

**Appendix F.
Interstate 25 and Crossroads Boulevard Road Improvements
Integrated Weed Management Plan (AECOM 2016)**

Interstate 25 and Crossroads Boulevard Road Improvements
(mp 258.67 to mp 260.16
Loveland, Larimer County, Colorado
Integrated Weed Management Plan



Prepared for: Colorado Department of Transportation

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Project No.: IM 0253-242 (20575)

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1.1 Noxious Weeds and Governing Rules and Laws

Noxious weeds are non-native plant species that are regulated by federal, state, and local laws designed to limit their establishment and spread. These are species that have been identified as economically and ecologically injurious to crops, ecosystems, natural habitats, native plants and animals, livestock, or humans.

President Clinton issued Executive order 13112 on invasive species in February 1999. This order created a federal invasive species council, established guidelines for federal agencies to address invasive species issues, and developed a National Invasive Species Management Plan.

The Colorado Noxious Weed Act [§ 35-5.5-101 through 119, C.R.S. (2003)] (Act) aims to control noxious weeds in the state by coordinating local, state, and federal managers; by funding local entities to implement weed management projects; by developing education and outreach activities at the state and local level; and by working with neighboring states to prevent the spread of noxious weeds across state lines.

The Act categorizes the recognized noxious weeds in the state as List A, List B, and List C. List A species are designated for eradication in the state due to their inherently injurious nature and limited occurrence. List B species are those species that are too widespread to eradicate and are instead identified for control among state and local governments and interested private landowners to stop further spread within the state. List C species are those non-native plants that are common and widespread and recommended for control by local jurisdictions through the development and implementation of local integrated weed management plans and through provision of further education, research, and biological control resources by the state to the entities that choose to require management of these species. In addition, a group of Watch List species have been developed, which are those species in need of further information to determine whether or not these necessitate designation as noxious weeds.

Larimer County's Noxious Weed Management Plan (Plan) supports the Act and provides specific information to eradicate List A species, contain and suppress List B species, and manage List C species and other troublesome weeds in the county. The Plan currently does not specify management needs of any List C species. The Larimer County Weed District maintains the plan and works with local entities to implement strategies to eradicate, limit, or manage weed infestations within the county.

1.2 Project Description

The project scope includes the reconstruction of approximately 1.5 miles of the existing roadway and replacement of two existing bridges that carry Interstate 25 (I-25) over Crossroads Boulevard. The linear roadway project will include grading activities, roadway widening of I-25 and Crossroads Boulevard while maintaining existing roundabout ramp terminals. Frontage roads will be removed, and improvements will be made to the pedestrian, roadway, and bridges. A new storm drainage system will be installed that ties into the existing systems. Demolition and construction of roadway structures; including bridges, paving, signing, striping, seeding, and excavation will be carried out as needed to accomplish the final geometry of the proposed interstate highway and bridge improvements.

The project will be constructed in phases to allow continuous operation of I-25 and Crossroads Boulevard. Grading and paving operations will occur as permitted by the Traffic Control Plan and Phasing Plan for the project. The sequencing of activities are anticipated to include pavement removal, grading, drainage system installation along I-25 and Crossroads Boulevard, maintenance of traffic improvements, construction of bridge structures, final paving, and final stabilization of the site. Installation of temporary Best Management Practices (BMP) will be installed at the appropriate time for the particular BMP.

The total area of the construction site is 79.2 acres. The Area of disturbance is 64.2 acres, and the area to be re-seeded covers 34.8 acres.

1.3 Project Location

The project is located along I-25 in Loveland, Larimer County, Colorado north and south of Crossroads Boulevard. The approximate center of the project is at 40.435958° North latitude and 104.992332° West longitude. It occurs in Section 3, Township 5 North, Range 68 West and Section 27 and Section 34, Township 6 North, Range 68 West of the 6th Principal Meridian.

1.4 Existing Vegetation

Seeded non-native cool season grasses planted to stabilize the site are the dominant plants in the Project Area. Smooth brome (*Bromus inermis*) was most commonly observed with lesser amounts of crested wheat grass (*Agropyron cristatum*) along the shoulders of I-25. The interchange area at Crossroads Boulevard appeared to have been reseeded with a native seed mix, but noxious weeds dominated most of this area. Limited native plants had re-established elsewhere in the Project Area. Noxious weeds and other non-native plants occurred at previously infested areas shown on CDOT's weed mapping application (CDOT 2016); sites that had recurring disturbance; or locations where the planted groundcover had established poorly.

Figure 1. Project Location



2.1 Purpose and Goals of this Plan

The purpose of survey was to identify the location and relative percent composition of noxious weeds along the existing right-of-way. The goal of this plan is to provide specific strategies to manage the identified noxious weeds and either eradicate, contain, or further manage their occurrence within the Project Area.

2.2 Survey and Data Management

AECOM biologists inventoried noxious weeds along the existing I-25 right-of-way in the Project Area on April 26, 2016. Occurrences of state-regulated noxious weeds were identified while walking the corridor. The incidences of these were mapped using a Trimble Geo7X GPS unit. Raw data were post-processed to achieve sub-meter accuracy. The relative cover of each occurrence was recorded in field notes.

Multiple noxious weeds occupied the same area in some places. Where this occurred, each species was described in the data, and the relative cover of each was noted. Small or individual incidences were mapped with points. Linear populations were mapped with lines, and identifiable areas were mapped with polygons.

CDOT noxious weed shapefiles from previous surveys of the area from 2011 through 2014 were plotted on field maps for reference during the survey. The highway median was not surveyed due to safety concerns. The median will be surveyed just prior to construction disturbance when traffic control is available. Mid to late season species potentially in the Project Area were not observable due to the larger project schedule limiting the period of survey to mid-Spring. A resurvey would be needed during the peak of the growing season to identify these.

3.1 Results

Four List B species were identified within the Project Area. These included Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), Scotch thistle (*Onopordum acanthium*), and Russian knapweed (*Centaurea maculosa*). There was evidence that previous occurrences of the thistles had been treated to control the established populations along I-25 south of Crossroads Boulevard. Spot herbicide treatment of some rosettes in the interchange area appeared to have occurred a few days prior to our survey.

Common mullein (*Verbascum thapsus*), downy brome (*Bromus tectorum*), and field bindweed (*Convolvulus arvensis*) were the list C species observed within the Project Area. Downy brome had the most extensive distribution across the Project Area. This species comprised between 60 to 80 percent of the plant cover in the inner and outer triangles of the Crossroads Boulevard interchange and typically dominated 60 to 80 percent of the plant cover bordering the abandoned frontage road along the eastern side of the Project Area. These borders were usually about a meter wide. Downy brome also was prevalent (60-80 percent coverage) along the boundary with the Harley Davidson dealership.

Appendix A includes the mapped incidence of noxious weeds encountered during the survey.

Table 1. Noxious Weeds Identified Along Project Corridor, April 2016 Field Survey

Common Name	Scientific Name	Larimer County Weed List	Map Code
List B Species			
Canada thistle	<i>Cirsium arvense</i>	Yes	CIAR
Musk thistle	<i>Carduus nutans</i>	Yes	CANUM2
Scotch thistle	<i>Onopordum acanthium</i>	Yes	ONAC
Russian knapweed	<i>Centaurea maculosa</i>	Yes	CEMA4
List C Species			
Common mullein	<i>Verbascum thapsus</i>	N/A	VETH
Downy brome (cheat grass)	<i>Bromus tectorum</i>	N/A	BRTE
Field bindweed	<i>Convolvulus arvensis</i>	N/A	COAR

¹ As part of this Plan, a preconstruction noxious weed inventory and subsequent mapping will be conducted prior to the commencement of project construction, to establish more accurate pre-construction conditions.

4.1 Objective and Approach

The objective of this plan is to decrease or eradicate noxious weed infestations in the Project Area in order to minimize spread within the project corridor or spread and establishment in surrounding natural, farmed, and landscaped areas. Ultimately, this would result in reducing additional economic burdens on CDOT and landowners surrounding the project corridor.

The general approach is to reduce the potential to spread of existing infestations and reduce the likelihood of introducing new noxious weeds into the Project Area. This involves:

- Excluding noxious weed seed and plant propagules from entering or spreading in the project area by making sure equipment and materials are weed-free
- Pretreating existing noxious weed occurrences in the Project Area to reduce the potential for spreading noxious weeds to new areas
- Avoiding infested sites in the Project Area to the extent possible to reduce the potential to spread noxious weeds
- Revegetating disturbed sites with a healthy plant cover or landscaping with materials that form a barrier to seeds and propagules

4.1.1 Integrated Approach to Weed Management

An integrated approach to weed management uses a variety of methods to obtain the objectives of limiting the establishment and spread of noxious weeds within a target area and surrounding lands. The integrated approach prescribes a combination the levels of control and the variety of strategies to achieve the desired outcome.

