www.monsanto.com/ito
PBI Gordon ..... www.pbigordon.com
Nufarm ..... http://www.nufarm.com/USIVM/IVMAquatics
Crop Production Services (formerly UAP Co) ..... www.uap.com
Van Diest Supply Co. ..... http://www.vdsc.com/Products/default.aspx
Labels and MSDS for all companies ..... http://www.cdms.net/Label-Database

Handling Herbicides Safely

Safety is the most important factor in herbicide use. All herbicides have a warning label that contains one of the signal words DANGER, WARNING, or CAUTION that denotes the toxicity level of the product. Materials with the word DANGER on the label are at least 10 times more toxic than those with the word WARNING, and 100 times more toxic than those with the word CAUTION.

The hazard potential of a herbicide depends on two primary variables: toxicity and exposure. Toxicity is the capacity of a substance to produce injury or death; exposure refers to the contact with the untargeted species. Therefore, a product may be extremely toxic but presents little hazard to the applicator or others when used:

- In a very diluted formulation;
- In a formulation not readily absorbed through the skin or readily inhaled;
- Only occasionally and under conditions to which humans are not exposed; and
- Only by experienced applicators that are properly equipped to handle the material safely.

On the other hand, a product may have relatively low toxicity but may present a hazard if used in concentrated form, which is readily absorbed or inhaled.

Agrichemicals are safe IF they are used in accordance with the recommended practices. To reduce the human hazards posed by the application of herbicides, always:

Read and follow the label instructions and precautions. THE LABEL IS THE LAW.

- Skin exposure to chemicals is potentially dangerous. Wear the protective clothing (apron, gloves, boots, etc.) that is indicated on the product's label. Avoid spilling the material on human skin and clothing. If contact occurs, wash immediately with soap and water. If no water is available, wipe off the chemical and then wash as soon as possible. DON'T leave chemicals on your skin, because your body will absorb them. Remove and wash contaminated clothing separately from other laundry before reusing.
- Do not breathe the vapors of these products.
- If agrichemicals come in contact with the eyes, flush thoroughly with water for a minimum of 15 minutes and immediately transport the victim to a physician.
- DO NOT SMOKE OR EAT while mixing or using herbicides.
- If you must come in contact with herbicides/agrichemicals, wear all appropriate safety equipment. Remember, leather shoes absorb chemicals and must be decontaminated.
- Store herbicides in original containers only. Keep out of the reach of children, livestock, and irresponsible personnel.
- Do not use empty chemical containers for other purposes. Triple rinse the container and put the rinse water into the spray tank. Follow the instructions for destroying the container.
- Prevent drift by reducing pressure.
- Be alert and keep your mind on the job.
- Get medical attention quickly if you or a co-worker experience any unusual or unexplained symptoms (headaches, nausea, dizziness, or other symptoms of possible poisoning) while applying herbicides. Don't take a chance with a person's life.
- Use every precaution to ensure that chemicals do not contaminate streams, lakes, or groundwater and ensure that all environmental requirements are being followed. Compliance with Nebraska's pesticide use general permit is required.
- Wash thoroughly and change clothes after spraying.
- Clean up all spills immediately and dispose of cleanup materials, contaminated soils or absorbents properly to prevent environmental contamination. See the "Herbicide Spills" section on page 85 of this guide.
- Have an Incident Response Plan ready and available where pesticides/ herbicides are stored and handled.

Wetting Agents, Surfactants, and Spreaders

Wetting agents, surfactants, and spreaders all enhance the toxic activity of agrichemicals. They accomplish this by altering aspects of a plant's natural defenses. A plant's leaves are a major organ of absorption and often are covered with a thick waxy material, cuticle, thick hairs, or numerous fine hair-like appendages. These physiological features retard leaf surface absorption. If these natural defenses can be overcome, increases in absorption of a chemical's toxic effect will be accentuated. Use of wetting agents in spray solutions will accomplish the following actions:

1. Increase absorption of the spray solution.
2. Increase the area of contact between the chemical and the leaf.
3. Cause better "sticking" of the spray solution to the leaf.
4. Reduce the amount of chemical needed to kill the target species.

When spraying, remember the following:

1. Ensure that sufficient agitation has occurred to mix the wetting agent and solution prior to applying.
2. Wet the vegetation to the point of runoff.
3. Apply the recommended rate of chemical.
4. Do not use more chemical mixture than is necessary to cover the vegetation.
5. Do not add more chemical than required.

When spraying within Salt Creek tiger beetle habitat range, do not use surfactants. See pages 49 and 64 for maps that denote these areas of Lancaster County. Locations of Salt Creek tiger beetle are similar to saltwort locations.

Mixing of Spray Solutions and Wettable Powders

To protect spray equipment and insure complete mixing of herbicides with solvent, the following procedures should be followed.

1. Solutions

   Fill the tank ⅓ full of water with the agitator operating before adding any agrichemicals. Add ½ of the amount of agrichemicals required and one pint of wetting agent per 100 gallons of solution. Continue filling the tank until it is ⅔ full and then add the remainder of the agrichemical and wetting agent.

2. Wettable Powders

   Fill the tank ⅔ full of water and all the wetting agent that will be required with the agitator operating before adding any agrichemicals. Prepare a "slurry" of the material to be added and slowly add ½ of it to the tank. Continue filling the tank with water and add the remaining ½ of the slurry when the tank is ¾ full.

3. Wetting Agents

   Since leaves with hairs or bristles prevent absorption, use a wetting agent to improve effectiveness when spraying weeds and brush. Wetting agents should be added to the tank as directed in #2 above. Insure that sufficient agitation has taken place to mix the wetting agent and solution prior to applying.

Applying Herbicides Safely

Apply herbicides in accordance with the product label and in a manner that *WILL NOT*:

1. Cause adverse effects on the environment (especially avoid chemicals being allowed to enter groundwater and/or streams, wetlands, or rivers through soil, water movement, or a well),
2. Endanger humans,
3. Damage agricultural products, food, livestock, fish, or wildlife,
4. Cause herbicides to be applied onto property beyond the boundaries of the target site,
5. Cause herbicides to be applied on a human by overspray. Workers in an immediately adjacent property must not be exposed,
6. Allow spray drift to affect unintended areas (most herbicide labels indicate methods for reducing spray). Review the “Pesticide Effects on Sensitive Crops” section, beginning on page 77.
7. Leave un-posted any treated area where chemical residue requires a specific time delay before human re-entry is safe. Sprayed areas also must be posted if the labels indicate or if the area is treated through irrigation systems.

Numerous methods for applying agrichemicals are available, each of which has unique advantages. Commonly used methods are: (1) foliar spray; (2) cut stump; and (3) pellets. Each of these techniques has particular advantages for use at different seasons or on different types of plants. Chemicals must be applied by certified applicators during proper weather conditions with concern for environmental stewardship.

1. Foliar Spray – Sprays directed on a plant's foliage, coating them with chemical substances which may protect or destroy them, are foliar sprays. To achieve the maximum effectiveness, a spray must "wet" the plant but not run off. The addition of a wetting agent enhances the effectiveness of such sprays. Plants that are actively growing under conditions of high soil moisture will absorb more chemical and be more severely injured than plants that are growing slowly. A thorough coverage of the foliage is a must.
2. Cut Stump Application - Please refer to the “Removing Unwanted Trees, Brush and Stumps” section.

3. Pellets – Pellets are available for summer brush and leafy spurge control. These pellets can be carried on the mowers for immediate control while the operator is in the area. If these chemicals are being used by contract mowers, remember that they must be properly licensed to apply them on NDOR's right-of-way.

Spraying Conditions

Ideal spraying conditions seldom occur. Therefore, precautions are necessary to avoid damage to the environment and desirable plant life, while ensuring elimination of problem species. The recommendations listed in this section increase chemical activity and minimize chances of injury to adjacent properties or to the applicator. If the spraying is done by contract, the applicator must have the appropriate licenses and follow similar good practices.

1. Spray on a day when temperatures are between 40° and 85° F, with no precipitation. DO NOT spray when temperatures exceed 85° F.
2. Do not spray when foggy conditions exist.
3. Spray when the wind velocity is less than 10 miles per hour. Particular attention should be paid to wind direction so susceptible non-target plants won't be damaged by drift or vapors.
4. Spray with operating pressures of 15 to 35 pounds per square inch. Drift danger may be further reduced by increasing the nozzle size, lowering operating pressures, and lowering the nozzle height.
5. Spray weeds when they are young and actively growing and when soil moisture is high. Spray the undersides of leaves whenever possible to improve penetration.
6. Spray when it is probable that the spray solution will remain on the plants at least four hours. Don't spray when rain is imminent, and do not mow shortly after spraying.
7. When spraying, use the proper chemical at the recommended rate. Use low volatile formulations.

Three Things to Remember When Using Herbicides:

1 **Spot spraying** Herbicides should be spot sprayed, rather than blanket sprayed over an entire area, since blanket spraying may cover desirable plants and may weaken existing vegetation (thus increasing weed infestation). Blanket spraying may be used to kill existing turf and weeds in preparation for native prairie seeding. Applying herbicides using appropriate nozzles and low pressure will reduce drift. Also, certain additives will increase droplet size.

2 **Appropriate timing** Page 126 (the Control Calendar) outlines the appropriate time to spray a specific weed for best effectiveness. Herbicides work better when used at higher temperatures. However, some formulations (e.g., ester formulations) should not be used when temperatures exceed 85°F. Foliar

herbicides must be applied during a rain-free period to be effective, and herbicides that are absorbed through the roots need rain directly after application to work best. Under all circumstances, herbicides should be sprayed during non-windy weather conditions, in order to minimize drift.

3. **Know how herbicides work** read information to understand herbicide formulations and applications. Knowing the appropriate herbicide to use for a given situation will optimize its use.

   Note: Many new formulations of glyphosate (Roundup™, etc.) exist. When using this product, pay attention to the percent active ingredient. This is true of many other products where knowledge of the common name is important. (Mention of trade names here does not constitute endorsement.)

Caution: Always read, understand and follow the label instructions! Application rates vary with weed/brush species, growth stage, time of year, weather, application techniques, active ingredient percent, etc. Boom and boomless sprayers are usually calibrated to put out 25 gallons per acre (about 50 gallons per acre with herbaceous plants and up to 100 gallons per acre with brush). Rates for spraying seedlings and pre-bloom stage plants are usually lower than rates for more mature plants, including bloom stage. Make sure you do not exceed the labeled high rate for the chemical!

Herbicide Spills

A herbicide spill is potentially hazardous and must be cleaned up immediately. Dispose of cleanup materials, contaminated soils or absorbents properly to prevent environmental contamination. Exercise extreme care when using materials and read and follow all label information.

To prevent possible spills:

1. Prevent bags and cardboard containers from getting wet.
2. Mix the chemicals at least 200 feet from any well (UNL Extension 2010).
3. Prevent or correct leaks in herbicide containers and application equipment.
4. Keep drift to a minimum by the proper use of spray enhancers (wetting agents, surfactants and spreaders), nozzle selection, pressure, and sprayer speed.
5. Avoid volatilization by using only amine formulations. Ester formulations may be used with caution for dormant stem treatments.
6. Properly dispose of all empty containers as required by law.
7. When transporting herbicides, tie down or secure the containers to prevent them from falling off the vehicle. Follow all state requirements for transporting.

<u>If a spill occurs:</u>

For an EMERGENCY situation, call 9-1-1.

Chemical industry public service hotline: 800-424-9300

For assistance with human herbicide exposures, call the Poison Center in Omaha at 800-222-1222.

For non-emergencies:

1. Rinse all skin that has been exposed to the material and remove all contaminated clothing.
2. Contain the spill as well as possible. Do not spread the spill by washing it down any drain. Prevent the spill from entering any waterways (streams, creeks, wetlands, rivers, etc.). Use common cat litter, sawdust, sand, or soil to soak up the herbicide. Consult the manufacturer for more specific cleanup recommendations.
3. Remove the absorbent material with a shovel and/or a broom after the spill has been absorbed. Make sure all contaminated soil is removed from the spill area, as well.
4. Place the contaminated soil and absorbent material into a suitable container, and dispose of the container in an approved landfill.
5. If the spilled amount is 25 gallons (or 100 pounds if dry material) or more, you must immediately contact the Nebraska Department of Environmental Quality (see box below). Spills that are less than these quantities still need to be recovered (cleaned up). If the spilled material cannot be recovered, then you need to report it.
6. If the spill reaches a waterway, then it MUST BE REPORTED, regardless of the quantity of chemical.
7. Clean the spill by removing the contaminated soil or by neutralizing the chemical with an application of activated charcoal, or both.
8. Wash spills off sprayer and dispose of the contaminated rinse water in accordance with state regulations.

To Report a Spill:

Monday – Friday	Contact:	Phone:
8:00 a.m. – 5:00 p.m.	State of Nebraska / NDEQ	(402) 471-2186
After Hours	Nebraska State Patrol	(402) 471-4545
Anytime	Federal/National Response Center	(800) 424-8802

Provide this information when reporting a spill:

- Description of the problem
- What substances are involved
- When the problem occurred (date and time)
- Location of the problem - - the address or directions to the site
- How you are aware of or affected by the problem
- Who or what caused the problem
- Description of any obvious environmental damage to air, water or land

More information is available on the Nebraska Department of Environmental Quality's website: http://www.deq.state.ne.us/

Herbicide Records

Commercial applicators must maintain a record of herbicides used on each site for a minimum of 5 years. The pesticide general permit requires 3-year record retention.

The form to be used for NDOR record-keeping is provided in this chapter's Appendix (page 150 – Pesticide Application Report).

Although non-commercial applicators are only required to keep daily application records on "restricted use" pesticides, we recommend they keep records on all applications including the application of non-restricted use pesticides. **Accurate application records are useful in case of damage claims for crops and landscaping.**

Calibration of Sprayers

Calibrating spray equipment is critical to the proper application of herbicides. Inaccurate or sloppy calibration has economic, legal, and environmental consequences. Please see the "Pesticide Effects on Sensitive Crops" section, beginning on page 77 for information on the importance of controlling where the chemical goes.

The University of Nebraska Lincoln has published a NebGuide (G1511) that provides guidance on calibrating broadcast and hand sprayers: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2725&context=extensionhist. In addition, the "Guide for Weed Management in Nebraska" (http://extensionpublications.unl.edu/assets/pdf/ec130.pdf) contains an informative section on calibrating sprayers.

Mixing for small-volume sprayer Table indicates the amount of herbicide needed per gallon of water					
Gallons/acre of solution applied with sprayer	**Recommend herbicide rate/acre**				
	5 fl oz/ac	**7 fl oz/ac**	**1 pt/ac**	**1 qt/ac**	**2 qt/ac**
20	7.5 cc/gal	10.5 cc/gal	5 tsp/gal	10 tsp/gal	3¼ fl oz/gal
30	5.0 cc/gal	7.0 cc/gal	3 tsp/gal	6 tsp/gal	2 fl oz/gal
40	3.8 cc/gal	5.8 cc/gal	2⅓ tsp gal	4¾ tsp/gal	1⅔ fl oz/gal
50	3.0 cc/gal	5.0 cc/gal	2 tsp/gal	3¾ tsp/gal	1¼ fl oz/gal
60	2.5 cc/gal	4.5 cc/gal	1⅔ tsp/gal	3¼ tsp/gal	6⅓ tsp/gal
70	2.1 cc/gal	4.1 cc/gal	1⅓ tsp/gal	2¾ tsp/gal	5½ tsp/gal
80	1.9 cc/gal	3.9 cc/gal	1¼ tsp/gal	2⅓ tsp/gal	4¾ tsp/gal
90	1.7 cc/gal	3.7 cc/gal	1 tsp/gal	2 tsp/gal	4¼ tsp/gal
100	1.5 cc/gal	3.5 cc/gal	1 tsp/gal	2 tsp/gal	3¾ tsp/gal

tsp = teaspoon fl oz = fluid oz gal = gallon cc = ml = milliliter 6 tsp = 1 fluid oz

Chemical drift can impact crops and other vegetation outside of the intended area. Please see the “Pesticide Effects on Sensitive Crops” section, beginning on page 77 for information on the importance of controlling where the chemical goes.

Influence of droplet size on potential distance of drift		
Droplet Type	**Time to Fall 10’**	**Lateral Distance Droplets Travel in Falling 10 feet in a 3 mph Wind**
Fog	66 minutes	3 miles
Very fine	4.2 minutes	1,100 feet
Fine spray	10 seconds	44 feet
Medium	6 seconds	28 feet
Coarse	2 seconds	8.5 feet
Fine rain	1 second	4.7 feet

Calculate Amount of Herbicide Needed

(Tank size [# of gallons]) X (percent solution desired) X 128 = oz of product to go in tank

Example: to calculate # of ounces of product to mix for a 1½ percent solution for use in a 100-gallon tank:

(100 gallons) X (0.015) X 128 = 192 ounces

NOTE: multiplying by 128 converts the result to ounces

Roadside Weeds to be Controlled

Nebraska's Noxious Weeds:

The table below names the listed noxious weeds in Nebraska. NDOR must control these species when found within the right-of-way or on any NDOR property, including maintenance yards.

Photographs follow in this section. Additional photographs of the state's noxious weed species, distribution information, and more is available through the Nebraska Weed Control Association at: http://www.neweed.org/ and through the Nebraska Invasive Species Council at:
http://neinvasives.com/species/plants/

Noxious Weed Species in Nebraska (2017)

Common Name	Scientific Name
Canada thistle	*Cirsium arvense*
Common reed	*Phragmites australis* ssp. *australis*
Diffuse knapweed	*Centaurea diffusa*
Japanese knotweed	*Fallopia japonica* (and hybrids including giant knotweed, *Fallopia sachalinensis*)
Leafy spurge	*Euphorbia esula*
Musk thistle	*Carduus nutans*
Plumeless thistle	*Carduus acanthoides*
Purple loosestrife	*Lythrum salicaria*
Salt cedar	*Tamarix ramosissima*
Sericea lespedeza	*Lespedeza cuneata*
Spotted knapweed	*Centaurea stoebe* ssp. *maculosa*

Roadside Invasive Species:

- The table below names several listed invasive weeds in Nebraska. Photographs follow in this section. Some things to consider:
- The table below is not the complete listing of all invasive species in Nebraska, but represents the plants most in need of being controlled on Nebraska roadsides, rest area properties, and on maintenance yards.
- When observed, these selected invasive plants should be removed or sprayed appropriately.
- Additional photographs of the state's invasive plant species, distribution information, and more is available through the Nebraska Invasive Species Council at: http://neinvasives.com/species/plants/

Invasive Weed Species to Be Controlled on NDOR Roadsides

Common Name	**Scientific Name**
Caucasian bluestem	*Bothriochloa bladhii*
Dalmatian toadflax	*Linaria dalmatica*
Perennial pepperweed	*Lepidium latifolium*
Teasel (common and cutleaf)	*Dipsacus fullonum* and *D. laciniatus*

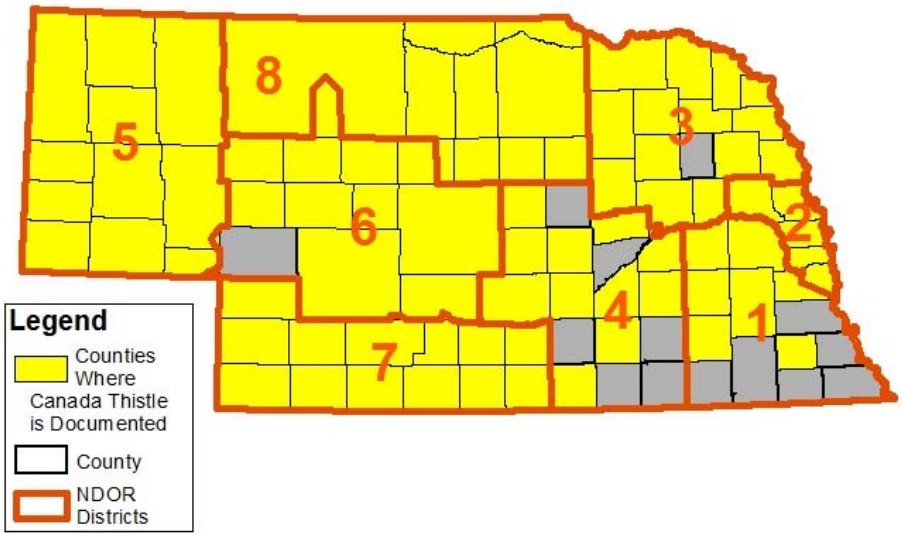
<u>County-Declared Noxious Weeds</u>

The table below lists weed species that are declared by individual counties to be a significant problem. Where these species occur in NDOR rights-of-way, they shall be controlled by NDOR forces or its contractors.