The Act explains three levels of control to set as a goal. These are eradication, containment, and suppression. Eradication aims to eliminate a particular infestation in an area over a short timeframe (1 to 3 years). Containment eliminates plants in the perimeter of the infestation and along dispersal routes to limit further spread of an infestation. Suppression reduces the density and severity of an infestation within a containment perimeter to mitigate further harm caused by common and widespread noxious weeds.

Several methods or strategies are available to eradicate, contain, or suppress noxious weeds. These include cultural controls (e.g. education, improved procedures, best management practices, and enhanced behaviors); mechanical controls (e.g. mowing, pulling, burning, flooding, mulching, and plowing); biological controls (i.e. introducing known predators of a species to reduce vigor or inhibit reproduction); and chemical controls (i.e. herbicides intended to kill a plant).

4.2 Project Specific Weed Management Actions

The Contractor shall control and prevent the spread of noxious weeds throughout the construction period to comply with Title CRS 35-5.5, Colorado Weed Management Act. This section outlines the weed management actions that will be taken for the I-25 Crossroads Boulevard Improvement Project. Components of this Plan include BMPs outlined in CDOT's Standard Specifications for Road and Bridge Construction (SSRBC 2011). The following

practices applied during construction would minimize the possibility of establishing new infestations and would discourage the spread of current noxious weed populations.

This section describes integrated methods to prevent, control, and monitor noxious weeds found in the noxious weed survey of the Project Area. The most practicable methods for noxious weed management in the Project Area include cultural, mechanical, and chemical methods to prevent the spread and control and treat existing populations of noxious weeds

4.2.1 Herbicide Treatment

SSRBC Section 217 describes the proper methods, timing, and proper use for furnishing and applying the proper herbicides for road projects by commercial licensed pesticide applicators.

- All herbicide labels shall be currently registered with the Colorado Department of Agriculture and the U.S. Environmental Protection Agency. All herbicides shall be supplied to the project in labeled containers. The labels shall show the product name, chemical composition, expiration date, and directions for use. In addition, only herbicides rated to be used in water will be used where wetlands, water of the US, and groundwater table are present.
- All herbicides shall be applied by commercial pesticide applicators licensed by the Colorado Department of Agriculture as qualified applicators. The Contractor shall furnish documentation of such licensure prior to herbicide application. Herbicide mixing and application shall be done in accordance with instructions on the registered product label. The Engineer shall be furnished such label information prior to mixing and application.
- The Contractor shall notify the Engineer at least 24 hours prior to each herbicide application and shall indicate the time and location application will begin. Application will not be allowed on Saturdays, Sundays, or holidays unless otherwise approved by the Engineer.
- Herbicides shall not be applied when weather conditions, including wind conditions, are unsuitable for such work. Herbicides shall not be applied when soil is extremely dry.
- Herbicide will be applied with wicks or sponges to avoid damage to non-targeted plants. All damage caused by improper herbicide application shall be repaired at the Contractor's expense.
- Broadcast herbicide spraying will only be approved with written approval of the Engineer and Larimer County Weed Supervisor.
- Herbicides shall not be used on areas that are to be topsoil sources unless otherwise approved by the Engineer.
- All herbicide treatments will be coordinated with the Larimer County Weed Supervisor.

4.2.2 Cultural Treatment – Construction Equipment

- All vehicles and equipment entering the project area will be cleaned thoroughly of dirt, plant, and other foreign material and are subject to inspection. Particular attention will be shown to the under-carriage and any surface where soil may accumulate and potentially harbor noxious weed seeds or other propagules. These efforts are critical to limit the

Project Area to the possible introduction and establishment of noxious weeds and non-native plant species. Arrangements will be made for inspections of each piece of equipment before entering the project area. Records of inspections will be maintained. Equipment found operating on the project area that has not been inspected will be shut down until cleaning in a designated area and inspection are completed.

- To minimize the possibility of importing noxious weeds, trucks and construction equipment will be dedicated to the project and not interchanged with other projects when possible.
- Drivers and operators will avoid driving through areas where noxious weeds may be present to reduce the possibility of spreading seeds or other propagules. Construction vehicles and equipment should park in designated areas or in unvegetated areas.

4.2.3 Cultural, Mechanical, and Chemical Treatment – Staging Areas

- Staging areas for equipment and supplies will be in weed free areas within the Project Area unless approved by the Engineer and pre-treated using integrated weed management practices. Weed infested staging areas shall be mowed and cleared of noxious weeds prior to utilizing these sites, and treated with the appropriate herbicide (Appendix B).
- Weeds will not be mowed or cut when fruits are mature and seeds are viable or capable of dispersing. Mowing, mechanical removal, or herbicide treatment should be done early in the growing season as possible.

4.2.4 Cultural Treatment – Topsoil Management

- Per SSRBC 207.02 topsoil shall consist of loose friable soil from the zone of major root development free of subsoil, refuse, stumps, woody roots, rocks, brush, noxious weed seed and reproductive plant parts from current state and county weed lists, heavy clay, hard clods, toxic substances, or other material which would be detrimental to its use on the project.
- Topsoil imported into the Project Area will be from a certified weed-free source to limit a potential route for noxious weed infestation.
- Compost, erosion control materials, or mulch that will be imported to the project site shall consist of Certified Weed Free sources under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS.
- If borrow material is used for any part of the project, the borrow material shall be weed-free and shall be obtained from a site preapproved by the Engineer. If the borrow is stockpiled it shall be stabilized and remain weed free for the duration of the project.
- Potential areas of topsoil salvage will be assessed by the Contractor's Qualified Supervisor for the presence and abundance of noxious weeds before use.
- If topsoil is used for any part of the project, the topsoil shall be inspected to be certified noxious weed free by the Contractor's Noxious Weed Management Supervisor.

- If List A or List B noxious weeds are found in disturbed topsoil, the material shall be disposed of at a solid waste disposal facility and not be used on the project.

4.3 Noxious Weed Species Methods

The amount area infested by noxious weeds in the Project Area is manageable with integrated weed management techniques. Appendix B contains fact sheets for each of the noxious weed species that were identified during the April 2016 noxious weed inventory and are outlined in this Plan.

- Integrated management practices endorsed by the Colorado Department of Agriculture (Appendix B) shall be used to treat the noxious weed species within the Project Area.
- In addition to the cultural methods described in sections 4.2.1 through 4.2.4, mechanical and chemical treatment of these species shall occur several times a year to eradicate, control, or contain existing infestations and to reduce the potential for their spread. Many of the species are biennial species, therefore they shall be treated at the following times: early in the year prior to seed set, in the middle of the growing season to ensure no plants were missed, and at the end of the growing season to treat any sprouts that would overwinter to the next growing season.
- Canada thistle is perennial and may require several treatments to control sprouts/rosettes, owing to the large storage capacity of the roots and likelihood of resprouting.
- Noxious weed plants, seed heads, and other plant parts that have been mechanically treated, shall be placed in appropriate bags or other suitable containers that can be tightly closed or sealed and shall be disposed of at a solid waste disposal facility.

4.4 Revegetation Commitments

Disturbed sites for construction, staging, and material storage activities will occur in compliance with the Storm Water Management Plan (SWMP) and using the following CDOT BMPs for revegetation:

- Disturbed areas will be reclaimed after completion of construction and seeded with a native seed mix appropriate for the climate and regional setting, as outlined in the project SWMP. In areas that cannot be immediately seeded due to seasonal constraints, a combination of soil roughening and a hydraulically applied fiber matrix will be used for temporary erosion control until seeding can occur.
- All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container.
- All seed mixes for temporary or permanent revegetation, soil amendments, and nursery material used for reclamation will be certified as noxious weed free in accordance with current state and local lists.

- The Contractor shall furnish to the Engineer a signed statement certifying that seed is from a lot that has been tested by a recognized laboratory for seed testing within six months prior to the date of seeding. Seed which has become wet, moldy, or damaged in transit or in storage will not be accepted.
- The best reclamation success would be achieved by including a variety of native species. It is generally recommended to plant native grass and forb seeds in the fall due to some native species requiring a chill period prior to sprouting.
- Seeding will be phased throughout construction to minimize the exposure of bare ground that could become infested with noxious weeds.
- A bonded fiber matrix, spray-on mulch blanket (CDOT Section 213), a flax based or wood straw, or approved equal product for reclamation of disturbed shall be used to mulch seeded areas.
- Weed-free mulches certified by the Colorado Department of Agriculture Weed Free Forage Certification Program and in compliance with the Weed Free Forage Act (Title 35, Article 27.5, CRS), shall be used on newly planted areas at an appropriate depth to retain moisture and retard weed growth.
- Compost used as a soil amendment shall be weed-free, organic compost derived from a variety of feed stocks including agricultural, biosolids, forestry, food, leaf and yard trimmings, manure, tree wood with no substances toxic to plants. Material shall be aerobically composted in a facility permitted by the Colorado Department of Public Health and Environment (CDPHE) to produce or sell compost in accordance with House Bill (HB) 1181. The Contractor shall submit a copy of this permit to the Engineer for approval and the project records. The compost shall be tested in
- The compost manufacturer shall be a participating member of in the U.S. Composting Council's Seal of Testing Assurance Program (STA). The Contractor shall provide a participation certificate and test data on a Compost Technical Data Sheet.
- Permanent and temporary erosion control measures shall be provided to minimize erosion and sedimentation (which may transport noxious weed seeds) during and after construction in accordance with the SMWP.