County(ies)	**Common Name**	**Scientific Name**
Banner, Box Butte, Cheyenne, Dawes, Deuel, Garden, Morrill, Scotts Bluff, Sheridan	Bindweed	*Convolvulus arvensis*
Rock	Bull thistle	*Cirsium vulgare*
Dawes, Sheridan	Houndstongue	*Cynoglossum officinale*
Banner, Cheyenne, Dawes, Kimball, Morrill, Scotts Bluff, Sheridan, Sioux	Scotch thistle	*Onopordum acanthium*
Lancaster	Teasel, common Teasel, cutleaf	*Dipsacus fullonum* *Dipsacus laciniatus*
Banner	Woolly leaf bursage	*Ambrosia grayii*
Cherry	Yellow bedstraw	*Galium verum*

Information for identifying and treating these weed species follows.

Canada Thistle - Noxious Weed



Canada Thistle

Photo courtesy of Nebraska Department of Agriculture

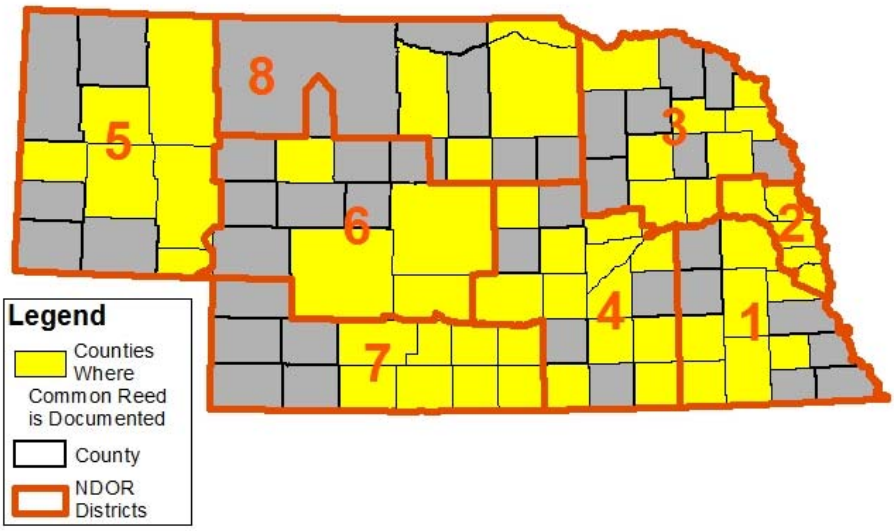
Remove isolated thistle plants by digging them with a spade. If unable to spot spray thistles, mow before seed sets (while plants are flowering).

The best time to treat biennial thistles is the spring or early summer before they bolt and flower, but they are most visible when flowering.

Check areas where control was applied or needed in previous years to scout for thistle rosettes in the fall. Treated areas likely will need re-treatment for 2-5 years for control.

See Part 3 - Chemical Control of Weeds for recommended chemical products to use.

Common Reed - Noxious Weed



Common Reed

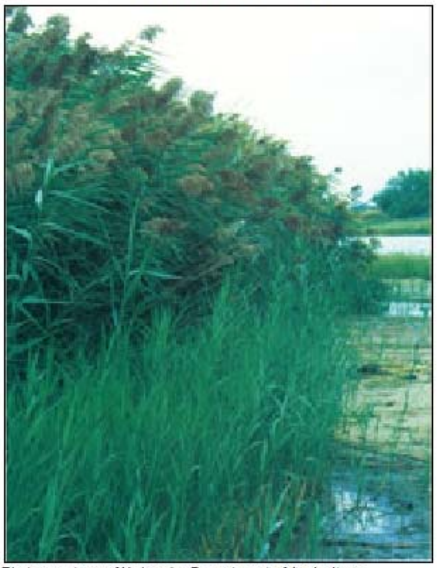


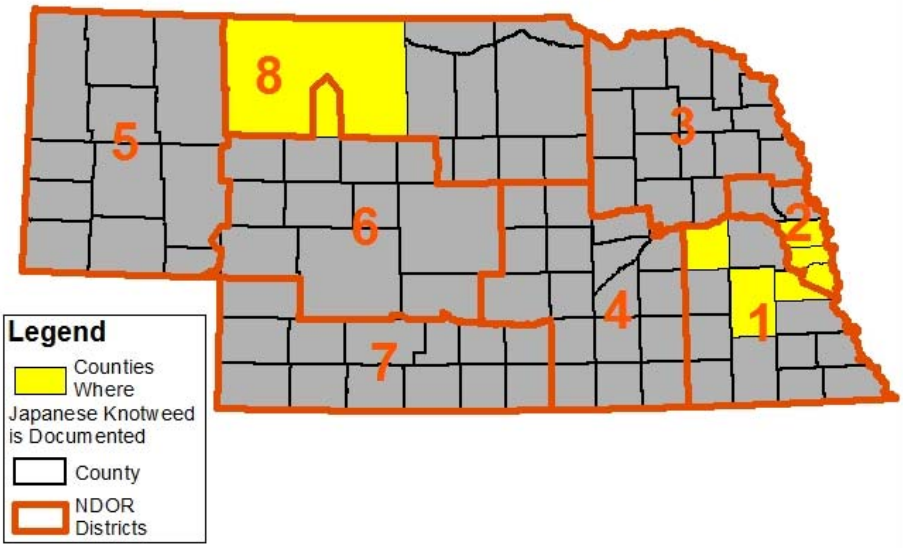
Photo courtesy of Nebraska Department of Agriculture

Mow common reed several times during the growing season for control. Mowing in August and September is most effective to control the plant's spread. If common reed is coming onto R.O.W. from adjacent private lands, encroachment will continue without cooperation from adjacent landowners.

Chemical application is recommended in the spring for best result. Treatment in late summer to early fall after the plant has flowered is also recommended. See Part 3 - Chemical Control of Weeds for herbicide recommendations.

Coordinate control efforts with the local Weed Management Area to prevent duplication or over-application. Several grants have been awarded to control this plant along the Platte and Republican Rivers.

Japanese Knotweed - Noxious Weed



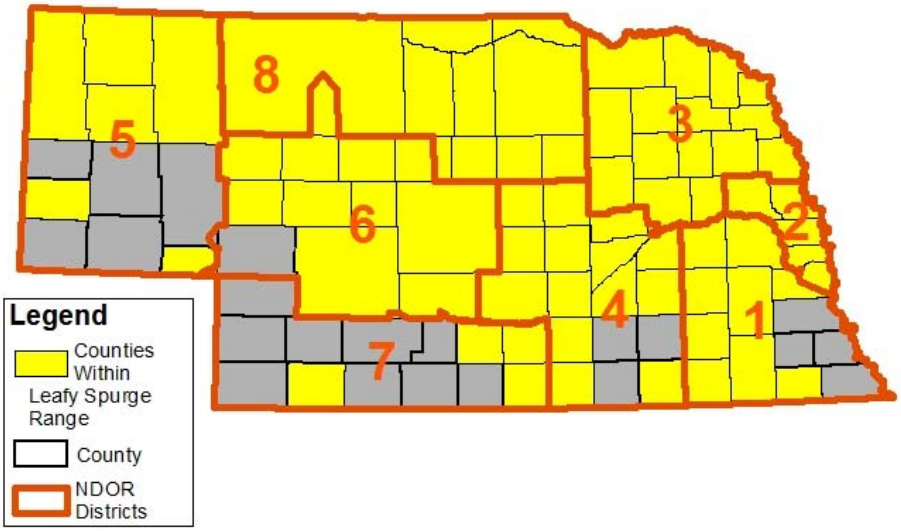
Japanese Knotweed

Photo by Carol Wienhold (Nebraska Department Of Roads)

Mowing around June 1 will reduce the plant material, reduce its energy reserves, and will make chemical treatments easier. If knotweed is growing among planted trees, you will have to cut it more often, starting earlier in the season to prevent it from growing over the trees.

Following a June 1 mowing, wait 6 weeks before applying herbicide (late July). If you are not going to mow, then plan on spraying twice. Make the first application between mid-July and early August, then a follow-up application by mid-September. Keep in mind that when spraying un-mowed knotweed, you'll likely be spraying over your head, thereby making additional safety measures necessary.

Leafy Spurge - Noxious Weed



Leafy Spurge

Photo courtesy of Nebraska Department of Agriculture

Leafy spurge will spread if not treated.

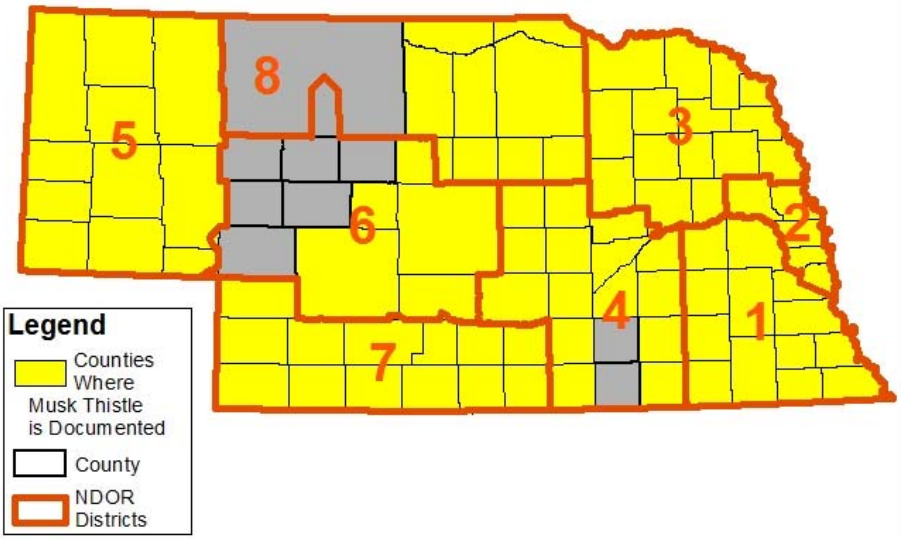
Chemical products are most effective when applied in spring when true flowers emerge (not when only bracts are present).

When leafy spurge is flowering, mow it to prevent seed formation and mark it for fall treatment

Retreatment in the fall is recommended to minimize leafy spurge re-growth. Treatment over several years is needed for eradication.

See Part 3 - Chemical Control of Weeds for recommended herbicide products for treatment.

Musk Thistle - Noxious Weed



Musk Thistle

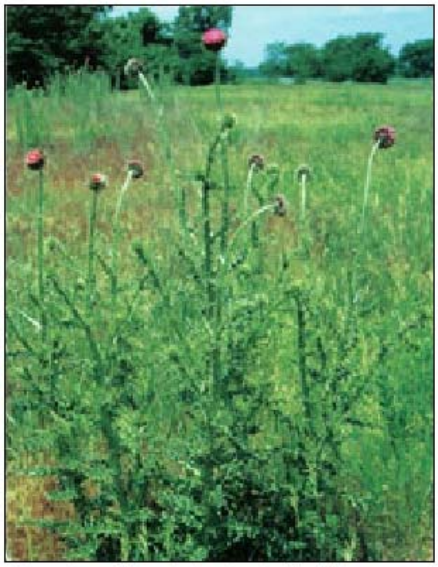


Photo courtesy of Nebraska Department of Agriculture

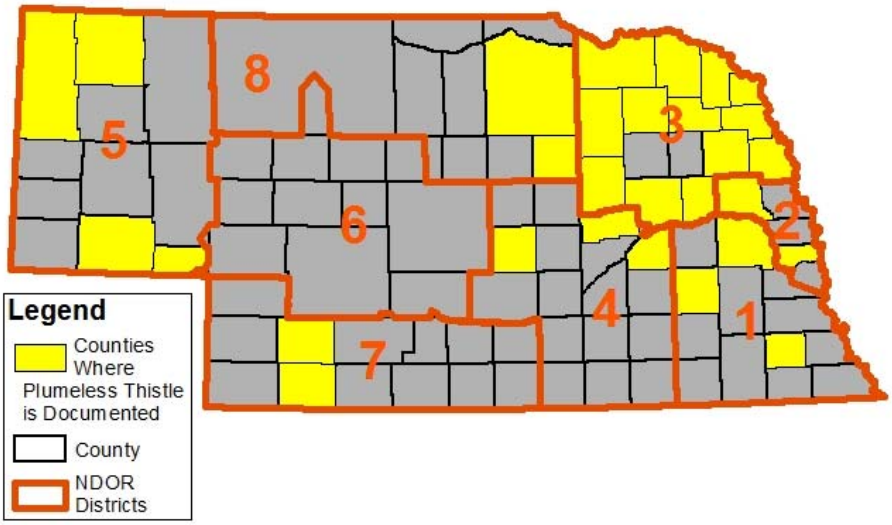
Remove isolated thistle plants by digging them with a spade. If unable to spot spray thistles, mow before seed sets (while plants are flowering).

The best time to treat biennial thistles is the spring or early summer before they bolt and flower, but they are most visible when flowering.

Check areas where control was applied or needed in previous years to scout for thistle rosettes in the fall. Treated areas likely will need re-treatment for 2-5 years for control.

See Part 3 - Chemical Control of Weeds for recommended chemical products to use.

Plumeless Thistle - Noxious Weed



Plumeless Thistle

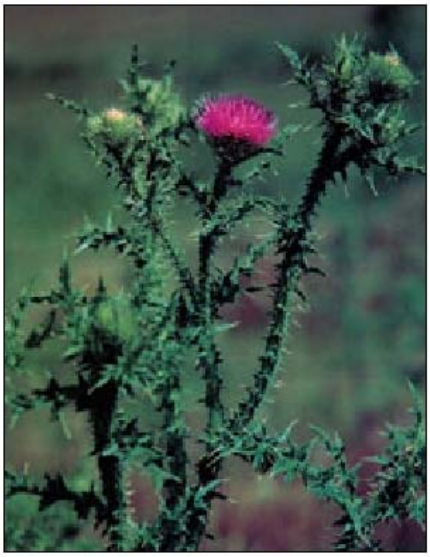


Photo courtesy of Nebraska Department of Agriculture

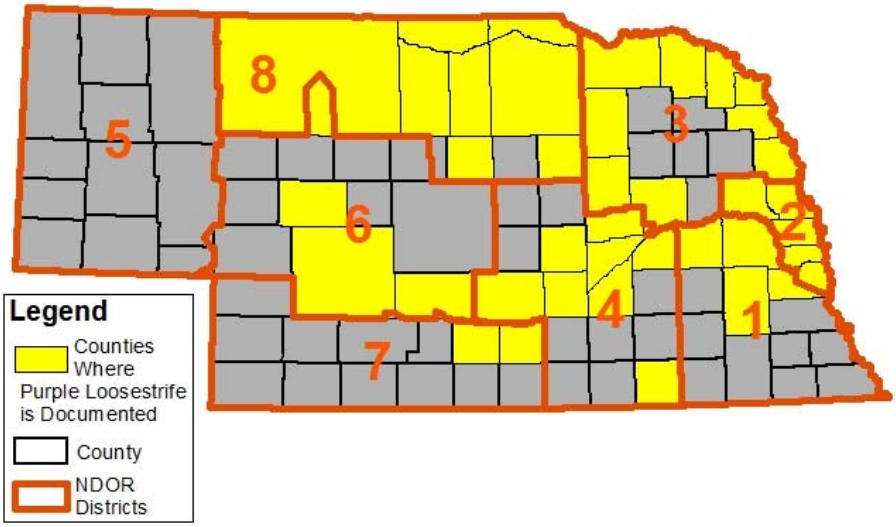
Remove isolated thistle plants by digging them with a spade. If unable to spot spray thistles, mow before seed sets (while plants are flowering).

The best time to treat biennial thistles is the spring or early summer before they bolt and flower, but they are most visible when flowering.

Check areas where control was applied or needed in previous years to scout for thistle rosettes in the fall. Treated areas likely will need re-treatment for 2-5 years for control.

See Part 3 - Chemical Control of Weeds for recommended chemical products to use.

Purple Loosestrife - Noxious Weed



Purple Loosestrife

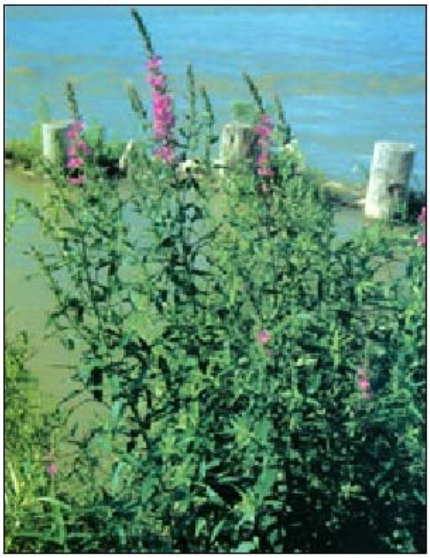


Photo courtesy of Nebraska Department of Agriculture

Do not mow.
New plants can sprout from cuttings.

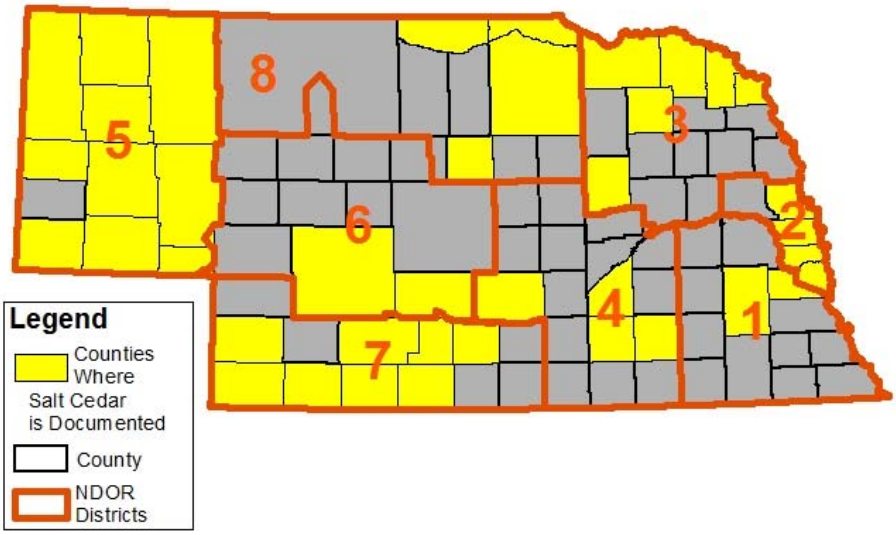
Burning has also proven ineffective. Pulling and digging can be effective, if all plant parts are removed. Dispose of plants in bags, taking great care to catch any dropping seeds in the bag.

Biological Control: Galerucella spp. beetles have been released along the Platte, Niobrara, and Missouri Rivers in Nebraska to suppress the plant. Contact the county weed supervisor for information on the release of beetles to infested right-of-way, especially wetland mitigation sites.

Use aquatic label herbicide if the area to be treated has surface water.

Chemical control: Treat with herbicide in late July or August, but before flowering to prevent seed set. See Part 3 - Chemical Control of Weeds for herbicide recommendations.

Salt Cedar - Noxious Weed



Salt Cedar

Photo courtesy of Nebraska Department of Agriculture

Control of saltcedar requires integration of several methods, like herbicide, mechanical removal, competition by other plants, fire and biological control (introduction of insects known to feed on saltcedar).

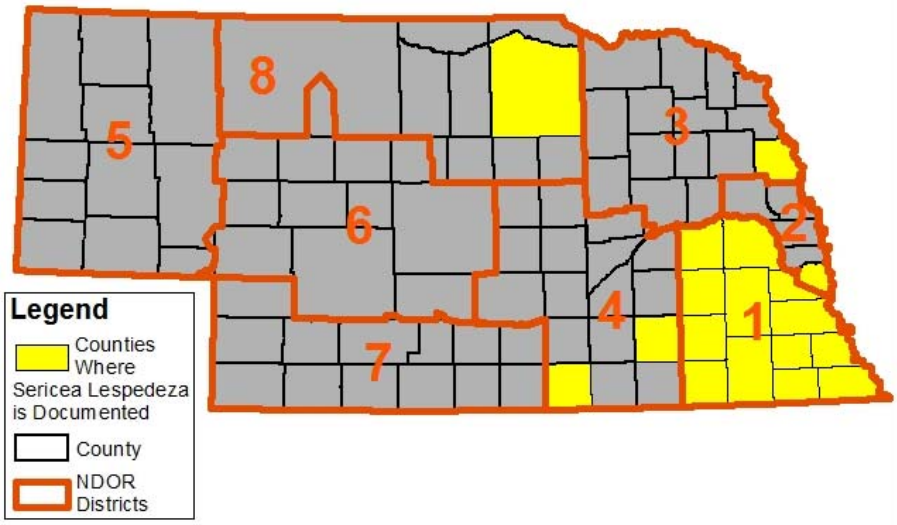
Apply herbicide in August – September, using either foliar or cut stump method.

Foliar application – Spray to completely wet the stems and leaves. After applying herbicide, leave the treated plants in place for 2 years for the chemical to act on all parts of the tree. Cuttings removed too soon could re-sprout.

Cut stump application - apply herbicide to the outer quarter of the freshly cut stem surface and the side of the stump. The cut stump method is effective for treating isolated plants or small infestations, and can be used to avoid injury to desirable grassy vegetation.

See Part 3 - Chemical Control of Weeds for herbicide recommendations.

Sericea Lespedeza - Noxious Weed



Sericea Lespedeza

Photo by John Pickering/discoverlife.org

2,4-D is not effective against sericea lespedeza.

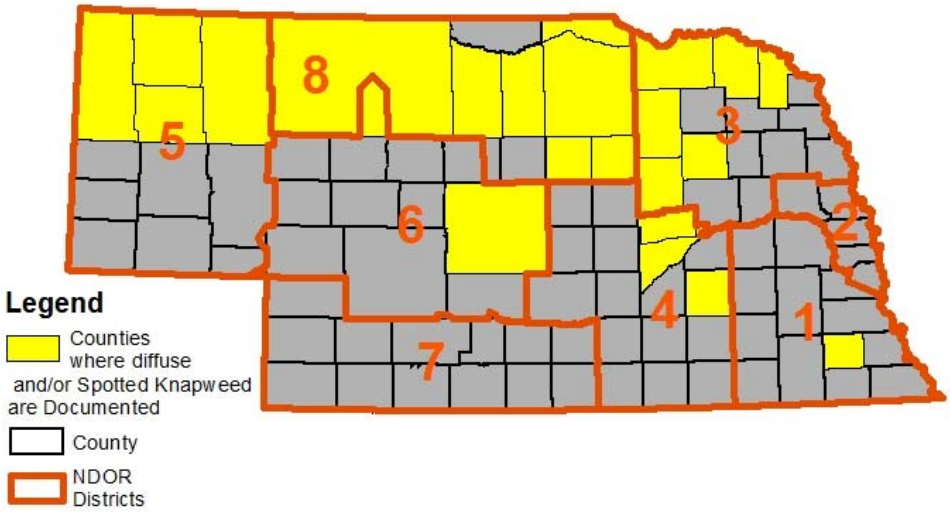
Sericea lespedeza spreads primarily by seeds. The method of seed dispersal is probably by animals.

Internet resources recommend repeated mowing and 2 types of chemical treatments:
Early summer, before flowering
During flowering phase

Mowing in the late bud stage for 2 to 3 consecutive years from mid-July to late summer should reduce the vigor of the stand.

See Part 3 - Chemical Control of Weeds for herbicide recommendations.

Spotted & Diffuse Knapweed - Noxious Weeds



Diffuse & Spotted Knapweed

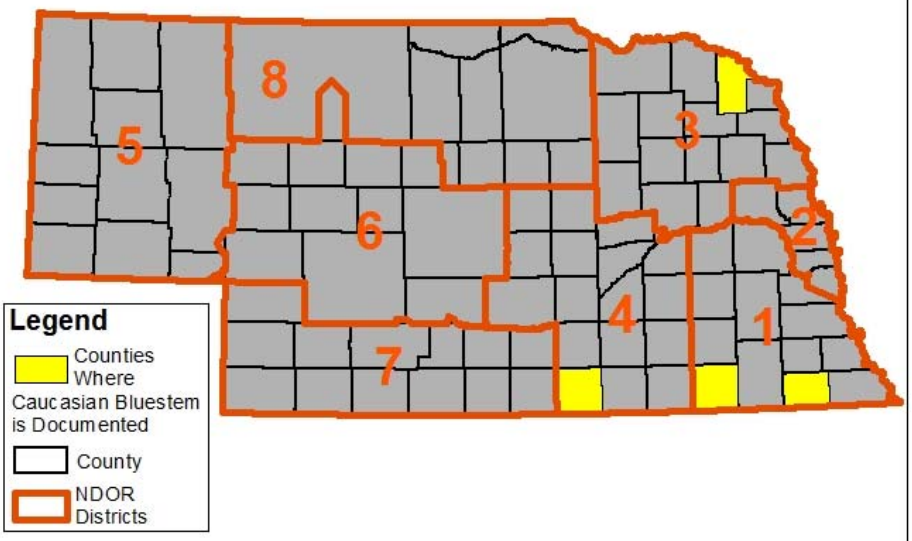
Photo courtesy of Nebraska Department of Agriculture

Seeding appropriate native grasses will help prevent invasion of spotted or diffuse knapweed.

Use a spade to remove single plants.

See Part 3 - Chemical Control of Weeds for recommended chemical products for control and eradication.

Caucasian Bluestem - Invasive Plant



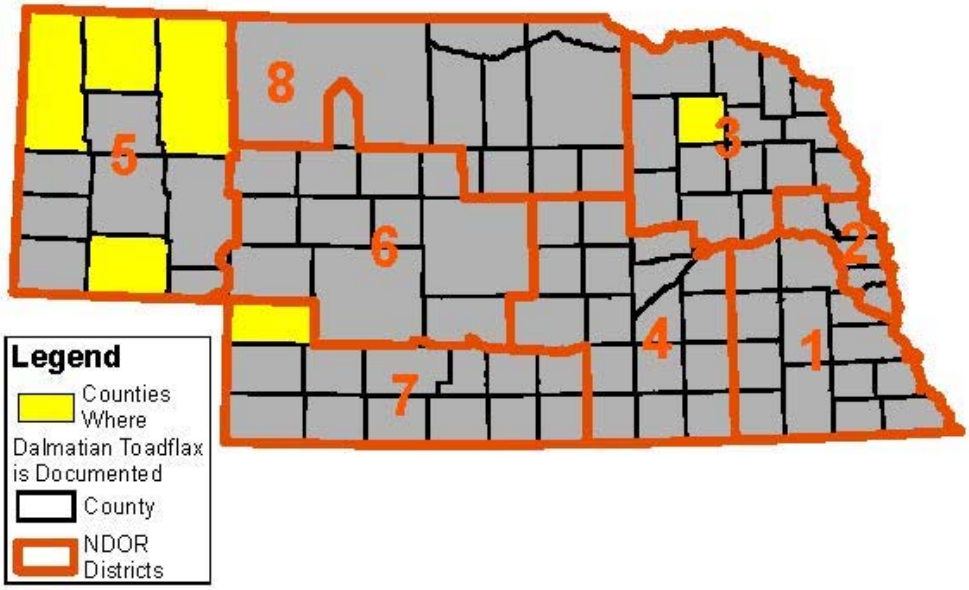
Caucasian Bluestem

Photo courtesy of Nebraska Weed Association

Several websites promoting this species as a forage grass seem to conflict with those encouraging its control as an invasive species.

The Society for Range Management recommends treating Caucasian bluestem with either glyphosate or imazapyr products.

Dalmatian Toadflax - Invasive Plant



Dalmatian Toadflax

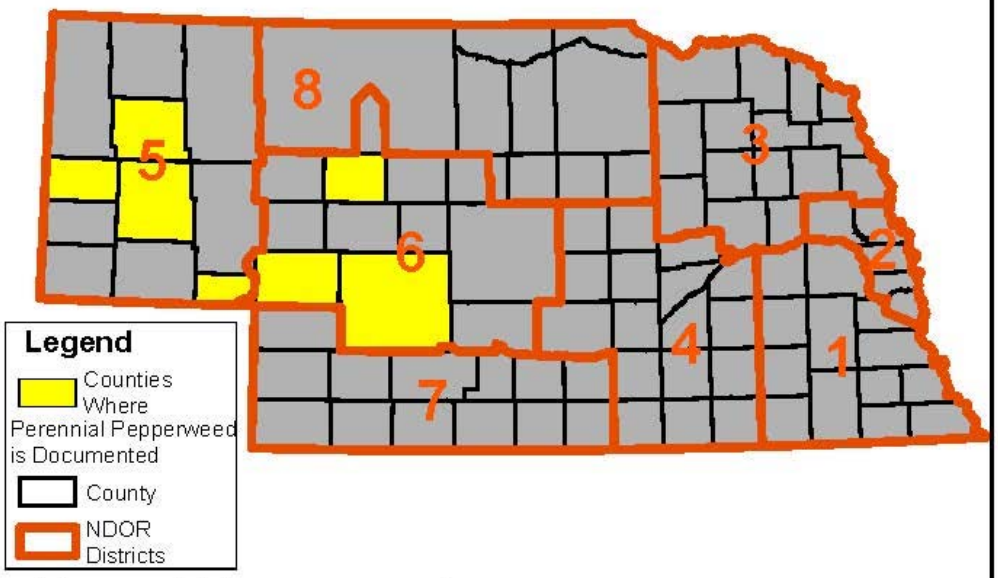
Photo courtesy of Nebraska Weed Assocation

Successful management requires integrating as many control methods as possible. Successful control can be obtained by pulling or killing the plants with herbicide before seed production begins. The plant also spreads through vegetative propagation (roots and fragments re-sprouting). Seeds can remain dormant for up to ten years, so this process must be repeated every year.

Competitive perennial grasses and forbs should be planted to utilize water and nutrients that would otherwise be readily available to toadflax.

Herbicide recommendations are found in Part 3 - Chemical Control of Weeds

Perennial Pepperweed - Invasive Plant



Perennial Pepperweed

Photo courtesy of Plant Conservation Alliance

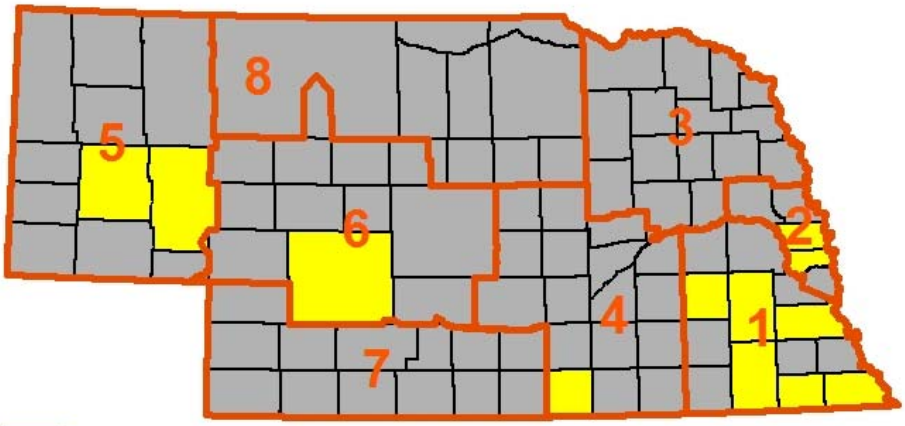
Hand-pulling plants in a small infestation can be effective if consistently done over 4-6 years. Careful use of herbicides is needed for populations too large to control by hand-pulling.

Hand pulling and tillage: Seedlings are easily controlled by hand-pulling or tillage, but these techniques do not control established plants because shoots quickly resprout from vast root reserves. Root segments as small as 1 inch are capable of producing new shoots.

Mowing and burning are not effective at reducing perennial pepperweed stands

Herbicide application timing is critical. Herbicides work best when applied at the flower bud stage and worst at the rosette or early bolting stage. Because plant phenology differs between location and year, regularly observe infested areas in spring and begin applying herbicides when flower buds appear.

Teasel - Invasive Plant



Counties where teasel is documented

County

NDOR Districts

Teasel

Teasel photos by Stevens County (WA) Noxious Weed Control Board

Pulling or digging individual plants will help remove this species. However, several years of treatment may be necessary to eradicate teasel. It is important to prevent all seed production so that there is no addition to the soil seed bank. It may take several years (five or six years) of repeated treatment. Map locations of infestations and treatment so that they can be located in future years.

Mowing is ineffective because the root crown will re-sprout and flower after being cut. Even repeated mowing is ineffective. Repeated mowing will stop some plants from flowering, but others will produce short flowering stems below the height of the mower.

Herbicide recommendations are available in Part 3 - Chemical Control of Weeds.

Bindweed - County Declared Noxious Weed

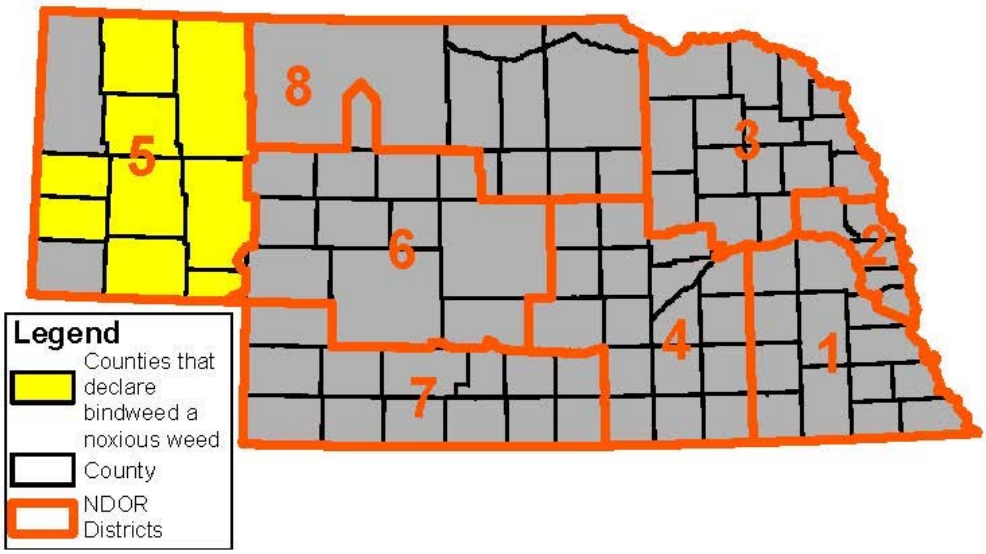


Photo courtesy of Kansas Department of Agriculture

Control of bindweed requires a long-term management program. An herbicide applied once will not eliminate established patches. Several re-treatments are required to control bindweed and keep it suppressed.

Long-term control of field bindweed from herbicides depends on movement of herbicide through the root system to kill the roots and root buds. This requires use of systemic (movement throughout the plant) herbicides. Examples of systemic herbicides include 2,4-D, dicamba, and glyphosate.

See Part 3 "Chemical Control of Weeds" for specific chemical recommendations.

Bull Thistle - County Declared Noxious Weed

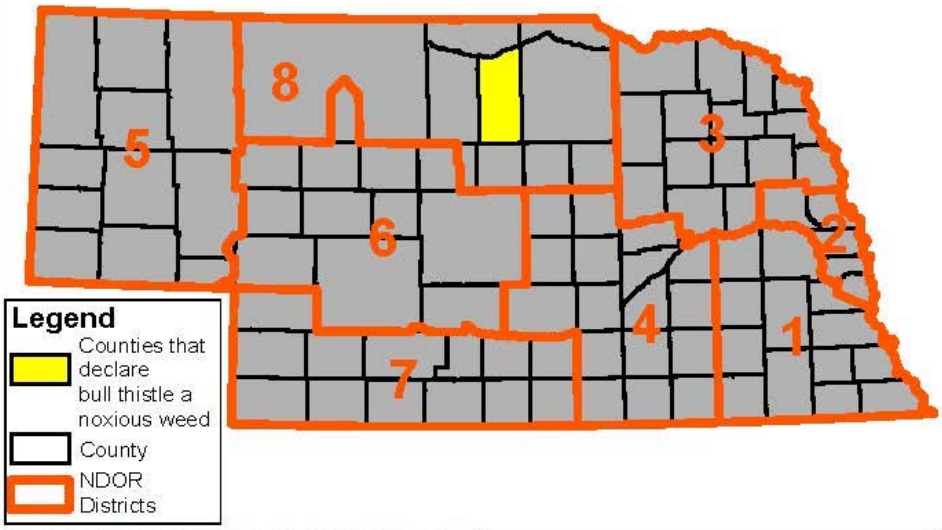


Photo courtesy of Kansas Department of Agriculture

The best time to treat biennial thistles is the spring or early summer before they bolt and flower, but they are most visible when flowering. Check areas where control was applied or needed in previous years to scout for thistle rosettes in the fall. Treated areas likely will need re-treatment for 2-5 years for control.

Some colonies develop resistance to specific herbicides so switch to another active ingredient if suppression is not achieved after 3 years of treatment. Mow when the plant is blooming to prevent seed formation and dispersal. DO NOT mow when seeds are being released from the plant.

If unable to spot spray thistles, mow before seed sets (while plants are flowering). Remove isolated plants by digging them with a spade.

See Part 3 "Chemical Control of Weeds" for specific product recommendations.

Houndstongue - County Declared Noxious Weed

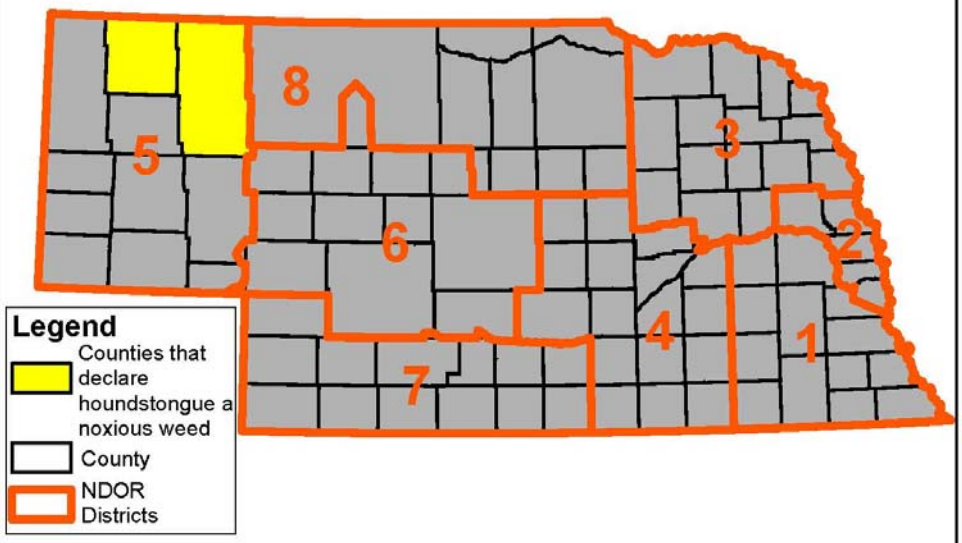


Photo courtesy of W.L. Wagner/
Rusty Russell@USDA-NRCS PLANTS Database

Houndstongue forms a rosette the first year of growth, and bolts and flowers the second season. The leaves are oblong, very pubescent and rough, which resemble a hound's tongue. The plant contains alkaloids that are especially toxic to cattle and horses.

Escort (metsulfuron) , 2,4-D, and Plateau are among the chemicals recommended in Part 3 "Chemical Control of Weeds.