4.5 Monitoring

- CDOT will monitor the Project Area during and after construction to determine the effectiveness of the integrated weed management efforts and to assess whether or not the objectives of the Plan are being met.
- Revegetated areas shall be monitored to make sure noxious weeds are not propagating and revegetation activities are successful according to the standards outlined in the SWMP.
- If establishment of desired vegetation is not progressing in compliance with the SWMP, additional over-seeding or planting may be needed to aid in containing or preventing establishment of noxious weeds.

This Plan's management actions are based on the results of the weed inventory in April 2016. This Plan can be amended if new noxious weed species are found in the Project Area. The prescriptions should be adapted to the dynamics of the physical and ecological environment and to the amount of success achieved in managing noxious weeds in the Project Area. This Plan will likely need updating as site specific information evolves and as weed inventories are updated to reflect the objectives.

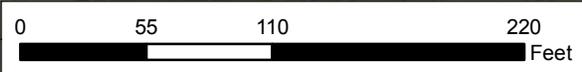
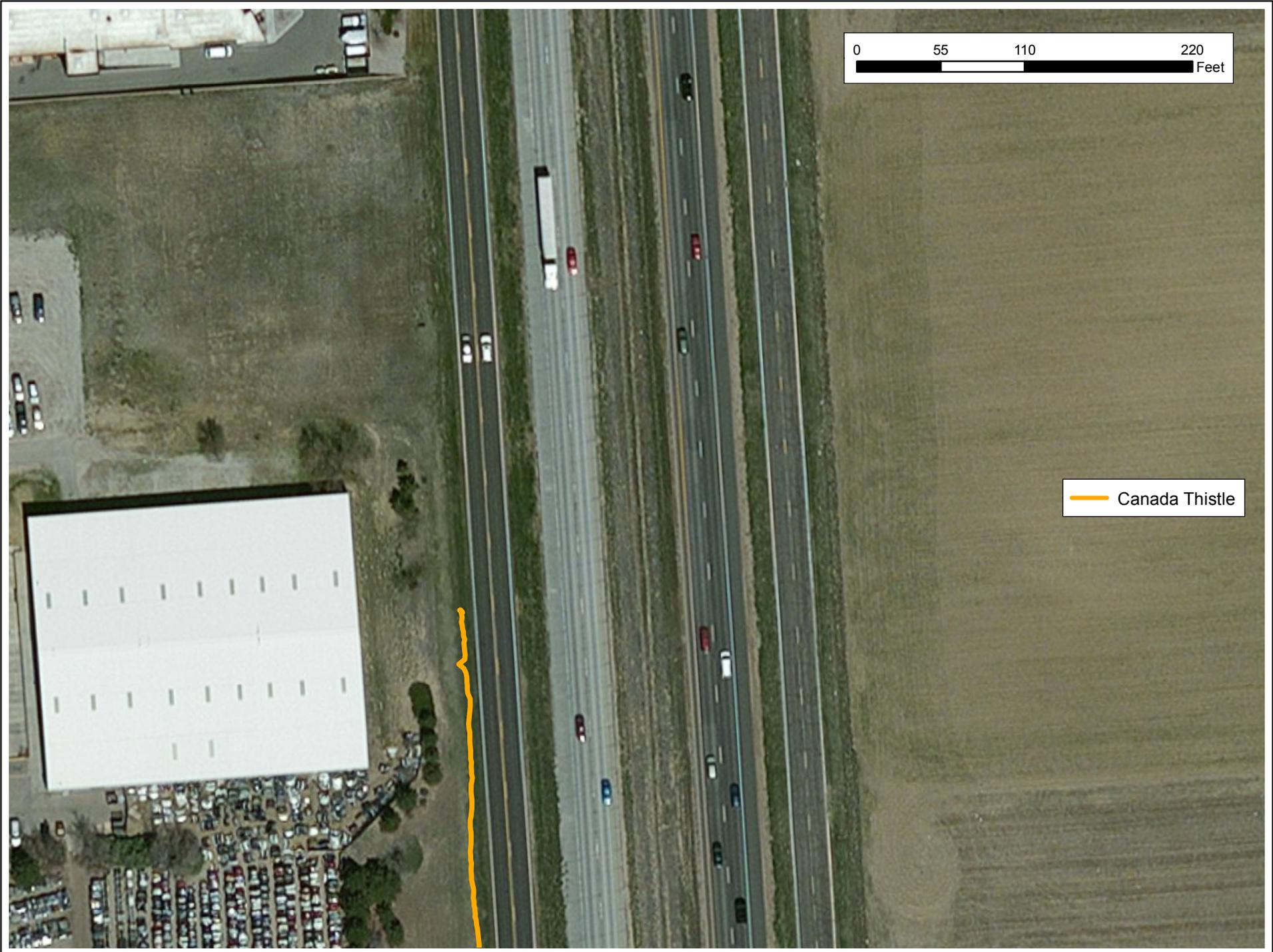
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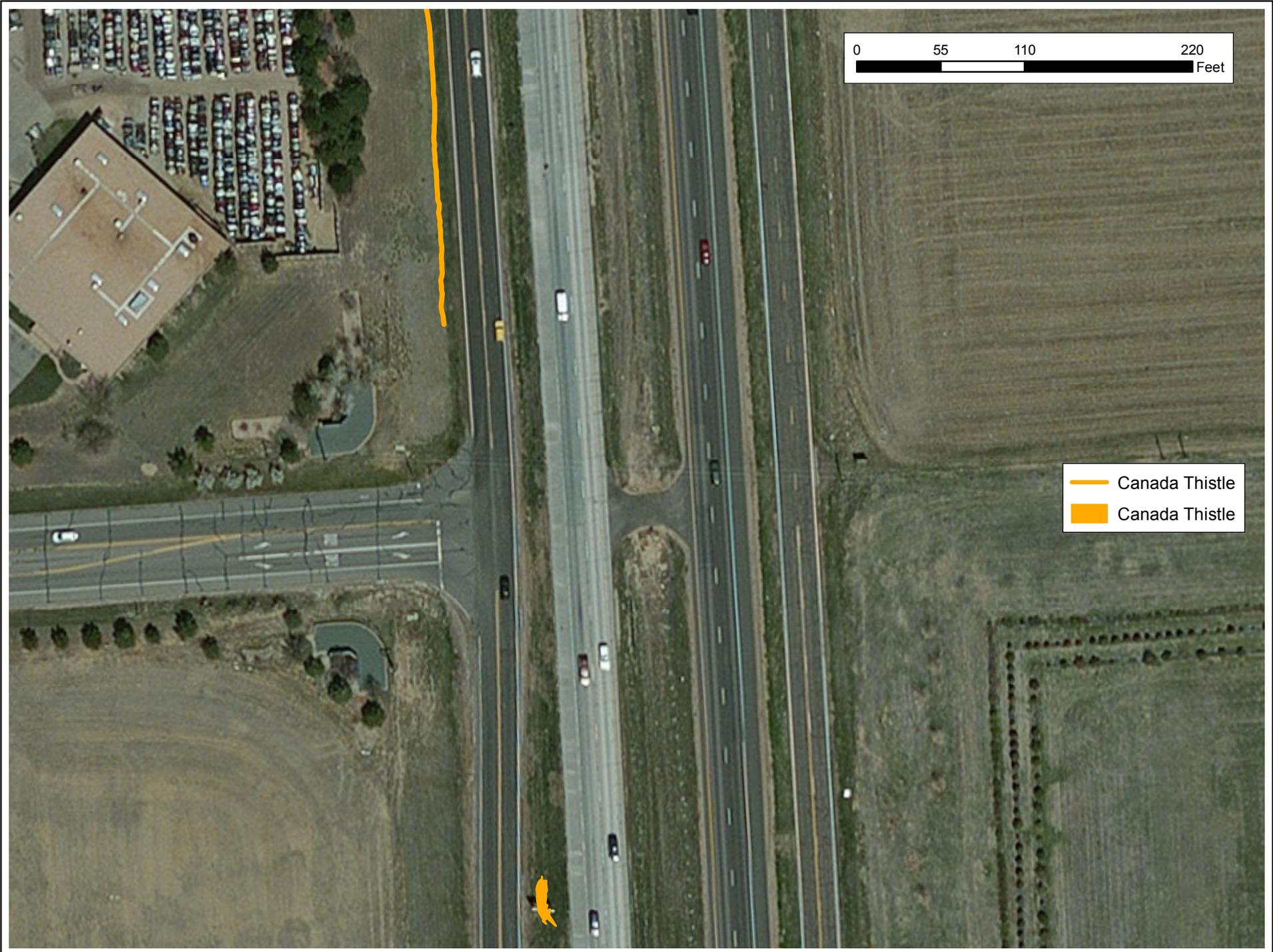
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Appendix A
Noxious Weed Maps