Scotch Thistle - County Declared Noxious Weed

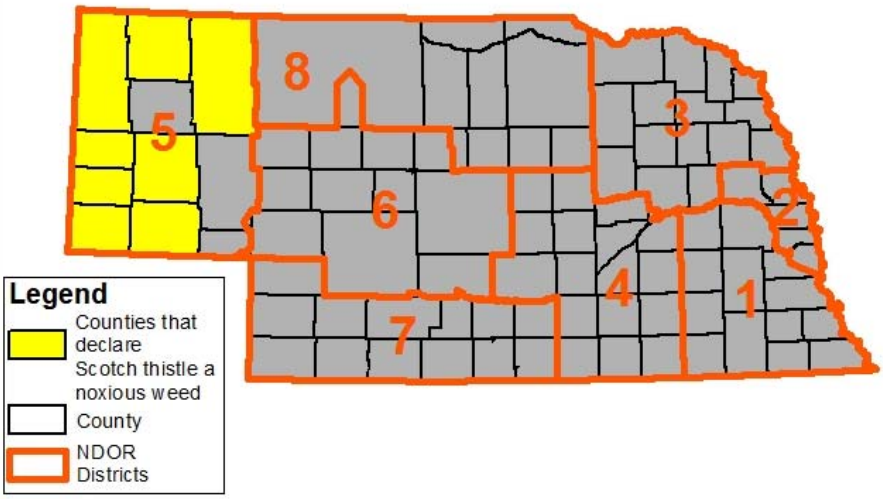
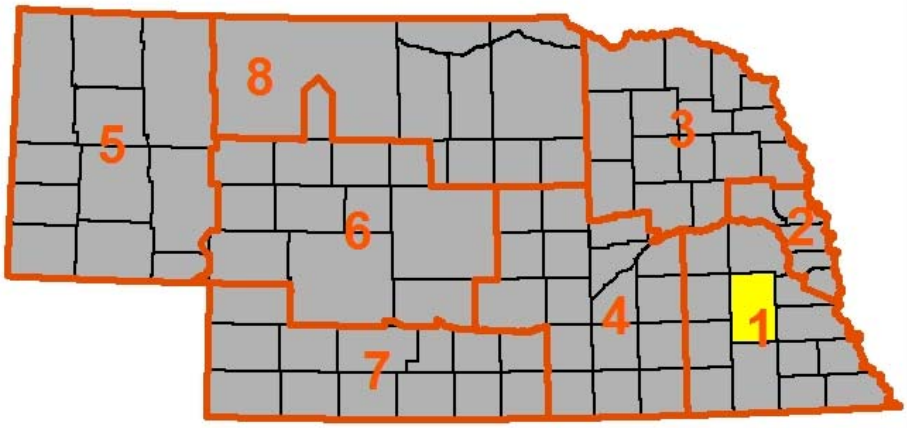


Photo courtesy of Gary Monroe@USDA-NRCS PLANTS Database

The best time to treat biennial thistles is the spring or early summer before they bolt and flower, but they are most visible when flowering. Check areas where control was applied or needed in previous years to scout for thistle rosettes in the fall. Treated areas likely will need re-treatment for 2-5 years for control.

Some colonies develop resistance to specific herbicides so switch to another active ingredient if suppression is not achieved after 3 years of treatment. Mow when the plant is blooming to prevent seed formation and dispersal. DO NOT mow when seeds are being released from the plant.

Teasel - County Declared Noxious Weed



County Declared Noxious
County
NDOR Districts

Teasel

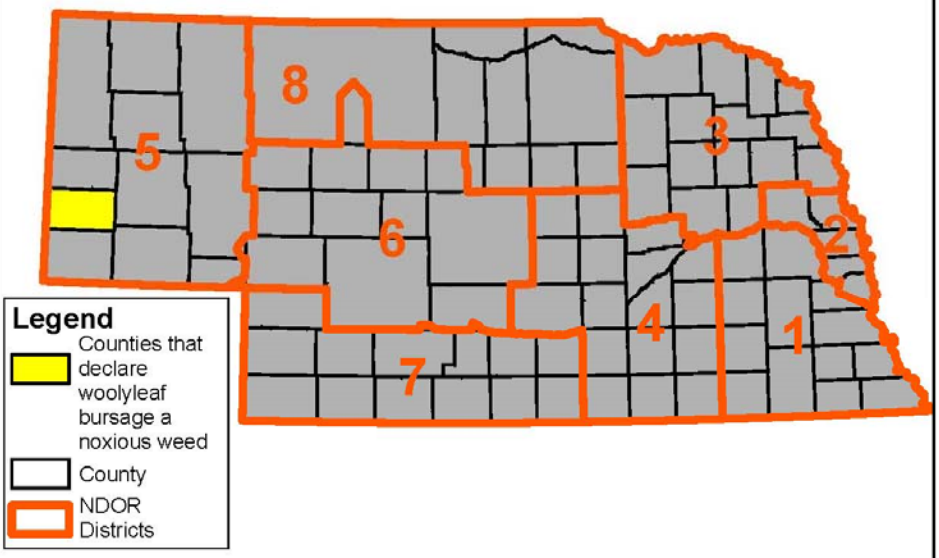
Teasel photos by Stevens County (WA) Noxious Weed Control Board

Pulling or digging individual plants will help remove this species. However, several years of treatment may be necessary to eradicate teasel. It is important to prevent all seed production so that there is no addition to the soil seed bank. It may take several years (five or six years) of repeated treatment. Map locations of infestations and treatment so that they can be located in future years.

Mowing is ineffective because the root crown will re-sprout and flower after being cut. Even repeated mowing is ineffective. Repeated mowing will stop some plants from flowering, but others will produce short flowering stems below the height of the mower.

Herbicide recommendations are available in Part 3 - Chemical Control of Weeds.

Woolyleaf Bursage-County Declared Noxious Weed



Photos courtesy of Pamela Borden Trewatha, Missouri State University

Wooly-leaf bursage looks like ragweed that has a white, fuzzy covering on the leaves. This species occurs in western Nebraska, but is spreading eastward. The plant forms colonies, and is un-palatable to grazing animals. Tillage can increase the spread because new plants may start from rhizome fragments.

See Part 3 "Chemical Control of Weeds" for product recommendations

Yellow Bedstraw - County Declared Noxious Weed

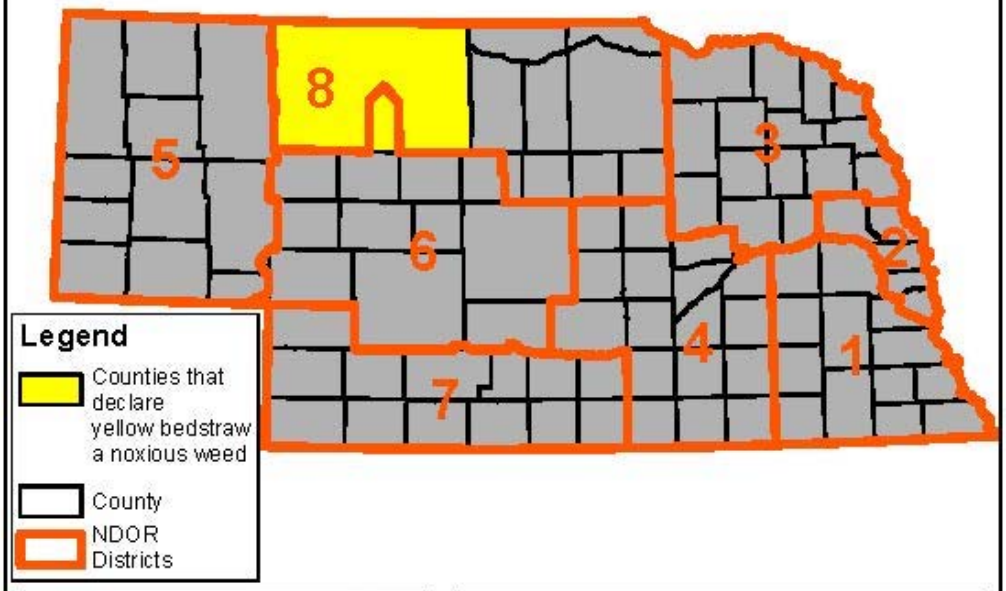


Photo courtesy of Nelson DeBarres@USDA-NRCS PLANTS Database

Yellow bedstraw aggressively crowds out other vegetation. Leaves are in whorls around the stem, and have bristles that allow it to stick to clothing and fur. This plant is used in folk medicine and pioneer's recipes for cheeses and dye.

See Part 3 "Chemical Control of Weeds" for product recommendations.

Part 3 – Chemical Control of Weeds

NDOR's Environmental Section coordinates with the Districts and the Nebraska Department of Agriculture for controlling noxious weeds and monitoring invasive species. NDOR complies with Executive Order 13112, which provides guidance pertaining to preventing the introduction of invasive species and providing for their control.

Control of chemical drift is important. Please refer to page 77 for information on avoiding impacts to adjacent properties, including Nebraska's vineyards, organic farms, and orchards. Applicators must be aware of the legal liability of impacts by chemical drift.

Pesticide application may commence if the Endangered and Threatened Species Standard Procedures (begins on page 70) are followed for the species ranges. If the application of pesticides cannot be performed within the guidance of the standard procedures, then the application project must be reviewed by the Nebraska Game and Parks Commission. This review is estimated to take 30 days to complete.

Information requested on the Notice of Intent (NOI) form pertaining to herbicide product names, EPA/FIFRA registration numbers, and active ingredients is provided in the Appendix (see pages 153-155).

NDOR District personnel should coordinate with the County Weed Superintendents for identification, location, and control of noxious and invasive plant species. While no requirements are in place for property owners to control invasive species, this section gives direction on appropriate management practices for noxious and invasive plant species, as well as county declared noxious species.

The "Guide for Weed Management in Nebraska" is updated annually to provide recommended treatments for noxious weeds and other problem plants. See the section entitled "Noxious and Troublesome Weeds".

Chemical products and application rates to use on specific Nebraska weed plants are available at this link:

http://extensionpublications.unl.edu/assets/pdf/ec130.pdf

Click on "Noxious and Troublesome Weeds" in the Table of Contents.

Read and follow the label instructions for the chemical product selected.

Chemical Product Information Websites

(for information, labels, and MSDS)

BASF ..... https://www.basf.com/us/en.html

Dow AgroSciences LLC ..... http://www.dowagro.com/vm/

Bayer (formerly DuPont) ..... http://www.backedbybayer.com/vegetation-management

Monsanto ..... www.monsanto.com/ito

PBI Gordon ..... www.pbigordon.com

Nufarm ..... http://www.nufarm.com/USIVM/IVMAquatics

Crop Production Services (formerly UAP Co) ..... www.uap.com

Van Diest Supply Co. ..... http://www.vdsc.com/Products/default.aspx

Labels and MSDS for all companies ..... http://www.cdms.net/Label-Database

Invasive Species Information ..... www.invasivespeciesinfo.gov

County Extension Offices ..... http://epd.unl.edu/

Pesticide Education Resources ..... http://pested.unl.edu/

Noxious Weed Control

Canada thistle (also musk and plumeless thistles)

http://cropwatch.unl.edu/organic/thistle provides information about this plant as well as control recommendations, as does http://extension.colostate.edu/topic-areas/natural-resources/canada-thistle-3-108/.

One of our most serious noxious weeds, Canada thistle is a perennial that will spread if not controlled. Some colonies develop resistance to specific herbicides so switch to another active ingredient if suppression is not achieved after 3 years of treatment. Mow when the plant is blooming to prevent seed formation and dispersal. DO NOT mow when seeds are being released from the plant.

If unable to spot-spray thistles, mow before seed sets (while plants are flowering). Remove isolated plants by digging them with a spade.

The best time to treat biennial thistles is the spring or early summer before they bolt and flower, but they are most visible when flowering. Check areas where control was applied or needed in previous years to scout for thistle rosettes in the fall. Treated areas likely will need re-treatment for 2-5 years for control.

For Canada, musk, plumeless, Scotch, and bull thistles:

Product	Quantity	Water	Surfactant	Notes
Escort XP (metsulfuron methyl) + 2,4-D	3 grams, 0.1 oz 3 oz	10 gal.	3 oz non-ionic	Requires good agitation
Transline (Clopyralid)	3-5 oz	10 gal.	Optional	Higher rate is for Canada thistle
Telar XP (Chlorsulfuron)	10 grams, 1/3 oz	10 gal.	3 oz non-ionic	Requires good agitation; must use within 24 hours
Milestone * (Aminopyralid)	2.4 oz	10 gal.	3 oz non-ionic	Also effective as a fall application
Perspective	1 oz	10 gal.	1 oz non-ionic	Or Streamline instead of Perspective
Method 240SL	8 oz	25 gal.	1%	

*See grazing and hay precaution on the label

For Canada thistle:

Product	Quantity	Water	Surfactant	Notes
Milestone (Aminopyralid)	5-7 oz	10 gal. per ac	3 oz non-ionic	Also effective as a fall application. Doesn't affect grasses
Telar XP (Chlorsulfuron)	10 grams, 1/3 oz	10 gal. per ac	1 oz ammonia	Requires good agitation; must use within 24 hours
Perspective	1 oz	10 gal. per ac	1 oz non-ionic	
Escort XP (metsulfuron methyl) + 2,4-D amine	3 grams, 0.1 oz 3 oz	10 gal. per ac	3 oz non-ionic	Requires good agitation
Transline (Clopyralid)	6 oz	10 gal. per ac	Optional	Doesn't affect grasses
Method 240SL	4 oz	25 gal.	1%	

Common reed see: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=5817&context=extensionhist for control measures.

This grass is colonizing sandbars and banks along the Platte River. It has been found in ditches and some wetland mitigation sites, also. Coordinate control efforts with the local Weed Management Area to prevent duplication or over-application. Several grants have been awarded to control this plant along the Platte and Republican Rivers.

If the plant is encroaching on ROW from private land, mow it several times during the growing season for control. Mowing in August and September is most effective to control the plant's spread. Encroachment will continue without cooperation from adjacent landowners.

Chemical application is recommended in the spring for best result. Treatment in late summer to early fall after the plant has flowered is also recommended. Using

Habitat/Polaris (imazapyr) or Rodeo (glyphosate), both being formulated for aquatic use, works well separately. However, using the chemicals as a mixture (see the "digital commons.unl" link above) also has been successful.

Always follow label instructions. Repeated treatments for several years will be necessary for control of this noxious weed. Do not cut for one year following application.

Product	Quantity	Water	Surfactant	Notes
Habitat* (Polaris) (Imazapyr)	1.5% solution 48 oz	25 gallons	MSO: 13 oz Non-ionic: 3 oz	Considered to be the most effective
Rodeo* (glyphosate)	1.5% solution 48 oz	25 gallons	Non-ionic, 5 oz	May require repeat application

*Aquatic label herbicide

Knapweeds (spotted or diffuse) See http://extension.colostate.edu/topic-areas/natural-resources/diffuse-and-spotted-knapweed-3-110/ for herbicide application recommendations. Colorado State University research indicates that Tordon 22K (picloram), Milestone (aminopuralid), Transline (clopyralid + 2,4-D) or Banvel/Vanquish/Clarity (dicamba) control diffuse knapweed.

Additional products: Chaparral, Redeem, Streamline.

Tordon is a restricted use herbicide, and must be applied by staff members that are licensed for this type of chemical.

Product	Quantity	Water	Surfactant	Notes
Method 240SL	4 oz	25 gallons	1%	
Transline (Clopyralid)	5 oz	10 gallons		Rosette to bud stage
2,4-D ester	10 oz	10 gallons	Drift control	Rosette stage
Perspective	1 oz	10 gallons	1 oz non-ionic	
Milestone *	6 ounces	10 gallons**/ac	Non-ionic, 3 oz/10 gallons	Rosette to bolting or fall regrowth
Opensight *	3 oz	10 gallons **/ac	Non-ionic; 3 oz	Rosette to bolting or fall regrowth

* See grazing and hay precaution on the label

** High volume application (i.e., 15 gallons or more) will improve coverage and control in dense vegetation

Japanese knotweed

http://plantscience.psu.edu/research/projects/vegetative-management/publications/roadside-vegetative-mangement-factsheets/5managing-knotweed-on-roadsides

Mowing around June 1 will reduce the plant material, reduce its energy reserves, and will make chemical treatments easier. If knotweed is growing among planted trees, you

will have to cut it more often, starting earlier in the season to prevent it from growing over the trees.

Following a June 1 mowing, wait 6 weeks before applying herbicide (late July). If you are not going to mow, then plan on spraying twice. Make the first application between mid-July and early August, then a follow-up application by mid-September. Keep in mind that when spraying un-mowed knotweed, you'll likely be spraying over your head, thereby making additional safety measures necessary.

When working near waterways, a formulation labeled for aquatic applications (such as Rodeo) is best. Using Rodeo when working close to water reduces the risk to non-target aquatic organisms.

Treat the area again during the second year. The site will look much improved after the first year's treatment, but if you don't follow up the second year, you'll have to start all over. Apply chemical in July of the second year.

Product	Quantity	Water	Surfactant	Notes
Streamline	7 oz	25-40 gallons	0.25%	Apply to active growing plants
Perspective	7 oz	25-40 gallons	0.25 %	Apply to active growing plants
Milestone	7 oz/acre	10 gallons	3 oz non-ionic	

Leafy spurge – Information about this noxious weed's life cycle and recommendations for control are available at several links:

https://www.ag.ndsu.edu/pubs/plantsci/weeds/w765.pdf

http://www.ag.ndsu.edu/pubs/plantsci/weeds/w765w.htm (use the custom search feature on the page)

http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2707&context=extensionhist

A listed noxious weed, this plant will spread if not treated. North Dakota State University research indicates that Tordon 22K (picloram), 2,4-D, or Banvel/Vanquish/Clarity (dicamba) are most effective when applied *in spring* when true flowers emerge (not when only bracts are present). Alternative products: Streamline, Journey.

The links provided lead to information about using the above-mentioned herbicides in combination for effectiveness. Tordon is a restricted use herbicide, and must be applied by staff members that are licensed for this type of chemical.

Product	Quantity	Water	Surfactant	Notes
Overdrive	6 oz	1 quart	Non-ionic	
Grazon P+D	32 oz	100 gal.	1 quart non-ionic	**Restricted use**
2,4-D Low Volatile Ester	3 quarts	100 gal.	Non-ionic, follow the label	30 gallons per ac rate; 16 oz dye
Perspective	1 oz	10 gal.	1 oz non-ionic	
Tordon 22K * + 2,4-D (4lbs/gal)	10 pints 2.5 gal	100 gal.	1 quart/100 gal. water	30 gal per acre. Apply before bloom

*Restricted use herbicide

Retreatment: Apply Plateau or Tordon 22K in late summer or early fall. Retreatment in the fall is recommended to minimize leafy spurge re-growth. Treatment over several years is needed for eradication.

When leafy spurge is flowering, mow it to prevent seed formation and mark it for fall treatment:

Fall treatment:

Product	Quantity	Water	Surfactant	Notes
Perspective	1 oz	10 gallons	1 oz non-ionic	
Tordon 22K **	10 pints	100 gallons	1 quart/100 gal water, non-ionic	Late summer or fall
Plateau (Imazapic) + 2,4-D *	8 oz	100 gallons	1 pint nonpionic	Apply 2 weeks before first frost

* Fill ¾ tank with water; add surfactant and 2,4-D; add Plateau and remaining water
** Restricted use herbicide

Purple loosestrife See http://dnr.wi.gov/topic/invasives/fact/purpleloosestrife.html for suggested control methods. Use aquatic label herbicide if the area to be treated has surface water.

Do not mow. New plants can sprout from cuttings. Burning has also proven ineffective. Pulling and digging can be effective, if all plant parts are removed. Dispose of plants in bags, taking great care to catch any dropping seeds in the bag.

Biological Control: *Galerucella* spp. beetles have been released along the Platte, Niobrara, and Missouri Rivers in Nebraska to suppress the plant. Contact the county weed supervisor for information on the release of beetles to infested right-of-way, especially wetland mitigation sites.

Chemical control: Treat with herbicide in late July or August, but before flowering to prevent seed set. Rodeo (glyphosate), Habitat (imazapyr), and Garlon 3A (triclopyr) are formulated and listed for use over water.