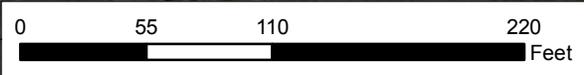
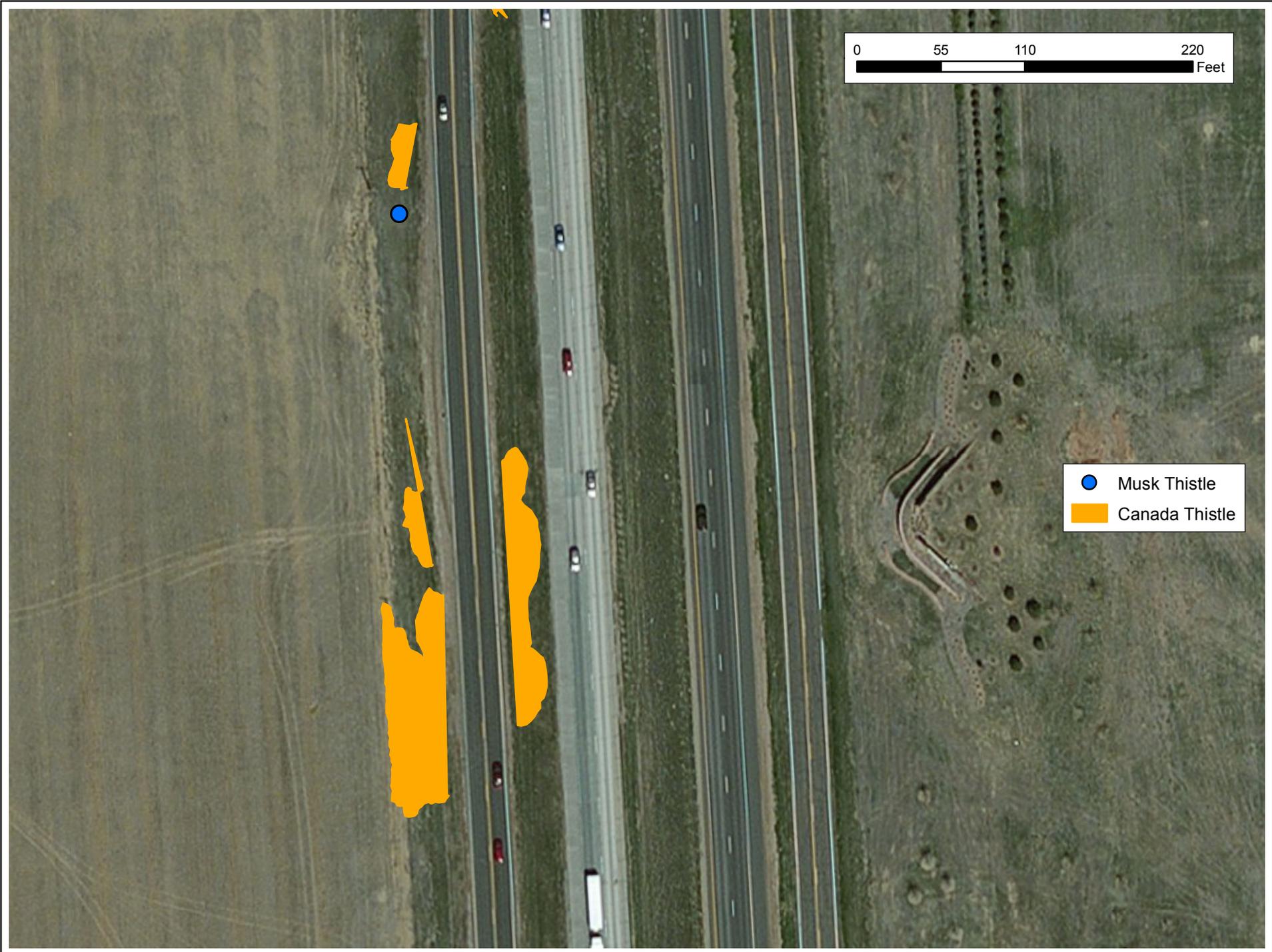


— Canada Thistle

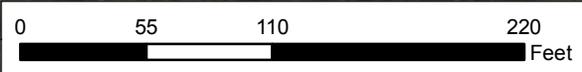
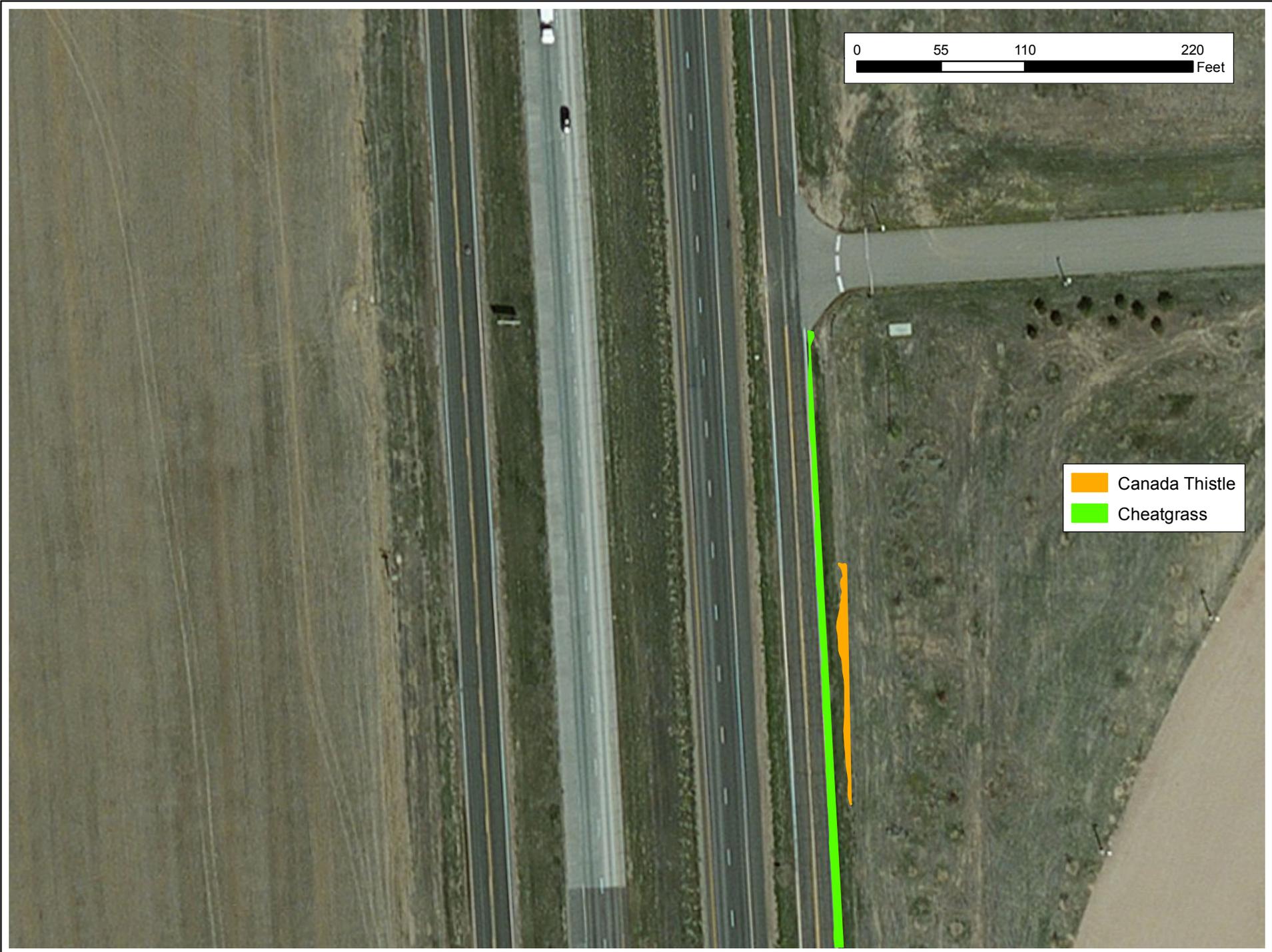


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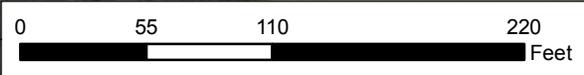
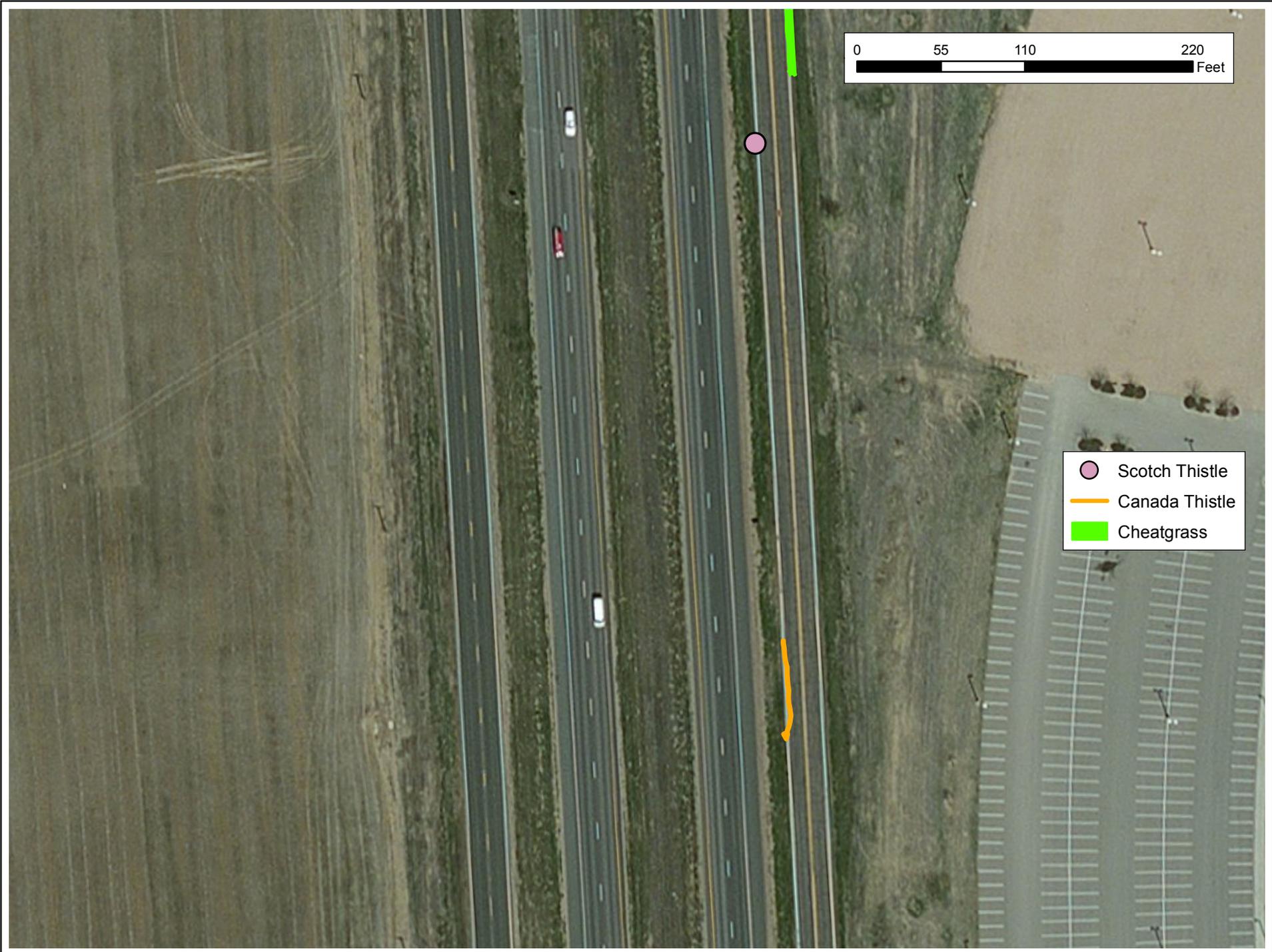
— Canada Thistle
— Canada Thistle



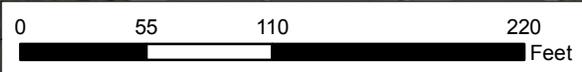
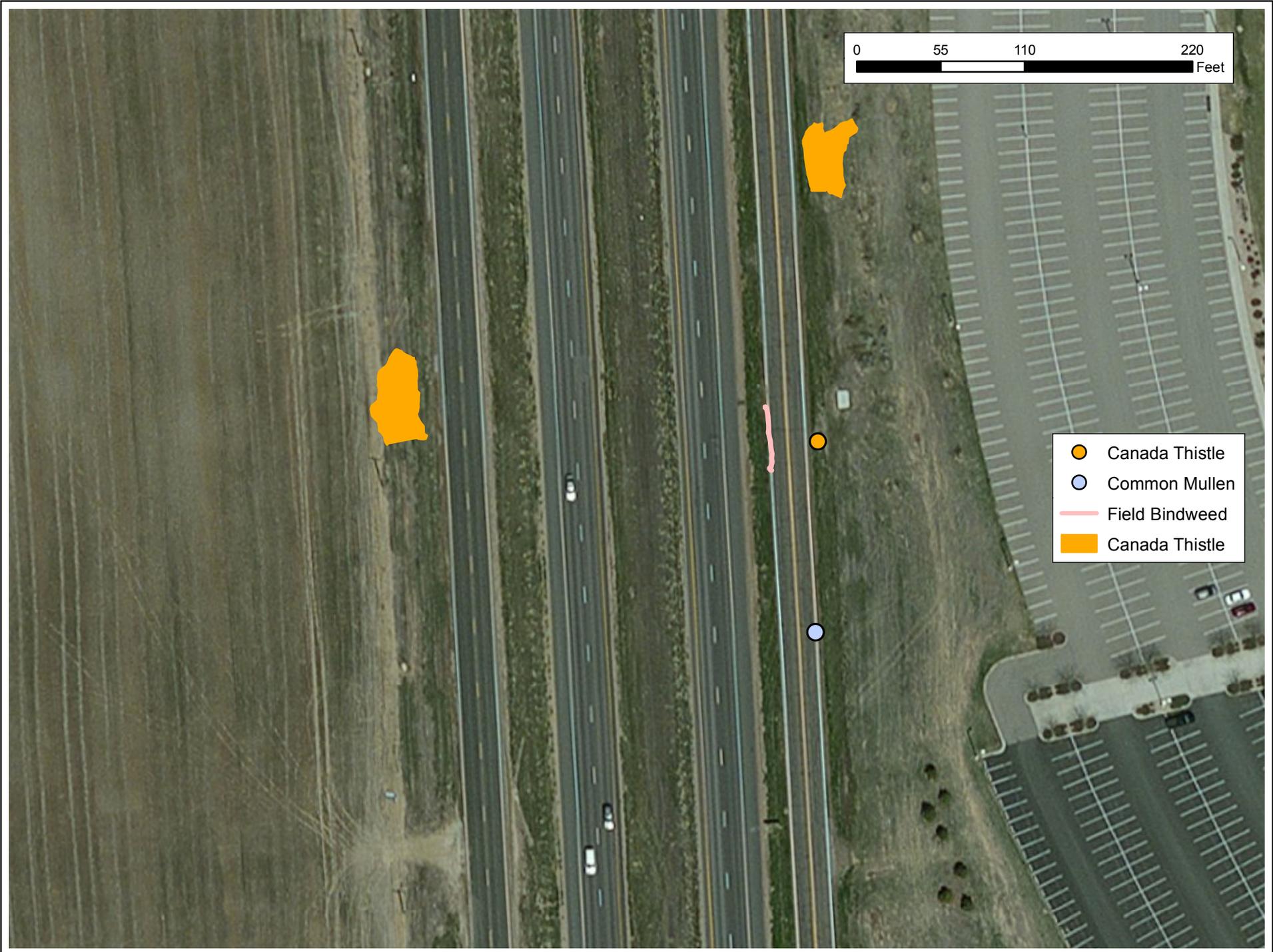
- Musk Thistle
- Canada Thistle