The density of purple loosestrife stands requires higher volumes of solution to ensure good coverage over all leaf material. Optimum volume of spray solutions for purple loosestrife is usually 50 gallons/acre.

Alternatively, cut the stems and paint the top of the cut stem, bagging and removing the part of the plant that is cut off. Apply the herbicide with a small drip bottle or spray bottle (adjusted to release only a small amount).

Product	Quantity	Water	Surfactant	Notes
Habitat* (imazapyr)	1 pint	10 gallons	Non-ionic: 3 oz MSo: 13 oz	
2,4-D amine	1 pint	10 gallons	Follow the label	Use aquatic formulation for plants in water
Rodeo* (glyphosate)	1 pint	10 gallons	5 oz non-ionic	Summer or fall
Garlon 3A **	1.5 quart/ac	50 gallons per ac	1 pint/50 gallons	Apply at mid bloom

* Aquatic label herbicide

** See handling precautions for eye damage risk

Saltcedar – Control of saltcedar requires integration of several methods, like herbicide, plowing/bulldozing (where it covers a large area), competition by other plants, fire and biological control (introduction of insects known to feed on saltcedar). See http://extensionpublications.unl.edu/assets/pdf/ec164.pdf for control recommendations.

Apply herbicide in August – September, using either foliar or cut stump method.

Foliar application – Spray to completely wet the stems and leaves. After applying herbicide, leave the treated plants in place for 2 years for the chemical to act on all parts of the tree. Cuttings removed too soon could sprout. Imazapyr (Habitat) is recommended for foliar application.

Product	Quantity	Water	Surfactant	Notes
Habitat* (Imazapyr)	20 oz	10 gal.	MSO: 13 oz Non-ionic: 3 oz	Apply during flowering (June)
Rodeo* (glyphosate)	13-25 oz	10 gal.	Non-ionic, 5 oz	May require repeat application
Milestone + Garlon 4 Ultra	7 oz 3quarts	10 gal/ac	Non-ionic, 3 oz MSO, 1 quart	Used for resprout treatments as well

*Aquatic label herbicide

Cut stump application - apply herbicide to outer quarter of the freshly cut stem surface and the side of the stump. Mix 8-12 oz Habitat per gallon of water or 2 quarts of Garlon 3A with 2 quarts of water, and apply to the outer quarter of the cut surface. Treat within 1 hour after cutting.

The cut stump method is effective for treating isolated plants or small infestations, and can be used to avoid injury to desirable grassy vegetation. Triclopyr (Garlon 3A) is recommended for cut-stump treatment.

Sericea lespedeza – See http://mdc.mo.gov/your-property/problem-plants-and-animals/invasive-plants/sericea-lespedeza-control

https://agriculture.ks.gov/divisions-programs/plant-protect-weed-control/noxious-weed-control-program and

http://www.snco.us/weed/sericea_lespedeza.asp

2,4-D is not effective against sericea lespedeza.

Internet resources recommend repeated mowing and 2 types of chemical treatments:

1. Early summer, before flowering – Remedy, Garlon (triclopyr)
2. During flowering phase – Escort, Cimarron (metsulfuron)

Product	Quantity	Water	Surfactant	Notes
Garlon 4 Ultra	1.5 pint/ac	10 gallons	3 oz non-ionic	Apply in spring and fall
Garlon 3A	2 oz	1 gallon		Apply prior to bloom
Perspective	2 oz	25 gallons	0.25%	August – October
Escort XP	1 oz	100 gallons	1 quart non-ionic	Late summer to fall during
Opensight	3 oz/ac	10 gallons	3 oz non-ionic	Apply in spring and fall

Additional products: Streamline, Pasturegard, Chaparral.

Invasive Weeds to Control on the Right-of-Way

Numerous plant species are considered to be invasive. Controlling the invasive species discussed below is of particular importance on highway roadsides. In some cases, the species first becomes established in a new territory when it is introduced onto a roadside. Eliminating problem species at the earliest possible time benefits the NDOR, adjacent landowners, and all other involved entities.

Caucasian bluestem

See http://www.rangelands.org/albuquerque2009/pdf_Abstracts/tech83_vegetationMgmt/83_4.pdf for basic information. Several websites promoting this species as a forage grass seem to conflict with those encouraging its control as an invasive species.

The Society for Range Management recommends treating Caucasian bluestem with either glyphosate or imazapyr products.

Dalmatian toadflax

https://www.ag.ndsu.edu/pubs/plantsci/weeds/w1239.pdf and http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410111.pdf are informative resources. Internet information for Nebraska http://nlc1.nlc.state.ne.us/epubs/U2250/H001.0130-2011.pdf recommends applying herbicides to growing plants before flowering in spring or fall. Use a surfactant to help the chemical to stick to the thick, waxy leaves. Suggested herbicides to use according to label directions:

Product	Quantity	Water	Surfactant	Notes
Telar XP	2-3 oz	25 gallons	4-6 oz silicon	Best: late October Medium: Aug-Sept
Perspective	7 oz	25 gallons	0.25%	Apply in October
Tordon 22K*	1-2 pint/ac	10 gallons	3 oz non-ionic	Apply bud to flowering

*Restricted use herbicide

Also:

Overdrive Cimarron Plus Glyphosate (Roundup and others)

Perennial pepperweed

Websites such as

http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74121.html and

http://learningstore.uwex.edu/assets/pdfs/A3832.pdf

provide photos, life cycle information, and control recommendations.

This plant is capable of invading wetlands, other areas of moist soil (including ditches), pastures and roadsides. Hand-pulling plants in a small infestation can be effective if consistently done over 4-6 years. Careful use of herbicides is needed for populations too large to control by hand-pulling.

Caution: This plant is toxic to livestock and may become more palatable to grazing animals after the plant dies. Precautions should be taken if grazing is a component of management (wetland mitigation banks that are grazed by goats).

Products recommended for use on perennial pepperweed include (always follow label directions):

Product	Quantity	Water	Surfactant	Notes
Opensight	3.3 oz/acre	10 gallons	3 oz non-ionic	Apply before bloom. Follow-up applications may be required
Escort XP	1 oz	25 gallons	0.25%	Apply to active growing plants
Streamline	4.75 oz	25 gallons	0.25%	Apply to active growing plants

Also: Telar Glyphosate (Roundup and others)

Imazapyr 2,4-D ester or amine

Teasel (common and cutleaf) - found in eastern Nebraska

http://www.inhs.uiuc.edu/research/VMG/teasel.html and

http://mdc.mo.gov/landwater-care/invasive-species-management/invasive-plant-management/common-and-cut-leaved-teasel-co contain information about this species.

Internet resources recommend spraying prior to teasel's flowering phase.

Triclopyr (Garlon 3A) won't affect neighboring grasses

2,4-D amine – not as effective as triclopyr products, but also won't affect neighboring grasses

Glyphosate (Roundup, for example) kills all plants

ForeFront Redeem

Streamline Journey

Product	Quantity	Water	Surfactant	Notes
Perspective	1 oz	10 gallons	1 oz non-ionic	
Milestone	6 oz/acre	10 gallons	3 oz non-ionic	Apply from bolting through early flowering
Opensight	3 oz/acre	10 gallons	3 oz non-ionic	Apply from bolting through early flowering
Transline	½ pint / acre	1 gallon		Apply from bolting through early flowering

Control of County-Declared Noxious Weeds

Bindweed

Bindweed can be spread by seed, root fragments, and infested soil. Field bindweed has a deep root system that competes with crop plants for water and nutrients. Control of bindweed requires a long-term management program. An herbicide applied once will not eliminate established patches. Several re-treatments are required to control bindweed and keep it suppressed.

Long-term control of field bindweed from herbicides depends on movement of the chemical through the root system to kill the roots and root buds. This requires use of systemic (movement throughout the plant) herbicides. Examples of systemic herbicides include 2,4-D, dicamba (Banvel/Clarity), picloram (Tordon) and glyphosate (Roundup or equivalent). Contact herbicides such as paraquat kill only the tissue directly contacted by the herbicide, which results in only short-term control of top growth.

Product	Quantity	Water	Surfactant	Notes
Perspective	1 oz	10 gallons	1 oz non-ionic	
Paramount (quinchlorac)	8 oz	100 gallons	1 quart MSO	Repeat in the fall for 3 seasons
Plateau	1.5 oz	1 gallon	1.3 oz MSO	
Method 240SL	4 oz	25 gallons	1%	
Glyphosate +2,4-D Ester	32 oz 0.5 pint/ac			Apply late summer through fall
Escort XP + 2,4-D Ester	1.5 oz 3 quarts	100 gallons	1 gallon non-ionic	Requires good agitation

Bull thistle see Noxious weed section for treatment of Canada and other thistles.

Common and cutleaf teasel see Invasive weed section for treatment of these species.

Houndstongue

Houndstongue forms a rosette the first year of growth, and bolts and flowers the second season. The leaves are oblong, very pubescent and rough, which resemble a hound's tongue. The plant contains alkaloids that are especially toxic to cattle and horses.

Escort (metsulfuron) at 1 to 2 ounces per acre (oz/ac) is very effective for controlling houndstongue and can be applied throughout the growing season. First-year houndstongue rosettes are controlled easily with 2,4-D at 2 pints/ac applied from late May to mid-June. Second-year plants are much less susceptible to 2,4-D. Plateau applied at 8 to 12 oz/ac will control houndstongue both pre- and post-emergence, but grass injury, especially to the cool-season grasses, may occur when Plateau is applied at the maximum rate.

Product	Quantity	Water	Surfactant	Notes
Plateau	1.5 oz	1 gallon	1.3 oz MSO	
Escort XP	1.5 oz	100 gallons	1 quart non-ionic	Requires good agitation
Opensight	3 oz/ac	10 gallons	3 oz non-ionic	Apply after bud stage; for rosette stage add 1 quart 2,4-D

Scotch thistle - see Noxious weed section for treating Canada thistle and other thistles.

Wooly leaf bursage

Wooly-leaf bursage looks like ragweed that has a white, fuzzy covering on the leaves. This species occurs in western Nebraska, but is spreading eastward. The plant forms colonies, and is un-palatable to grazing animals. Tillage can increase the spread because new plants may start from rhizome fragments.

Product	Quantity	Water	Surfactant	Notes
Round-Up Max	1-2 oz	1 gallon		
2,4-D low volatile ester	1.5 oz	1 gallon		When plant is budding
Plateau	1 oz	1 gallon	1.3 oz MSO	

Yellow bedstraw

Yellow bedstraw aggressively crowds out other vegetation. Leaves are in whorls around the stem, and have bristles that allow it to stick to clothing and fur. This plant is used in folk medicine and pioneer's recipes for cheeses and dye.

Product	Quantity	Water	Surfactant	Notes
Plateau	1.5 oz	1 gallon	1.3 oz MSO	
Milestone	7 oz	100 gallons	1 quart non-ionic	

Chemical Additives and Accessories

Dye: BASF (formerly Becker Underwood) – Tablets – Liquid & Water Soluble Packets

Surfactant Non-ionic - Liberate (surfactant & drift control), Premier 90
Methylated Seed Oil (MSO) – Soy Stik
Silicon – Silenergy, Silco

Drift Control: Liberate (surfactant & drift control), Gardian

Insect Control

Lawns:

Billbugs and Webworms		Talstar Professional or Tempo SC Ultra
Spider mites		Soapy water, Avid, or Talstar Professional
Grubs		Merit or Acelepryn – apply June 10 to July 10
		Safari (NuFarm)

Right-of-Way:

Eastern tent caterpillar		Tempo Sc Ultra, Sevin
		Non-chemical: Dipel
Grasshoppers		Tempo SC Ultra
Mosquitoes	Adults	Talstar Professional, Tempo SC Ultra on shrubs & trees
	Larvae	Minnows, BTI briquettes (both are non-chemical approaches)

Special Location Weed Control

Lawns:

Pre-emergent – Dimension or Barricade
Broadleaf weeds – Trimec 992 or Vessel, Mecamine "D" (2,4-D amine); Speedzone (2,4-D ester), or Escalade2 (NuFarm), 2,4-D, dicamba, fluroxypyr

Right-of-Way:

In joints	Perspective, Landmaster BW, Journey, Stalker, Glyphosate (follow label instructions for spot spraying)
Wet ditches	Rodeo, Habitat, Garlon 3A
Under asphalt	Stalker, Journey, Arsenal, HyVar XL, Spike 80 DF
In trees & shrubs	Casoron 4G – November thru March, Pendulum, Transline
Grass in trees & shrubs	Poast Over the Top with Fusilade II during the growing season

Guardrail Areas:

Chemical treatments must be rotated to minimize resistance development in annual weeds. Some weeds have already developed resistance to glyphosate (Round-Up) including marestail and giant ragweed. **Guardrails set in pavement should be treated only after weeds appear.**

1. Guardrails and signs set in pavement (do not overspray), treat after weeds emerge (always read and follow label directions):

Product Name	Quantity	Water	Surfactant	Notes
Round-up (glyphosate)	6 oz	1 gallon	Follow label	Generic formulations are available
Journey (Imazapyr + glyphosate)	1 gallon	10 gallon	1 pint MSO 3 oz Non-ionic	Premix of glyphosate and imazapyr (Arsenal)
Horticultural vinegar (Acetic acid)	100% product	No mixing	None needed	Available from A.M. Leonard & others; apply when temperatures are over 70, may take 2 applications
Esplanade E2	8 oz	1 gallon	None needed	
Endurance (prodiamine) + glyphosate	1 ounce 1 ounce	10 gallons		Spring only

2. Guardrails (not around water or in pavement) – mixes above or the following if resistance occurs (always read and follow label directions):

Pre-Emergence Guardrail Treatment:

Product Name	Quantity	Water	Surfactant	Notes
Pendulum AquaCap (Pendimethalin) Arsenal (Imazapyr)	1.5 gallons 2 pints	100 gallons	Non-ionic, 1.5 quarts	Fish toxin, add glyphosate for post-emergent application
Landmark XP (Sulfometruon methyl, Chlorsulfuron) Payload (Flumioxazin)	10 ounces 16 ounces	100 gallons	Non-ionic, 1 quart	Payload must be applied within 24 hours of mixing; do not apply where runoff is likely; toxic to aquatic species
Perspective* +Esplanade + glyphosate	11 oz 7 oz 1%	100 gallons	None needed	Bare ground mixture

*aminocyclopyrachlor & chlorsulfuron

3. Post-emergence Guardrail treatment (always read and follow label directions):

Post-emergence Guardrail Treatment:

Product Name	Quantity	Water	Surfactant	Notes
Escort XP (Metsulfuron methyl) 2,4-D	1 ounce 24 ounces	25 gallons	Non-ionic, 12 ounce	Premix Escort with 1 gallon water to make a slurry; use within 24 hours; must be agitated.
Vista XRT (Fluroxypyr)	10 ounces per acre	10 gallons per acre **	MSO, 13 ounces	Fish toxin; For kochia & Russian thistle
Milestone *	5 ounces per acre	10 gallons per acre **	Non-ionic, 3 ounces	Use 7 oz on mature broadleaf plants
Perspective	4.5 oz	25 gallons	Non-ionic, 8 oz	
Capstone *	5 pints/acre	10 gallons per acre **	Non-ionic, 3 ounces	Maximum rate of 9 pints/acre/year

* See grazing and hay precaution on the label

** High volume application (i.e., 15 gallons or more) will improve coverage and control in dense vegetation.

Control Calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Canada Thistle												
						Caution: Seed Spread						
Leafy Spurge												
						Caution: Seed Spread			Plateau			
Biennial Thistles												
			Rosette							Rosette		
Japanese Knotweed												
Knapweed Species												
			Rosette							Rosette		
Purple Loosestrife												
						Contact Wetland Manager if found in mitigation site.						
Salt Cedar												
	Apply seasonally recommended chemical to cut stump.											
								Contact Wetland Manager if found in mitigation site.				
Sericea lespedeza						Treat June – October, before and during flowering						
Red Cedar	Priority given to hazard trees, seed bearing *(has berries)*, adjacent to rangeland and pasture.											
							Escort					
Unwanted Trees & Shrubs				No treatments Apr. 1 – Sept. 1								
	No snow on ground									After leaf drop, no snow.		

Plant is flowering

Mechanical control

Chemical control

Wetland Vegetation Control

NDOR owns many wetlands across the state. These areas are susceptible to some noxious weeds and invading cottonwood trees. The noxious weeds that are the most common in the wetlands are purple loosestrife, common reed grass, and Canada thistle, with an occasional patch of leafy spurge in the upland area near the wetland. The County weed control authorities may call your attention to these noxious weeds and want to spray them or you may notice these weeds through your own vigilance.

After coordinating with NDOR's Environmental Permits Unit, if spraying is deemed appropriate, this recipe is good for volunteer trees (especially cottonwoods) and purple loosestrife in wetlands.

Recipe for a three-gallon backpack sprayer applied after July 15

1. For a three-gallon backpack sprayer, add the following:
   A. 1 gallon of water
   B. 6.25 fluid ounces of Rodeo (may add 3 fluid ounces of 4 pound amine)
      OR as an alternate: use 8 oz Garlon 3A instead of Rodeo
   C. 2 ounces non-ionic surfactant
   D. 1 ounce of dye
   E. Add 2 more gallons of water
2. Spray to wet the entire plant
3. The solution may be prepared in bulk.

   Garlon 3A and Capstone are suitable for use in wetlands that are dry when product is applied.

General Information on Herbicides

Broadleaf					
Product	**Active Ingredient(s)**	**Surfactant**	**Hay Restriction**	**Rainfast**	**Other**
Several	2,4-D amine or ester	Follow label	30 days	4 hrs	Amine formulation causes irreversible eye damage; do not use around grapes
Cimarron Plus	Metsulfuron methyl + Chlorsulfuron	Non-ionic	37	4 hrs	Effect not seen immediately, leaching potential increases with soil pH
Escort XP	Metsulfuron methyl	Non-ionic	0-3 days	4 hrs	Effect not seen immediately
Milestone	Aminopyralid	Non-ionic	See label	4 hrs	Eye irritant
Opensight	Aminopyralid + Metsulfuron methyl	Non-ionic	See label	4 hrs	Eye irritant
Overdrive	Diflufenzopyr	Follow label	0	4 hrs	Use with caution around alfalfa & soybeans, high runoff potential - do not over apply
Garlon 4 Ultra	Triclopyr (ester)	Non-ionic	See label	4 hours	Toxic to fish
Garlon 3A	Triclopyr (amine)	Non-ionic	See label	4 hours	Aquatic labeled; irreversible eye damage
Streamline	Aminocyclopyrachlor & metsulfuron	MSO, Non-ionic	Not for haying/grazing acres	2 hours	
Perspective	Aminocyclopyrachlor & chlorsulfuron	MSO, Non-ionic	Not for haying/grazing acres	2 hours	
Tordon 22K	Picloram	Non-ionic	See label	4 hours	No aquatic label. Restricted use herbicide.
Telar	Chlorsulfuron	Non-ionic	0	2 hours	Effect not immediately seen, not effective in fall; leaching potential increases with soil pH
Transline	Clopyralid		See label	2 hrs	High runoff and leaching potential, do not over apply or use near shallow groundwater, eye irritant
Vista XRT	Fluroxypyr	MSO	See label	1 hour	High runoff potential, do not over apply; toxic to fish

Non-Selective					
Product	**Active Ingredient(s)**	**Surfactant**	**Hay Restriction**	**Rainfast**	**Other**
Landmaster	Glyphosate + 2,4-D		30 days	6 hours	Eye injury potential
Polaris (Habitat)*	Imazapyr	Non-ionic or MSO required	7 days	1 hour	High runoff & leaching potential
Journey	Imazapic + Glyphosate		7 days	1 hour	Runoff & leaching potential
Plateau	Imazapic	Methylated seed oil (MSO)	7 days	1 hour	High runoff & leaching potential, especially in high pH soils
Rodeo*	Glyphosate	Non-ionic	0-56 days	2-6 hours	
Round-Up	Glyphosate	Non-ionic	0-56 days	2-6 hours	Low leaching & runoff potential, carried by sediment
Spike 80 DF	Tebuthiuron	N/A	See label	N/A	Soil residual

Trees & Brush					
Product	**Active Ingredient(s)**	**Surfactant**	**Hay Restriction**	**Rainfast**	**Other**
Garlon 3A*	Triclopyr amine	Non-ionic	See label	6 hours	Irreversible eye damage Wear goggles, especially when mixing product.
Streamline	Aminocyclopyrachlor & metsulfuron methyl	MSO, Non-ionic	No haying	4 hours	
Garlon 4 Ultra	Triclopyr ester		See label		Toxic to fish
Spike 80 DF	Tebuthiuron	N/a	See label	N/A	Soil residual
Opensight	Aminopyralid + Metsulfuron methyl	Non-ionic	See label	4 hours	Eye irritant
Krenite	Fosamine		NA		
Pathfinder II	Triclopyr ester	None	14 days		Lactating animals shouldn't eat the hay before 14 days have elapsed.
Stalker (winter use)	Imazapyr	optional	7 days		High runoff & leaching potential
Pathway	Picloram	None			Ready to use for cut stumps

Bare ground					
Product	**Active Ingredient(s)**	**Surfactant**	**Hay Restriction**	**Rainfast**	**Other**
Polaris	Imazapyr	Nonionic		1 hour	High runoff & leaching potential
Landmark XP	Sulfometuron methyl + Chlorsulfuron	Improves post emergent control, see label			
Payload	Flumioxazin	Non-ionic	Season long	1 hour	Low leaching, medium runoff – attaches to sediment
Perspective	Aminocyclopyrachlor & chlorsulfuron	MSO, Non-ionic	365 days	4 hours	
Pendulum Aquacap	Pendimethalin				Toxic to fish, Low leaching, medium runoff – attaches to sediment
Endurance	Prodiamine	None			
Spike 80 DF	Tebuthiuron	N/A	See label	N/A	Soil residual
Method 240SL	Aminocyclopyrachlor	N/A	Yes		
Esplanade 200SC	Indaziflam	N/A	Yes		

Part 4 - Mowing

Roadside mowing is necessary for NDOR to meet its objectives for traveler safety and for controlling problem vegetation. Wise timing of mowing will allow roadside flowers to support populations of pollinating organisms and to produce seed for regeneration.