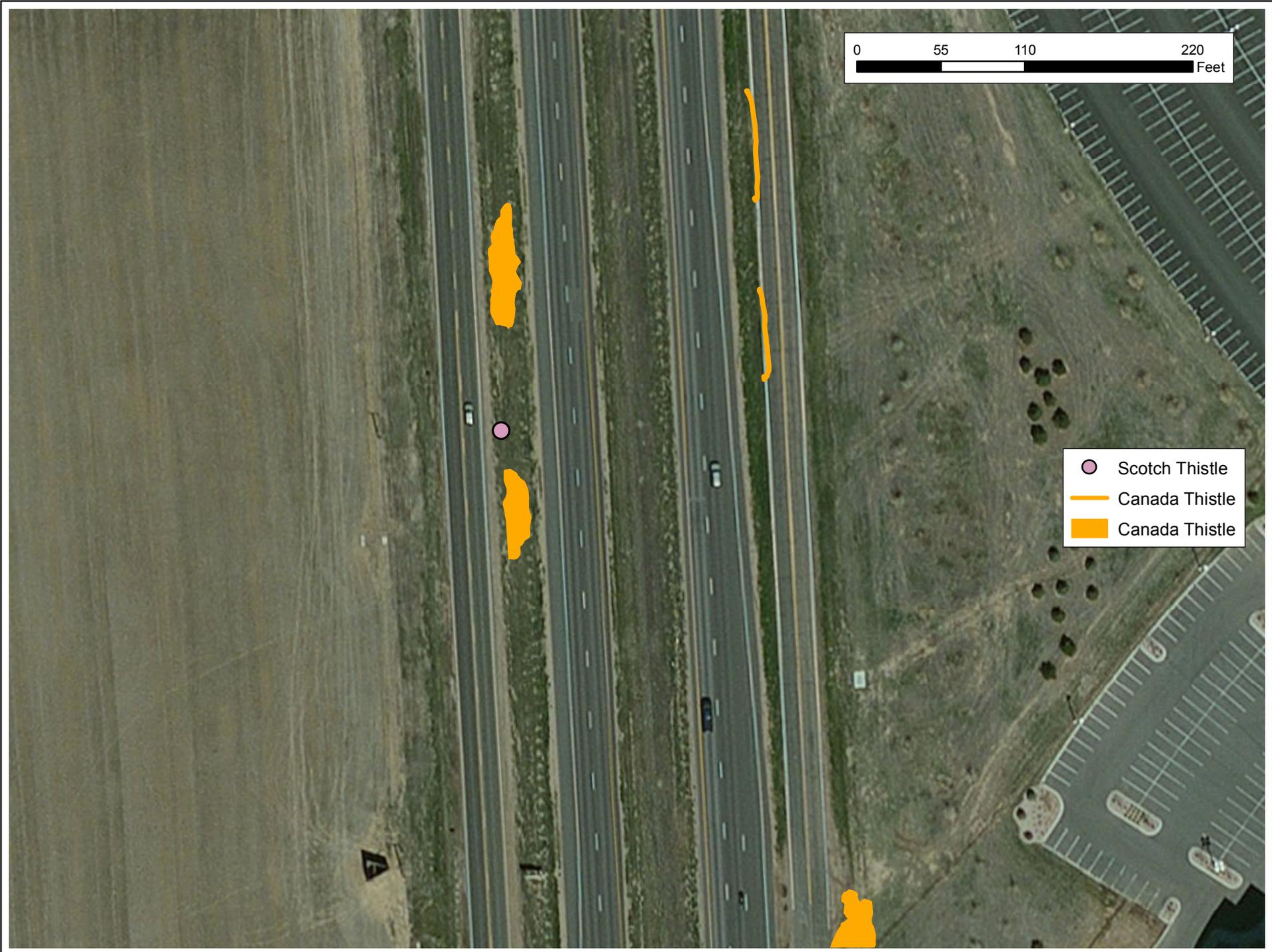
- Canada Thistle
- Cheatgrass



- Scotch Thistle
- Canada Thistle
- Cheatgrass

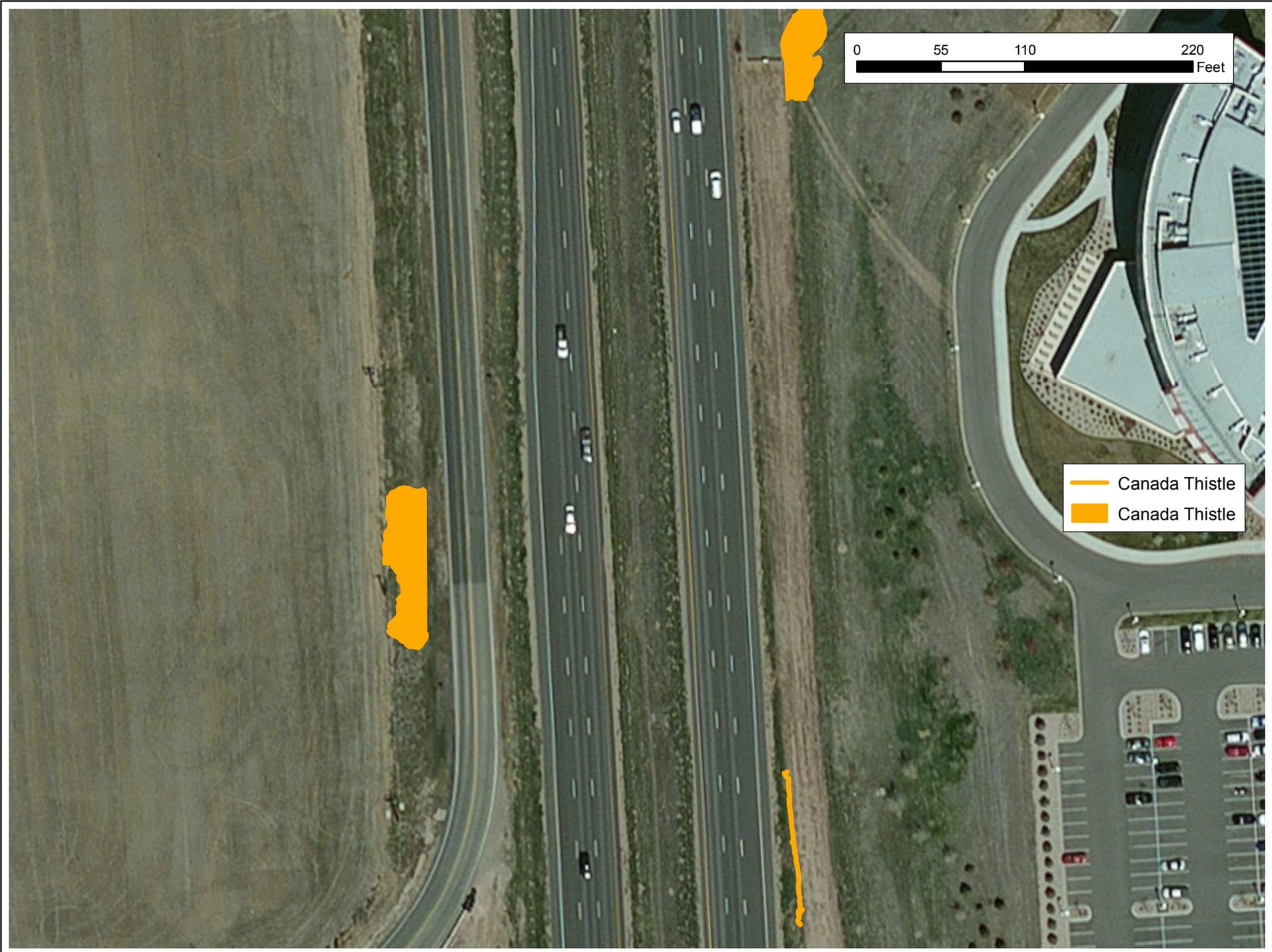


- Canada Thistle
- Common Mullen
- Field Bindweed
- Canada Thistle



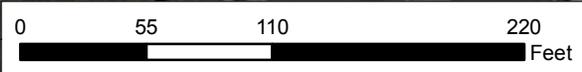
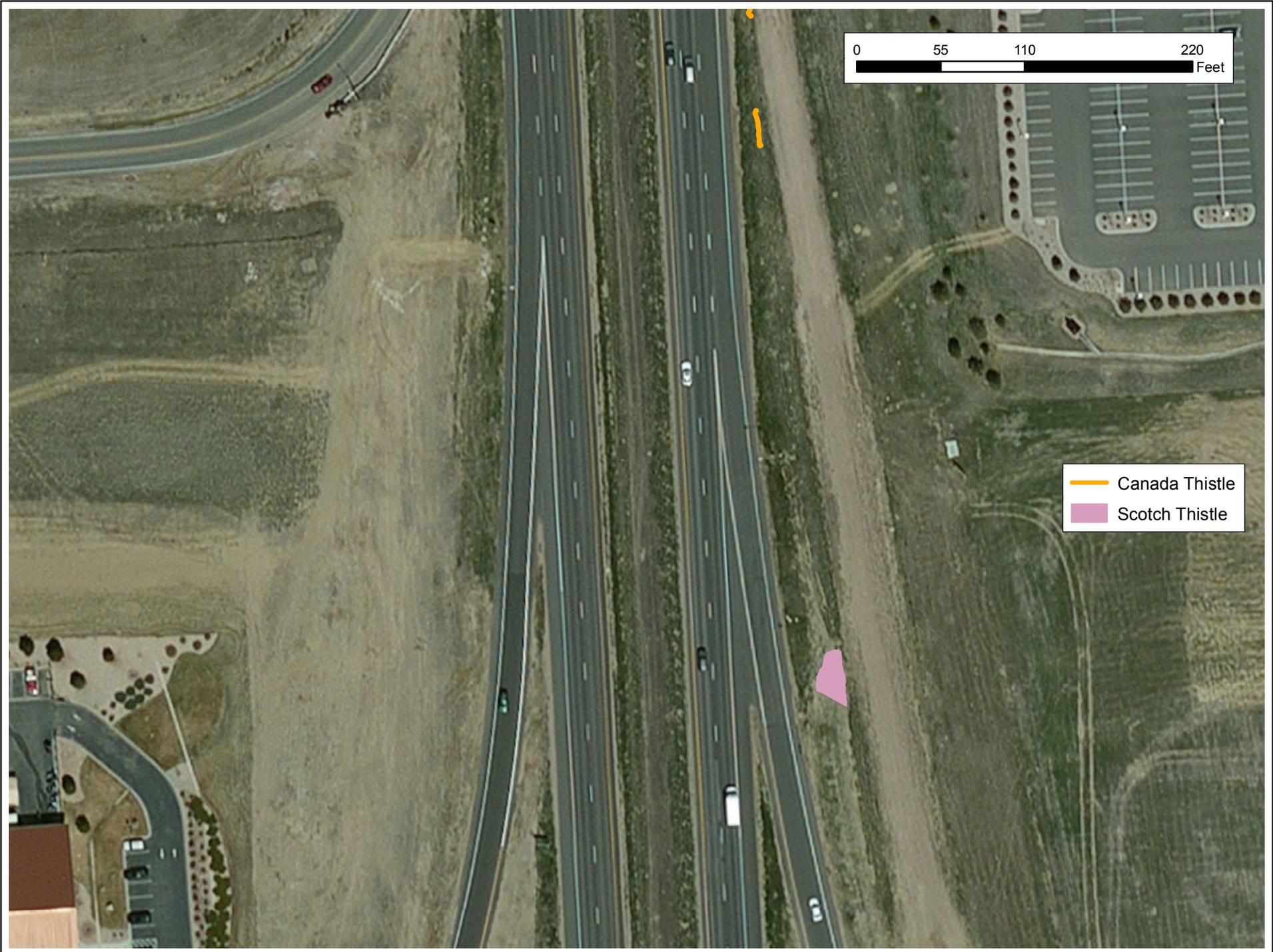
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- Scotch Thistle
- Canada Thistle
- Canada Thistle