Safety – shoulders and medians are mowed to provide sight distance and room for a vehicle to pull off the road. The width of the clear zone along a horizontal alignment is dependent on roadside geometry, design speed, and radius of horizontal curvature. Maintenance of the clear zone is related to sight distance, which allows a vehicle's operator to see ahead a sufficient distance to perform the vehicle maneuvers that may be needed. The roadside clear zone should be maintained sufficiently wide where possible to provide adequate intersection sight distance at at-grade intersections or private driveways where vehicles may be entering or leaving the traveled roadway.

Vegetation control - NDOR uses mowing as a vegetation control tool. Its benefits include:

- Removing weeds before they can set seed and spread
- Preventing volunteer trees from becoming roadside hazards
- Removing vegetation from hard features like guard rails
- Removing the remains of old vegetation for aesthetic enhancement
- Providing a manicured appearance for community entrances and urban areas
- Spreading flower and grass seed when mowing occurs at the appropriate time.

Mowing roadsides is expensive in terms of personnel hours, equipment hours, and fuel consumption. If done improperly, mowing can cause additional maintenance problems and adverse effects to soils and roadside habitat. Improper mowing height and too frequent or poorly-timed mowing can reduce root mass, plant vigor and overall plant production potential of desirable plant species. Operating heavy equipment on roadside slopes can destroy vegetation, weakening the plant community and making roadsides more susceptible to weeds and erosion. If done at the wrong time, mowing can also rapidly spread undesirable weed species and disrupt the life cycles of pollinating organisms, which are important for human food production and global ecology.

When mowing roadsides, it is important to consider timing. Mowing of ditches and backslopes should not occur until after desirable grasses have reached dormancy or set seed. **For Nebraska, mowing before May 1 and after October 1 will also protect pollinating organisms and Monarch butterflies.**

If the goal is control of weed seed production in an area where no desirable vegetation is present, mowing should take place during the plants' flowering period and prior to seed development. This will increase the likelihood that the target problem plant will not produce seed.

Improving Wildflower Longevity in Roadside Seeding Areas

Improving the longevity of wildflowers in the roadside has ecological, aesthetic, and investment protection benefits. Several strategies for establishing and maintaining wildflowers in roadside stands were evaluated in this study. Interseeding wildflower seeds into existing roadside vegetation, increasing wildflower seeding rates, segregating wildflower seeding drill rows from grass seed drill rows during planting, varying the time of mowing, and varying the height of mowing were the main variables for the study.

Mowing Safety

Slopes

- **Rural Areas** Slopes 3:1 and steeper shall not be mowed and shall be identified with a marker, or a slope indicator shall be attached to each tractor that is used for mowing.
- **Urban Areas** Some 3:1 and steeper slopes may be mowed. Use equipment specifically designed for the operation.

Obstructions

- Marker posts are to be placed to identify and locate all culvert pipe, concrete box culverts, headwalls, flared end sections, splash basins, flumes, drop inlets, and other objects that are difficult to see from the seat of a mower.
- Marker posts shall be 6 ½ foot lightweight steel posts with a 3-button delineator at the top.
- Marker posts that have been damaged shall be straightened, plumbed or replaced as a matter of course.

Mowing with tractors

- A mower operator is subjected to numerous hazards. These include washouts, ruts, culverts, markers, slopes, flying debris, passing motor vehicles, and excessive operating speeds.
- For the protection of employees, the supervisor shall inspect and patrol the area to be mowed for physical hazards. The supervisor shall also make sure that all personnel are wearing safety clothing. Eye protection is recommended.
- Slopes greater than 3:1 shall not be mowed.
- Sickle bar mowers shall be used with the sickle bar pointed toward the upside of the slope.
- Operators shall wear safety seat belts.

- Mowing side by side or in close tandem shall be avoided. Mower operators should stay far enough from each other to avoid any flying objects such as rocks or debris.
- The operator should stay in his/her seat until the power take-off has been disengaged and the mower has come to a complete stop.
- Never attempt to unclog or adjust a running machine – even at idle speed.
- When raising a cutter bar, keep hands and fingers away from the guards. Fingers can be severed by a falling knife even if the PTO is disengaged. Spare sickle bar blades shall be stored in such a manner that if the front of the tractor strikes an object, the spare blades cannot move into the operator's area.
- Mow with the flow of traffic except in special circumstances or where permission is granted by the supervisor.
- All motor vehicle laws will be observed.
- All highway mowers shall be identified with the slow-moving vehicle warning emblem affixed.
- Cross highways with the tractor-mower rig only at locations where adequate sight distances exist.
- All mowers shall be disengaged when moving onto highways and roads.

<u>Mowing with push-mowers</u>

- Push-mowers (small rotary hand mowers) are to be used in landscaped areas and in other areas that require mowing, but are inaccessible to tractor units. Traffic circles, intersection lawn areas, and steep slopes are such areas. Other locations to be mowed in this way include areas around culvert inlets and outlets, bridge ends, and immediate areas near highway signs, guardrails or posts, and traffic control devices.
- Prior to operating push-mowers, clear the area of debris.
- Footing can be unsteady on wet slopes. Consider working in another area until vegetation dries.
- When cleaning or replacing blades, disconnect the ignition wire.
- Shut off the engine when the mower is unattended or when refueling.
- Keep fingers and feet away from rotary blades.
- Wear safety-toe shoes when operating small hand rotaries.
- Use all provided shields and guards when operating equipment.

Flying debris

- Mowing roadsides can make roadside debris become flying projectiles. Flying debris can be prevented by using chain debris guards and setting the mower at a height suitable for the terrain. Mowing blade height should never be below 6 inches.
- Do not use heated or welded mower blades, since they can become brittle and are prone to breaking.
- Protect the public by directing the path of potential flying debris toward the ditch and backslope, instead of toward the roadway.

Mowing Practices

Mowing height The mower blade must be maintained at least 6 inches from the ground to reduce the likelihood of exposing bare soil or damaging the crown portion of the native grasses. It is important to maintain this blade height if the area to be mowed includes desirable grasses. Close mowing may be allowed in special cases where no desirable species occurs and restoration work will follow immediately.

Mowing dates First mowing event should occur just prior to Memorial Day. A second mowing in mid-summer should focus on shoulders only for correcting sight distance problems, and may need to be repeated as shoulder vegetation grows. Mowing width for this task should be between 5 feet and 15 feet from the edge of the paved surface, as needed to allow safe sight distances. A final mowing event (after October 1) keeps snow from building up on highway shoulders.

Private mowing on the right-of-way is not authorized. However, rural residences and rural businesses may mow within reason.

Clean the mower Mowing can spread weed seed from infested areas to new areas. At the completion of a mowing job, the deck is typically covered with plant material from the site. Clean the mower after each operation to ensure that mowing operations are not contributing to the spread of noxious and nuisance weeds. Weed seeds can also become lodged in other vehicles - - check and clean out headlight, wheel well, and bumper areas before moving to the next work site.

The DVD entitled “Dangerous Travelers: Controlling Invasive Plants along America’s Roadways” outlines the problem of weeds migrating across the country. Weeds and seeds can be transported by cars and maintenance equipment, and are spread through the pathways that roads provide. This DVD is published by the USDA Forest Service, and is available for downloading at:

http://www.fs.fed.us/invasivespecies/prevention/dangeroustravelers.shtml

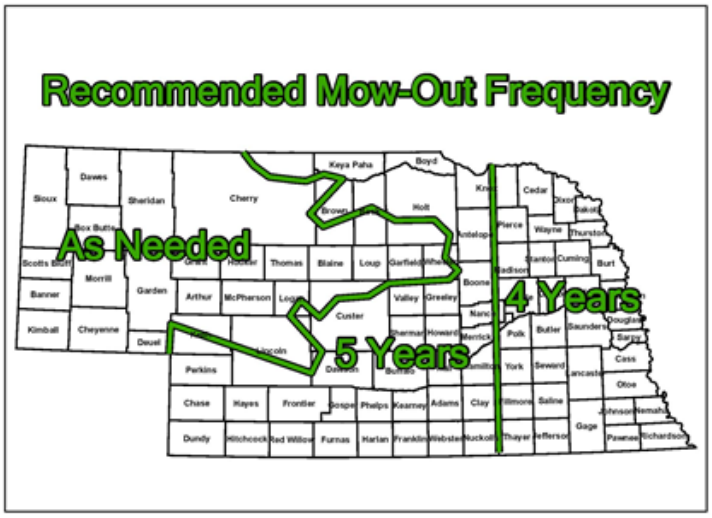
Some ways to combat spreading weeds via mowing equipment include:

1. Thoroughly clean maintenance equipment after working in weed infested areas. This includes mowers or blading equipment. Cleaning should include power washing.

2. Stockpile any cuttings removed from infested areas. Dispose of this material; do not reuse these cuttings, because weeds could spread.
3. Insist that all equipment brought onto NDOR right-of-way is clean and weed-free.
4. Frequently inspect equipment storage areas for weeds. Remove any weeds that are present.

A total mow-out of the right-of-way will be completed periodically. This shall be planned so that at least ¼ or 1/5 of the total mileage in the maintenance area is done each year. The vegetation shall not be removed from an entire district in any one year. The mow-out is limited to *one side of the road in any given year*. The mowing frequency map is your guide. Mow-out operations are not recommended until after October 1.

- Mow-outs shall comply with the dates allowed by the Memorandum of Understanding between NDOR and the Nebraska Game and Parks Commission (included in the Appendix of this section). However, mowing foreslopes, ditches, and backslopes only after October 1 is beneficial for seed dispersal of wildflowers AND for supporting *pollinating organisms'* life cycle completion.
- Landscape program trees and shrubs – When the complete right-of-way is mowed, use extra caution beyond the clear zone to preserve established woody plantings. Newer plantings usually have mulch spread around the trunks, or may be guy-wired with a stake.
- Volunteer trees and shrubs – saplings of red cedar, cottonwood, Siberian elm, and other weedy species should be mowed out. Mowing is not recommended for trees greater than 3 feet tall. These trees will need to be cut and the stems treated, as described in the "Removing Unwanted Trees, Brush and Stumps" section. Volunteer shrubs may be left to grow, unless they cause a snow drifting hazard or interfere with sight distance requirements. Trees and shrubs that remain after mowing must not be a future hazard to NDOR operations or to the public.



Highway Types

Urban Interstate and Expressways Keep it neat! Mow as frequently as is needed and remove trash. Consider having more than one group to pick up trash. If the grass has become exceedingly long and mowing creates a large amount of deadfall, then remove the mowed plant debris to improve the appearance and prevent killing the grass underneath.

Use caution when mowing around landscape plantings, so damage is avoided or minimized. If mowing equipment is too large to mow between plantings, then consider developing an unmowed "island." Do not mow slopes that are 3:1 or steeper, except with special equipment.

Rural Interstate and Expressways for both the median and outside shoulders, the minimum mowing width is 5 feet. If wildflowers are present, maximum width is 8 feet. If no flowers are present, the maximum width is 15 feet. Mowing height should never be shorter than 6 inches.

1. Major Rural Interchanges that serve as city entrances may be mowed on a continuous basis.
2. Other Rural Interchanges Maintain the 5-foot to 15-foot mowing width along the interior of the interchange. These interchanges may be mowed in the fall to emphasize the trees and shrubs and to help protect them from fire. Remember to leave strips of unmowed grass for snow control.
3. Mainline – Interstate and Expressway

   First mowing 5-foot minimum to 15-foot maximum

   Final mowing as necessary for snow control

   Total mow-out one side only. Not before October 1.

   Medians Interstate and Expressways

   a. First mowing - 5-foot minimum to 15-foot maximum
   b. If there are flowers in the median, keep the mowing at the 5-foot to 8-foot width until the blooming has stopped.
   c. Final mowing - total mow-out except for medians wider than 58 feet which may be left alone except for the 15-foot mowing.
4. Rural Medians Mow in time for the Memorial Day holiday, then 2 trim mowing events prior to Labor Day. Do a full mowing after Labor Day. Let the wildflowers go to seed before the final mowing.

Rural Primary and Secondary Roadside Areas

1. Slopes that are 3:1 or steeper shall not be mowed. These slopes shall be identified with a hazard marker or a slope indicator on the tractor.

2. The minimum mowing height is 6 inches. Where mowing is required, maintain the height of the vegetation between 6 inches and 12 inches. Mow approximately 3 feet beyond the guardrail.
3. Check for sight distance on a frequent basis.

Shoulder Mowing Widths

1. Surfaced Shoulder The minimum width is 5 feet. Maximum width is 15 feet.
2. Turf Shoulder Mow to 15 feet (except where 15 feet would be a hazard to the operator or to the public).
3. Flowers If the 15-foot width is going to mow flowers, then reduce the width to 5 feet or 8 feet until the flowers have stopped blooming.
4. Mowing may be required beyond 15 feet for sight distance at farmsteads, intersections, and rural businesses. When doing this extra mowing, use smooth sweeping curves to blend in with the topography and the other mowing.

Sandhills Region Mowing

1. Mowing Operations – The soil and vegetation characteristics of the Nebraska Sandhills Region differs significantly from other areas of Nebraska, whose soils contain a higher level of organic matter.

   Because of the sandy soils, shoulder mowing in the Sandhills Region shall be given special consideration. Height of vegetation shall be maintained at a minimum of 6 inches. This height can be obtained with one mowing, on or around July 1st of each year. One additional mowing may be needed in some locations for snowdrift control. This should be started after October 1.

   Mowing widths on the highway shoulder areas will be limited to a minimum distance of 5 feet and a maximum distance of 15 feet beyond the edge of roadway surfacing on the first mowing. Care should be taken to prevent unnecessary disturbance of the fragile soil and grasses. It shall be at the discretion of the supervisor as to what mowing equipment will be utilized (15-foot batwing or sickle bar).
2. Total Mow-out Not required. Optional. If chosen, the frequency is every 5 years. Total mow-out shall be done after October 1.
3. Waterways All waterways within the right-of-way are to be kept clear and major waterways can be mowed if necessary.
4. Snow Control Mowing The final mowing may extend beyond the 15-foot zone for snow control in those areas that need the extra mowing.
5. Establishment Period Mowing Not required, but occasional weed mowing will help the new seeding to grow (see below).

Vegetation Establishment Period Mowing for Non-Sandhills Areas

The establishment period for the roadside seeding will normally be a 2-year period during which fence-to-fence mowing will be done as often as is necessary to control weeds.

Maintain the vegetation stubble at a 5- to 6-inch level. Do not let the weeds get over the 12-inch maximum height before mowing.

The establishment period mowing is critical to the early development of the grass and flowers. This action reduces weed competition, thereby improving the establishment of the seeded native species. The seeding of our roadside is not cheap, but being cheap with the mowing can turn out to be expensive if we have to re-seed an area.

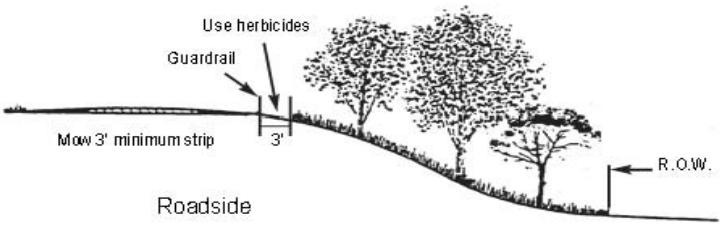
Mowing Wildflower Planting Areas ("Wildflower Islands")

Installation of wildflower islands (small areas that have a high seeding rate of flowers, planted to benefit pollinating organisms) will be coordinated with the Districts. Pollinating organisms live in and move through Nebraska generally between May 1 and October 1.

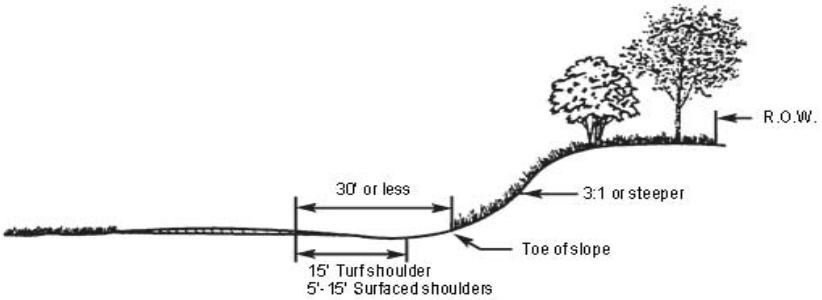
Managing weeds and mowing in these areas will require coordination between District Operations/Maintenance staff and the Roadside Stabilization Unit. However, mowing wildflower islands only before May 1 and after October 1 will be part of the standard management for these roadside features.

Mowing Details

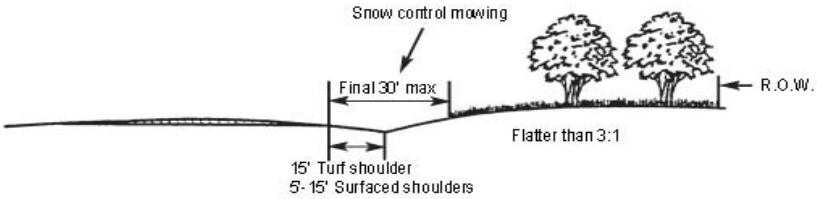
A. Guardrail - mow to a minimum of 3 feet beyond guardrail. Herbicides will reduce the need for hand trimming under the guardrail and surfacing under the guardrail will eliminate the chemicals. When the slope beyond the guardrail is less than 3:1, it will be mowed to 30 feet on the snow control mowing. If the entire right-of-way is to be mowed, this area will also be mowed.



B. Slopes that are 3:1, or steeper shall not be mowed. On the final snow control mowing, the mowing section is to be extended as shown in this detail. Do not mow up the slope.