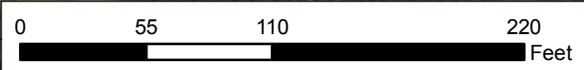
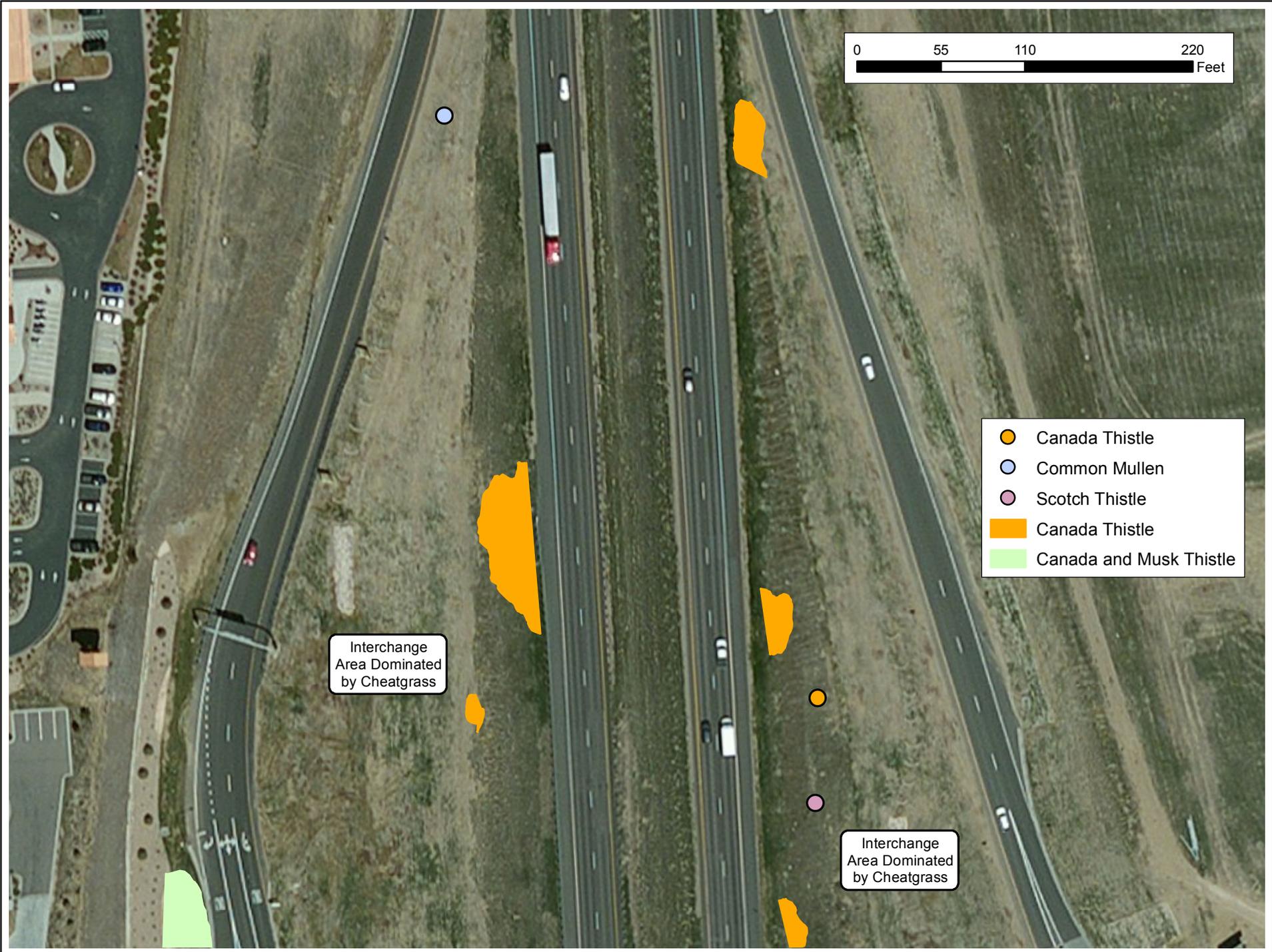


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— Canada Thistle
— Canada Thistle



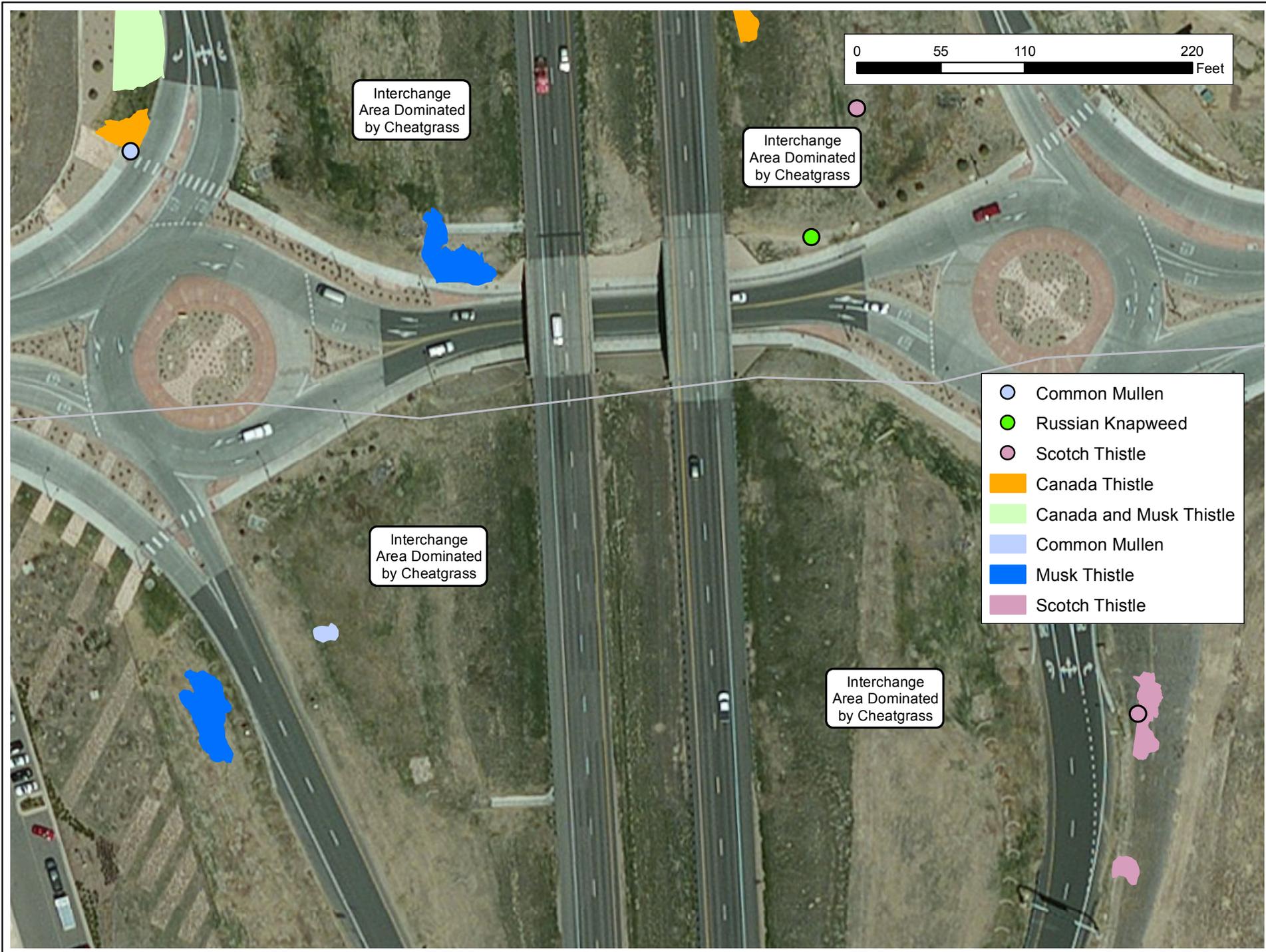
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- Scotch Thistle