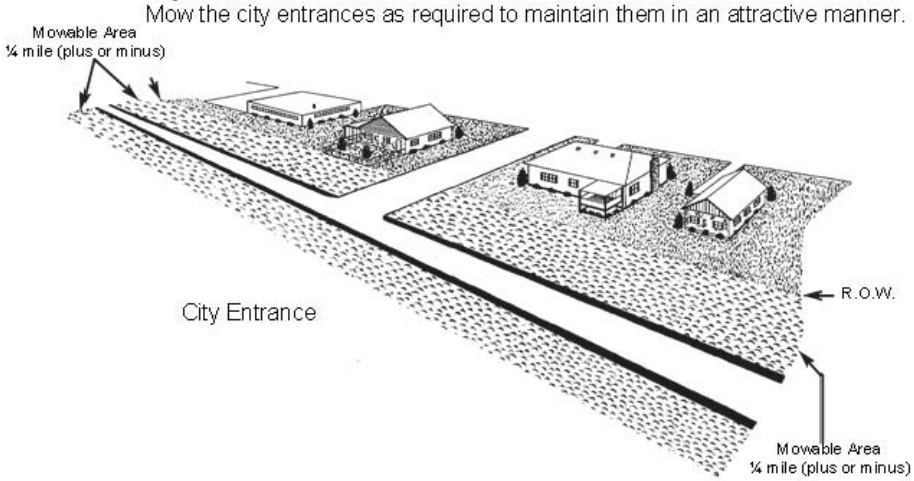
C. Slopes that are 3:1, either cut or fill, shall be mowed as shown in this diagram, except when the entire right-of-way is mowed.



D. The toe of the slope is the limit of mowing, even if it falls inside the 15-foot or snow control limits.

E. City Entrances

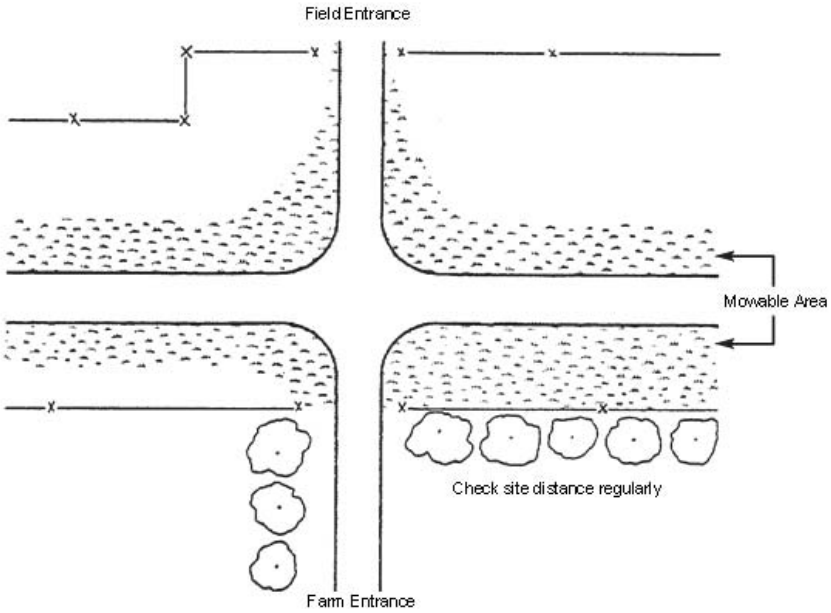
Mow the city entrances as required to maintain them in an attractive manner.



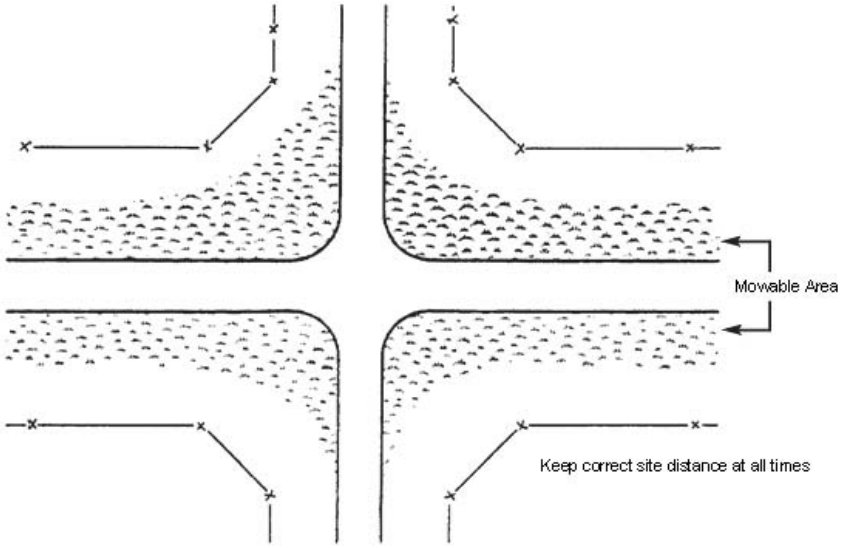
F. Urban Area Fence Lines

Mow a 5-foot width to the fence where landscape plantings and degree of slope permit.

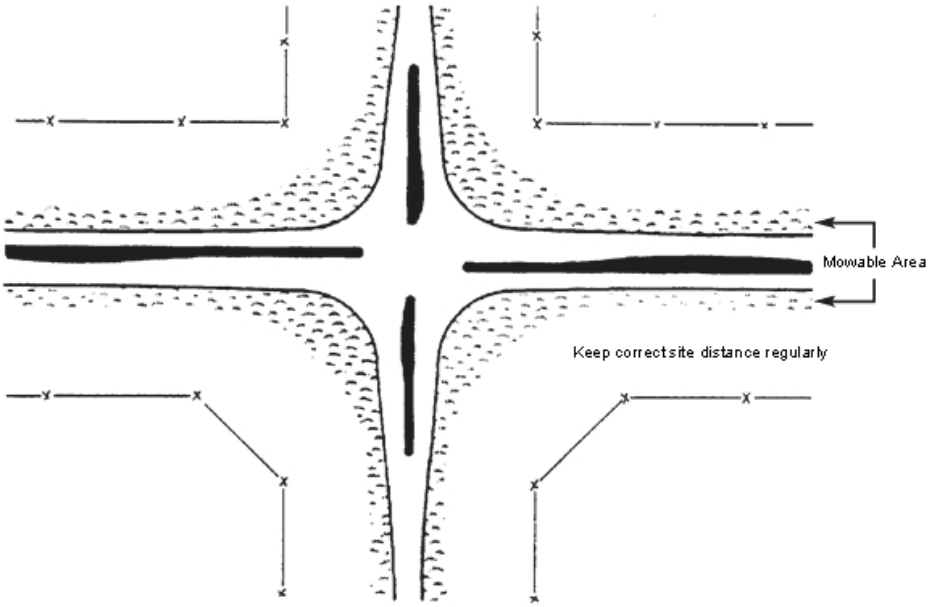
G. Farm Dwelling and Field Entrance Mowing



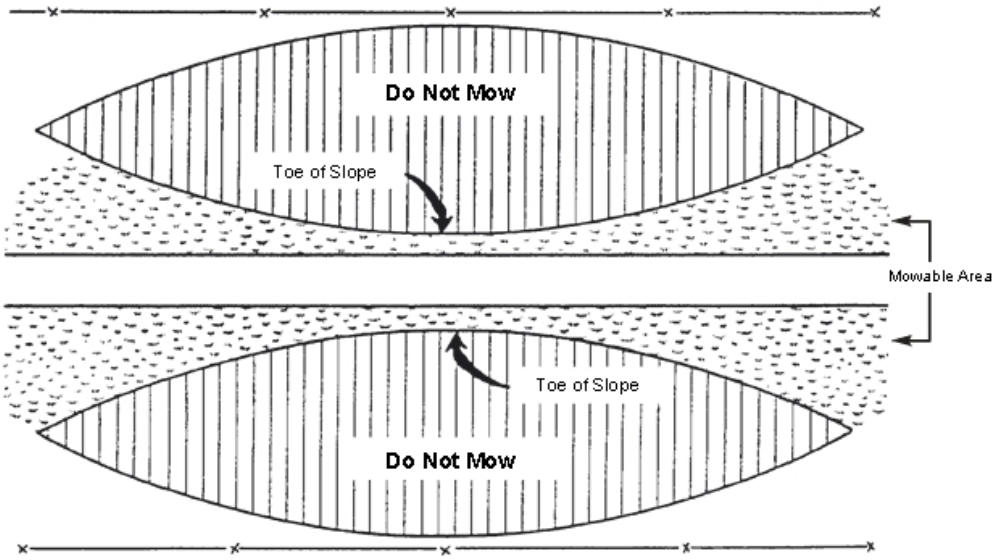
H. County Road Intersection Mowing



I. Highway Intersection Mowing

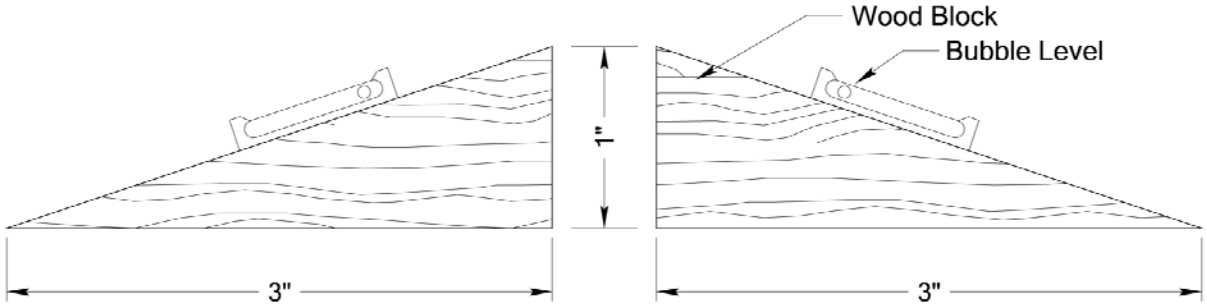


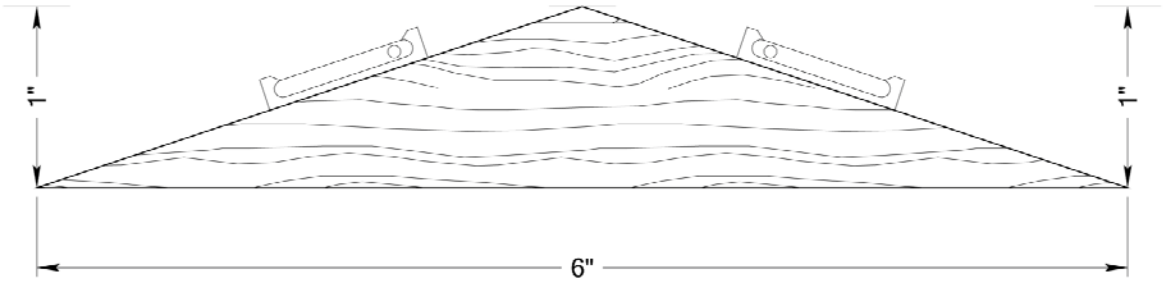
J. Slopes 3:1 and Steeper



Placing Slope Indicators on Mower Tractors

* These sketches show the method to place slope indicators (bubble levels) on mower tractors to indicate to the operator when he/she is on a 3:1 slope.



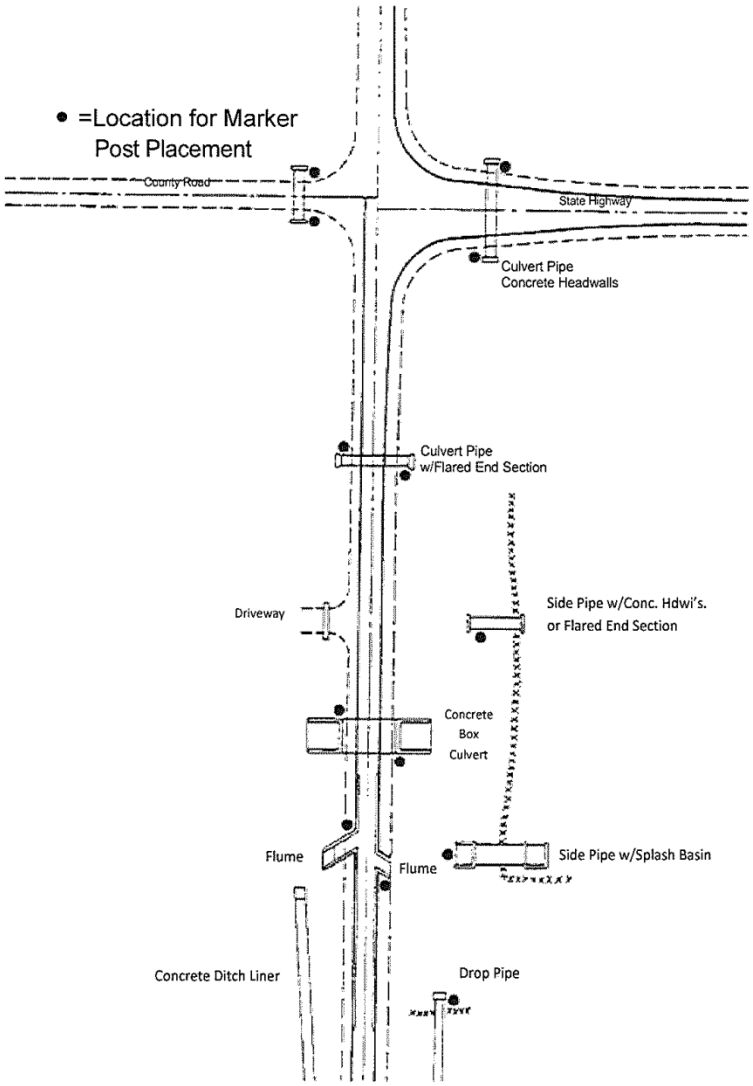


Park the tractor on a level floor. Find a place on the tractor's dash that is level. If the area on the dash is big enough, use one wood block with 2 levels (as in the lower diagram). If there isn't enough room for the 6" wood block, cut it in half and place the 3" sections (as in the upper diagram) so they are visible to operator while operating the tractor.

When the tractor leans to the right, the bubble level on the left side will start to move to the center when you are approaching the 3:1 slope. This is the time to get off the side hill, since rolling the tractor is possible at this angle.

Typical Installation of Marker Posts

The following roadway indicates typical placement of marker posts. Care shall be exercised in marker post placement to avoid damage to culvert pipe headwalls, parapet walls, etc.



Part 5 - Removing Unwanted Trees, Brush and Stumps

NDOR strives to create a roadside landscape using natural and designed re-vegetation that is appropriate to the landscape regions. The roadside landscape must also conform to NDOR roadside safety needs. Selective removal of trees and shrubs that have become roadside hazards may occur when the vegetation does not conform to the safety standards.

Before removing trees and shrubs, the Environmental Section of the Project Development Division should be consulted to ensure that the planned activity is in compliance with the Migratory Bird Treaty Act. No chemical treatment or removal is allowed from April 1 – September 1 without the area first being surveyed by a qualified biologist.

1. Trees and shrubs selected for removal may be cut and the stump treated. All fresh cut stumps shall be treated to prevent re-growth. Cedar tree stumps do not need to be treated.
2. Drainage areas shall be kept free of shrubs and trees.
3. Fences shall be kept free of trees and shrubs. Vines are to be left undisturbed.
4. Trees that shade the road and create an icy condition in the winter may be removed. Discuss the situation with the Roadside Stabilization Unit in NDOR's Project Development Division prior to removal.
5. All debris resulting from the tree and brush cutting work shall be chipped and/or removed from the right-of-way and either chipped and spread or taken to a predetermined location. As much as possible, all material that is cut in a day shall be disposed of during the same day. Wood chips may be saved for mulching around plantings.
6. Groupings of trees growing in areas designated to be retained may be selectively thinned to stimulate growth and development, if necessary. Contact the Roadside Stabilization Unit in the Environmental Section for guidance on the thinning procedure.
7. Whenever a highway construction project outside of a community's corporate limits causes the removal of woody vegetation from the right-of-way, the regrowth of such woody vegetation shall be controlled by established roadside management practices such as mowing, haying, or other mechanical and chemical means.

Cut Stump Herbicides

Once a stump has been cut, chemical application must be done immediately to stop re-growth. The longer application is delayed, the less effective it will be on killing the root system supporting the stump. Minutes count! In non-freezing weather, use undiluted 2, 4-D Amine with a color dye of 2 oz. per 5 gallons of 2, 4-D Amine. Brush or spray this mixture on the stump immediately after cutting. This should produce at least a 90 percent kill. If this work is done during the normal growing season, the stump may grow a sprout 2 to 3 feet tall before the plant dies.

During the growing season:

A. Garlon 3A mix 1:1 with water
   or Garlon 4 Ultra 25% + 75% basal oil
B. Milestone 1:1 with water for locust
C. Krenite S: 50-100% concentrate
D. Roundup – Pro: 75-100% concentrate

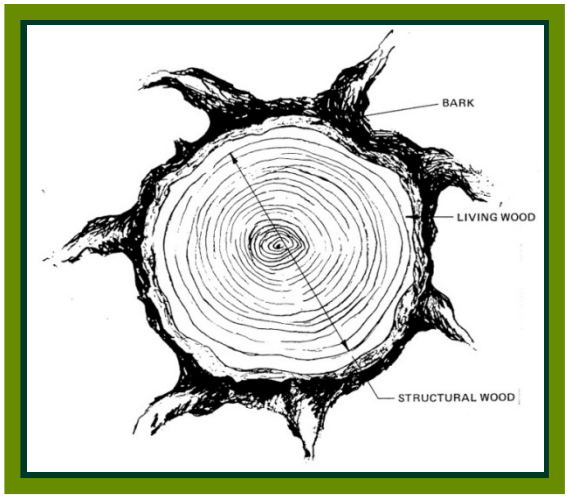
During the dormant season:

A. Pathfinder II or Pathway
B. Milestone
C. Stalker basal mixtures

Cut Stump Treatment for Stumps Over 3" in Diameter

- Treat the living wood only – *treat immediately after cutting*
- Stumps that are 3" and under, cover the entire stump and sides immediately

Foliar Application
Woody vegetation and brush should be controlled during the dormant season if possible. If not, a foliar application may be made with Garlon 4 Ultra or after September 1, Krenite.



Red Cedar Control
Cedars cut below live branches will not re-sprout and need no chemical treatment. Herbicides do not work well on trees larger than 6 feet, and the potential for offsite drift is high. NDOR prefers to spray trees that are 3 feet or shorter so they don't become an eyesore if they are not removed promptly after control efforts take effect.

Eradication priority should be given to female trees bearing fruit (blue berries), especially where ROW adjoins range or pasture.

100 Gallon Herbicide Mixture

1. 2 ounces of Escort XP
2. 1 pint of silicon surfactant
3. Spray to wet – from spring green-up to first frost
4. Symptoms are slow to appear – it may take the entire growing season for a complete kill.

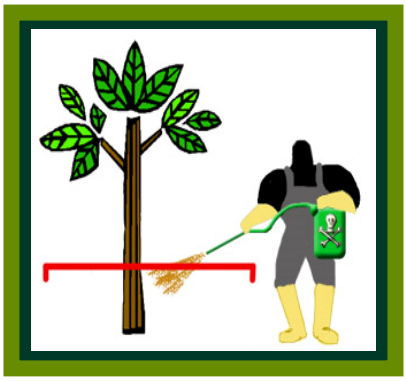
Alternate 100-gallon mixture:

#1-4 above plus 10 oz Streamline

Call if you have questions, call (402) 479-4499, or email Ronald.Poe@nebraska.gov.

Unwanted Tree Control with Dormant Basal Treatment (cannot be used in snow cover or in standing water)

- Spray entire trunk from knee high to the ground.
- Spray to **wet only** – we do not want runoff.
- Wear appropriate clothing:
  - Rubber boots
  - Plastic gloves
  - Disposable coveralls
  - Eye protection (goggles)



1. Pathfinder II is a ready-to-use product and requires no mixing
2. Garlon 4 Ultra 1 quart per 3 quarts penetrating oil makes 1 gallon of spray
3. Stalker 1-2 oz. per gallon of penetrating oil; do not use around desirable woody plants (the product affects adjacent vegetation, leaving a ring of bare ground)
   - Penetrating or basal oil is carried by Van Diest or UAP as J.L.B. Oil Plus.
   - The recipe says the basal treatment should be made to the lower 12 to 18 inches of the tree trunk – approximately **knee high down to the ground**. Spray to wet only. Runoff is not necessary and only wastes the mix.
   - Areas that are treated with this basal method will have dead brush next year and can be a scheduled cleanup event.

Equipment

Choosing the appropriate equipment will increase the ease of basal bark and cut surface applications and reduce herbicide waste. First, choose a wand that shuts off at the spray tip, rather than at the handle. If this type of wand is not available, using a 5-10 lb check valve with your nozzle tip will work. By stopping the flow at the tip rather than at the handle, less herbicide is wasted through dripping. Second, choose a 5500 adjustable tip (X3-X8) that can be adjusted to a cone spray pattern. Third, choose a sprayer that has oil resistant seals. These units will usually be designated as having Viton seals or simply as having oil resistant seal. Backpack sprayers are preferable to hand sprayers, due to ease of transporting on foot and ease of use.

Seasonal Brush Control

Spring – Summer	No treatment from April 1 – September 1 (migratory bird protection)
August 1 to September 15	Krenite-S (see recipe below)
Season long	Use basal treatment or cut surface treatment

Use the following recipe for September brush control. Spray the entire bush or tree – kills on contact only

100-gallon mix

1. 1 quart drift control agent
2. 1½ gallons Krenite-S
3. Use higher pressure (50 to 80 psi)
4. 98 gallons of water

Appendix

Managing Roadside Vegetation

NDOR's Pesticide Application Report

NDEQ's Notice of Intent

Pesticide Products Used (herbicide names, EPA registration numbers, active ingredients)

Contact Information for pesticide application reports / NDOR District Engineers and Operations and Maintenance Managers

Memorandum of Understanding (1997) NDOR and Nebraska Game and Parks Commission

Pesticide Application Report

PART 1 – APPLICATION DAY

Date:	Start Time: ☐ A.M. ☐ P.M. End Time: ☐ A.M. ☐ P.M.		District:	County:
Check Appropriate Boxes: ☐ NB ☐ EB ☐ SB ☐ WB	☐ Roadside ☐ Bridge ☐ Ramp ☐ Landscaped Area	☐ Wetland Mitigation Site ☐ Interchange ☐ Shoulder ☐ Median	☐ Interchange ☐ Shoulder ☐ Yard/Stockpile ☐ Rest Area	☐ Spot Spray ☐ Aquatic ☐ Blanket Spray ☐ Wetlands
Applied By: *Name(s)*				Applicator License No.:
Temperature: °F	Wind Speed and Direction:			Forecast for Next 24 Hours:

Target Species	Product Name	Aquatic Label?	Restricted Use?	Application Rate	Amount of Chemical Used

No. of Acres Treated:	Disposal of Leftover Product:
Method of Application:	Equipment Used:
Highway No. or Site Name:	Target Area *(i.e., R.P. to R.P., Buffer, Guardrail)*
GPS Coordinates:	

PART 2 – FOLLOW-UP INSPECTION

Perform this inspection 1-5 days after pesticide application.

Date of Follow-up Inspection: ☐

Inspect the areas sprayed on the date in the top portion of this page. Do you see:

1. The occurrence or new knowledge of any spills, leaks, contamination, or incident at the target area that could impact water quality. ☐ Yes ☐ No
2. Any adverse impact to non-target species or threatened and endangered species, human health, or the environment. ☐ Yes ☐ No
3. Evidence indicating a possible release of pesticide into water. ☐ Yes ☐ No
4. Evidence of oil or petroleum product contamination in the pesticide application *(e.g., visible oil sheen)*. ☐ Yes ☐ No
5. Any physical characteristic in the pesticide application that could indicate the presence of a pollutant or pollutants not previously identified or anticipated. ☐ Yes ☐ No

Retain this form for 3 years at your District office to comply with BMP for Pesticide General Permit (NCP100000).

DR Form 16, March 2012

Notice of Intent form for pesticide application:

NOTICE of INTENT
for the
Pesticide General Permit

This Notice of Intent (NOI) is a request for coverage under the NPDES General Permit for Pesticides NEP100000 for application of pesticides to waters of the State of Nebraska. Complete this form and submit it along with any requested or supporting documents to the Department. The Department must receive the NOI request at least seven (7) working days before intended application. Authorization status will be posted on the Departments web site at www.deq.state.ne.us.

Owner or Management Authority

Company

First Name Last Name MI

Address (Line 1)

Address (Line 2)

City State Zip

Phone Cell e-mail

Reason for Submittal of NOI

Please check all that apply:

- ☐ State Resource Water A
- ☐ 303(d) listed ingredients or residuals
- ☐ Threatened and Endangered Species (T&E) or Critical Habitat
- ☐ Flowing stream confluence within 250 feet of state resource water, 303(d) listed water or T&E
- ☐ Public drinking water surface water intake contribution
- ☐ Other: _____

Pesticide Being Applied

	Pesticide Name	FIFRA Label No.	Type	Active Ingredient(s)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

Location of Target Area

Select one	Name		Multiple Targets in List	Map is required
☐ State Wide			☐ List Attached	☐ Map Attached
☐ State Park or Forest:	_____	or	☐ List Attached	☐ Map Attached
☐ County or Counties:	_____	or	☐ List Attached	☐ Map Attached
☐ Municipalities:	_____	or	☐ List Attached	☐ Map Attached

☐ Lake: _____ (Name) ☐ Stream: _____ (Name) ☐ Map Attached

GPS Location of Mid-Point: _____ degrees N/S _____ degrees E/W

Notice of Intent, Page 2

Targeted Pests
Attach list if more than 12

1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.

Best Management Practices (BMP)
Select all that were considered as options to or in conjunction with the pesticide to reduce the amount of pesticide applied.
At least one must be selected.

- ☐ No Treatment
- ☐ Environmental controls (oxygen, benthic barriers, shading, water level control, etc.)
- ☐ Mechanical Removal (hand pulling, weed rollers, mechanical harvesters, mowing, dredging, etc.)
- ☐ Biological Control Agent (grass carp, ladybugs, etc.)
- ☐ Biopesticide (larvicides)
- ☐ Other _____

Threatened and Endangered Species or Critical Habitat

- ☐ No Threatened and Endangered Species or Critical Habitat

- ☐ Letter of No Effect (enclose letter)
- ☐ Letter of No Effect based on conditions (enclose letter)
- ☐ Additional consultation required (enclose letter)

Certification and Signature
I have examined and am familiar with the information submitted on this pesticide general permit application. To the best of my knowledge the information supplied is true and accurate.

_____ _____
Signature of certifying official* Date

_____ _____
Printed Name Title

*For facilities subject to the terms and conditions of the General Pesticide Permit (NPDES Permit NEP100000), this form must be signed by the Certifying official as defined in Part V of the permit

Send original NOI (no photocopies or faxes) for **NPDES** General Permit NEP100000 to the following address:

Nebraska Department of Environmental Quality
Wastewater Section
Suite 400, The Atrium
1200 'N' Street
PO Box 98922
Lincoln Nebraska 68509-8922

Pesticide Products Used
Supplement to Pesticide General Permit N.O.I.

NDOR 2012 (updated 2017)

Pesticide Name	EPA Registration No.	Type	Active Ingredient
2,4-D amine	352-439	Herbicide	Dimethylamine salt of 2,4-D-Dichlorophenoxyacetic acid
2,4-D ester	2217-936	Herbicide	Isooctyl ester of 2,4-dichlorophenoxyacetic acid
2,4-D low volatile ester	42750-22	Herbicide	Present as 2-ethyl hexyl ester
Acelepryn	352-731	Insecticide	Chlorantraniliprole
Arsenal (Polaris)	241-299	Herbicide	Imazapyr
Banvel	66330-276	Herbicide	Dimethylamine salt of dicamba
Barricade	100-1139	Herbicide	Prodiamine
Capstone	62719-572	Herbicide	aminopyralid +triclopyr amine
Casoron 4G	400-168-59807	Herbicide	Dichlobenil
Chaparral	62719-597	Herbicide	Aminopyralid
Clarity	7969-137	Herbicide	dicamba, diglycolamine salt
Cimarron	352-670	Herbicide	Metsulfuron methyl + chlorsulfuron
Dimension	62719-542	Herbicide	dithiopyr
Endurance	100-834	Herbicide	Prodiamine
Escalade 2	228-442	Herbicide	Methylheptyl acetate, Dichloro –o anisic acid, dimethylamine 2,4-dichlorophenoxyacetate
Escort XP	352-439	Herbicide	Metsulfuron methyl
Esplanade	432-1516	Herbicide	Indaziflam
Forefront	62719-524	Herbicide	Aminopyralid
Garlon 3A	62719-37	Herbicide	Triclopyr (amine)
Garlon 4 Ultra	62719-527	Herbicide	Triclopyr (ester)
Glyphosate	524-517	Herbicide	Glyphosate
Grazon P+D	62719-182	Herbicide	Picloram + 2,4-D
Habitat (Polaris)	241-426	Herbicide	Imazapyr
Horticultural Vinegar	N/A	Herbicide	Ascetic acid
HyVar XL	352-287	Herbicide	Bromacil
Imazapyr	74477-5	Herbicide	Imazapyr
Journey	241-417	Herbicide	Imazapic + glyphosate
Krenite	352-395	Herbicide	Fosamine
Landmark XP	352-645	Herbicide	Sulfometuron methyl + chlorsulfuron

Pesticide Name	EPA Registration No.	Type	Active Ingredient
Landmaster BW	42750-62	Herbicide	Glyphosate + 2,4-D
Mecamine D	34704-239	Herbicide	2,4-D, Mecoprop-P, and dicamba
Merit	3125-439	Insecticide	Imidacloprid
Method 240 SL	352-786	Herbicide	Aminocyclopyrachlor
Milestone	62719-519	Herbicide	Aminopyralid
Opensight	62719-597	Herbicide	Aminopyralid + metsulfuron methyl
Overdrive	7969-150	Herbicide	diflufenzopyr
Over the Top with Fusilade II	100-1084	Herbicide	Fluazifop-P-butyl
Paramount	7969-113	Herbicide	quinchlorac
Pasturegard	62719-477	Herbicide	Triclopyr
Pathfinder II	62719-176	Herbicide	Triclopyr ester
Pathway	62719-31	Herbicide	Picloram
Payload	59639-120	Herbicide	Flumioxazin
Pendulum	241-340	Herbicide	Pendimethalin
Pendulum Aqua Cap	241-416	Herbicide	Pendimethalin
Perspective	352-846	Herbicide	Aminocyclopyrachlor & chlorsulfuron
Plateau	241-365	Herbicide	Imazapic
Poast	7969-58	Herbicide	Sethoxydim
Redeem	62719-337	Herbicide	Triclopyr & clopyralid
Remedy	62719-70	Herbicide	Triclopyr
Rodeo	62719-324	Herbicide	Glyphosate
Round-Up Max	524-539	Herbicide	Glyphosate
Safari	86203-11-59639	Insecticide	Dinotefuran
Sevin	432-1226	Insecticide	Carbaryl
Speedzone	2217-833	Herbicide	2,4-D, 2-ethylhexyl ester
Spike 80 DF	62719-107	Herbicide	Tebuthiuron
Stalker	241-398	Herbicide	Imazapyr
Streamline	352-848	Herbicide	Aminocyclopyrachlor & metsulfuron
Talstar Professional	279-3206	Insecticide	Bifenthrin
Tempo SC Ultra	432-1363	Insecticide	Beta-Cyfluthrin; 1,2-Propanediol
Telar XP	352-654	Herbicide	Chlorsulfuron
Tordon 22K	62719-6	Herbicide	Picloram
Transline	62719-259	Herbicide	Clopyralid

Pesticide Name	EPA Registration No.	Type	Active Ingredient
Triclopyr	62719-260	Herbicide	Triclopyr
Trimec 992	2217-517	Herbicide	2,4-dichlorophenoxyacetic acid
Vanquish	228-397	Herbicide	Dicamba DGA
Vessel	2217-656-72112	Herbicide	2,4-dichlorophenoxyacetic acid
Vista XRT	62719	Herbicide	fluroxypyr

Contact Information for NDOR Pesticide Application Records

NDOR District Engineers and Operations and Maintenance Managers

NDOR District	Mailing Address	Area Served	Phone Number
1	302 Superior St Lincoln NE 68521-2481	Southeast	(402) 471-0850
2	4425 S 108th St PO Box 45461 Omaha NE 68145-0461	Omaha and vicinity	(402) 595-2534
3	408 N 13th St Norfolk NE 68701-3714	Northeast	(402) 370-3470
4	211 N Tilden St PO Box 1488 Grand Island NE 68802-1488	South Central	(308) 385-6265
5	140375 Rundell Rd PO Box 220 Gering NE 69341-0220	Panhandle	(308) 436-6587
6	1321 N Jeffers PO Box 1108 North Platte NE 69103-1108	Central	(308) 535-8031
7	619 Auditorium Dr McCook NE 69001-3569	Southwest	(308) 345-8490
8	736 E 4th St Ainsworth NE 69210-1215	North Central	(402) 387-2471

Memorandum of Understanding
Between the Nebraska Game and Parks Commission and the Nebraska Department of Roads

This Memorandum of Understanding is made and entered into by and between the Nebraska Game and Parks Commission, hereinafter referred to as the Commission, and the Nebraska Department of Roads, hereinafter referred to as the Department. The purpose of this agreement shall be the establishment and administration of a program of cooperation in roadside management. Roadside habitat is vitally important to the wildlife species that use it. It is very important to pheasant and quail populations. Pheasant and quail provide the bulk of the upland game hunting in Nebraska and thereby make a substantial annual contribution to the state's economy.

Witnesseth:

Whereas, the Commission under authority of Section 81-805, R.R.S. Statutes of Nebraska, has among other things responsibility for management and enhancement of the wildlife resources of Nebraska, and;

Whereas, such enhancement and management are based on habitat development and improvement, and;

Whereas, as research has shown that 25 percent of the pheasants are hatched in roadsides, and;

Whereas, the right-of-ways along Nebraska's road systems managed by the Department of Roads are of significant importance as wildlife habitat, and;

Whereas, the Department has the responsibility for maintenance, human safety, and vegetation management on roads within its jurisdiction, and;

Whereas, vegetating the right-of-way with adaptive species of grasses and legumes is the most economical method of soil stabilization, reduction of routine maintenance, noxious weed control, enhancement of vehicle safety, and production of wildlife habitat, and;

Whereas, the Department and the Commission have cooperated in the past on developing seeding mixtures for the state and county roads and on a living snowfence program, and;

Whereas, the Department and the Commission are each desirous of performing their aforesaid responsibilities in an efficient and economical manner and in concert with each other;

Now, therefore, in consideration of the execution and adoption of this agreement by the parties hereto, each one agrees with the other as follows:

1. That roadside vegetation management is essential to maintain the vigor and quality of the plant community, and to meet necessary safety and drainage requirements along Nebraska highways, and that mowing or controlled burning are the preferred management options.
2. That total roadside mowing be done on a scheduled rotational basis and that no more than one-third of a district shall be mowed out in any one year. The term "total roadside mowing" is defined as mowing all areas within the right-of-way, including, but not limited to, the median and the road shoulder.
3. That the rotational total roadside mowing be done no more often than every four years east of Highway 14 and no more often than every five years west of Highway 14. The Panhandle and Sandhills regions are excluded from a total roadside mowing requirement.
4. That total roadside mowing be restricted to one side of the road in any given year.
5. That this does not restrict the Department from necessary management of roadside vegetation via shoulder, median, town and farmstead entrance, sight distance, and snow control mowing as may be required on either side of the road on an annual basis.

6. That total roadside mowing will be conducted only between the following dates:

   A. Rotary mowing at a five-inch or greater height - July 15 to November 1.
   B. Mowing by haying methods - July 15 to September 10.

7. That the entire roadside may be made available for haying when a drought emergency is declared by the Governor of Nebraska. The areas to be first offered for haying would be those areas that were scheduled for a total roadside mowing in that year. If the demand exceeds these offered areas, other areas may be made available. Haying dates may be extended past the September 10 cutoff date in a drought emergency.

8. That the establishment period for a new seeding is normally a two-year time period during which the seeded area is mowed at a five-inch cutting height as frequently as necessary to insure stand viability.

9. That the Commission will utilize its information and education capabilities to inform the public of the importance of roadsides to the soil, water, and wildlife resources of Nebraska. In addition, they will utilize the same capabilities to educate the public on the need to manage roadside vegetation through rotational mowing and to promote the cooperative programs between the agencies.

10. The Commission will assign a person to serve as a representative to the interagency Statewide Roadside Seeding Committee.

11. The Commission will work with and coordinate activities with the Department in areas where programs or responsibilities overlap, such as county roadside management programs.

12. It is mutually understood and agreed to, by and between said parties, that:

    A. Nothing herein contained shall be construed as obligating the Department or Commission to expend in any one fiscal year any sum in excess of funds made available for such use.
    B. This agreement shall be effective on the last date of execution as noted below.
    C. This agreement shall remain in force until mutually modified or terminated.
    D. This agreement is executed by the Commission and the Department after due consideration on the dates affixed beside their authorization and adoption thereof.

In witness thereof, the parties hereto have signed this Memorandum of Understanding this 17th day of July 1997.

This agreement is entered into in the spirit of cooperation for the conservation of the roadside habitat that is so vital to our wildlife resources.

State of Nebraska
Game and Parks Commission

Rex Amack
Director

State of Nebraska
Department of Roads

Allan L. Abbott
Director-State Engineer

NDOR Roadside Facilities

NDOR's highway rights-of-way include facilities that support highway users, highway maintenance, and the environment. Vegetation management priorities and goals at rest areas, truck parking areas, District Offices, maintenance yards, wetland mitigation sites, liquid deicer storage areas, and research plots may differ from those along shoulders, ditches, and backslopes.

Rest areas and truck parking areas generally are landscaped, lawn-type settings. The traveling public uses these areas both as motorists and as pedestrians. Pedestrians must be able to see where walking is safe among parked and moving vehicles in daylight as well as at night. Preserving a wide visual range of the parking and sidewalk areas enhances pedestrian safety. Vegetation management priorities here are:

Removing tree limbs that are problematic to vehicles and pedestrians

Weed control in the lawn and within landscaped areas

Removing tall vegetation that could be used as a hiding place near sidewalks (contact the Roadside Stabilization Unit in the Environmental Section, Project Development Division for specific information).

Maintaining special planting areas (e.g., flower beds) by weeding and refraining from herbicide applications.

Maintenance yards and storage areas may become problem weed areas. If storage areas are used infrequently during the growing season, weeds that get started in the spring can produce a lot of seeds by mid-summer. Mow and treat weeds as needed (before the weed plants produce seeds) during the spring, summer and fall, according to the Chemical Control of Weeds and Mowing sections of this document.

Wetland mitigation sites and wetland mitigation banks are in place to make up for wetlands that were or will be affected by road projects. While noxious weeds must be controlled, vegetation management at these facilities must be coordinated through NDOR's Environmental Permits Unit (EPU). Manipulating these sites without EPU staff's approval may work against the wetland's purpose and cause problems between NDOR and the environmental agencies. Contact the NDOR Environmental Program Manager for information on vegetation management in or around NDOR's wetland mitigation facilities:

NDOR Environmental Program Manager for EPU (402) 479-4410

Research plots are part of NDOR's vegetation research effort. Using actual right-of-way as the setting for experimentation and observation helps NDOR to find and use the most effective products and techniques to get good vegetation started quickly, to prevent erosion, and to save the Department money.

University research staff and NDOR staff visit the sites during the growing season to make observations and record data. Because mowed-off plants are more difficult to identify, the research sites should not be mowed until the researchers have given the "all

clear" sign. The plots are posted "MOWING PROHIBITED" to allow the researchers to carry out measurements that are needed to run the research project.

Currently, these plots are located only in Districts 1 and 4. With close coordination between the Districts and the Environmental Section, the needs for data collection, the public's safety, and NDOR's maintenance can be met.

Carol Wienhold (402) 479-3917 carol.wienhold@nebraska.gov

NDOR research plots along a highway near Lincoln

Hay Harvesting Permit Program

NDOR directs permit issuance for mowing and harvesting hay on highway rights-of-way in Nebraska. The enabling legislation is Chapter 39, Article 13, Neb. Rev. Stat. 39-1359.01. Persons who wish to apply for a hay harvesting permit should contact the appropriate District Engineer, using the information on page 156.