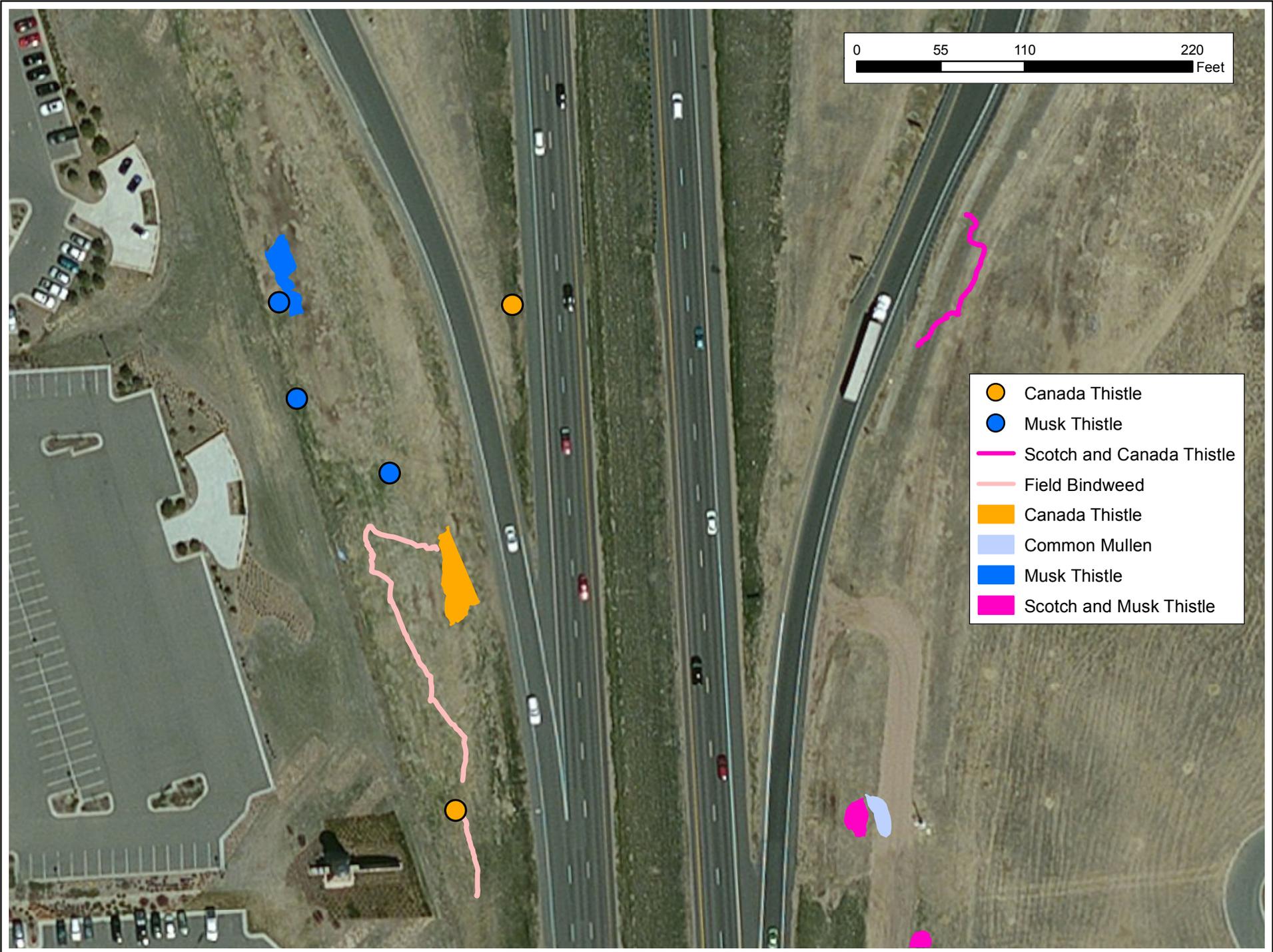


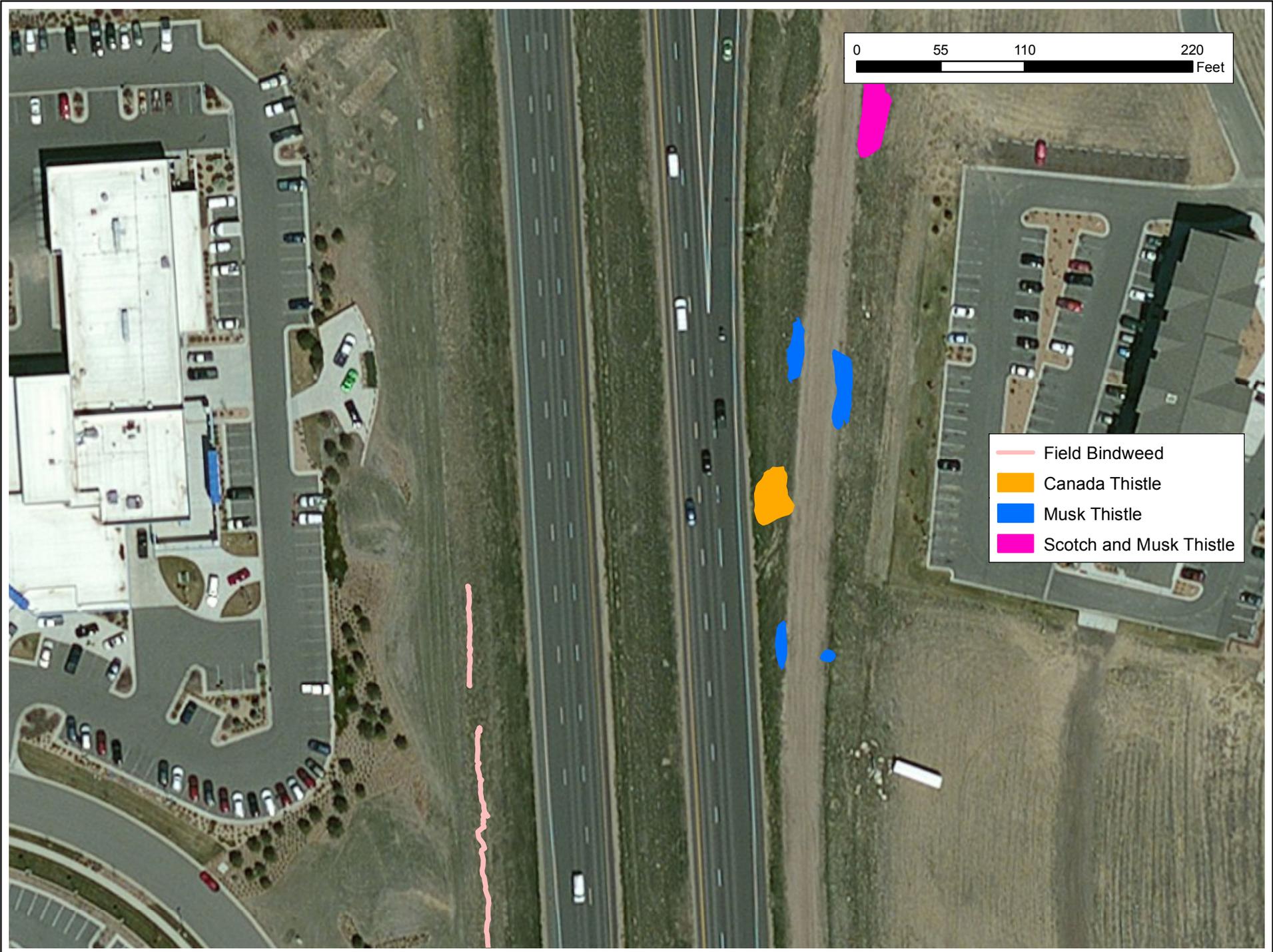
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- Common Mullen
- Scotch Thistle
- Canada Thistle
- Canada and Musk Thistle

Interchange Area Dominated by Cheatgrass

Interchange Area Dominated by Cheatgrass

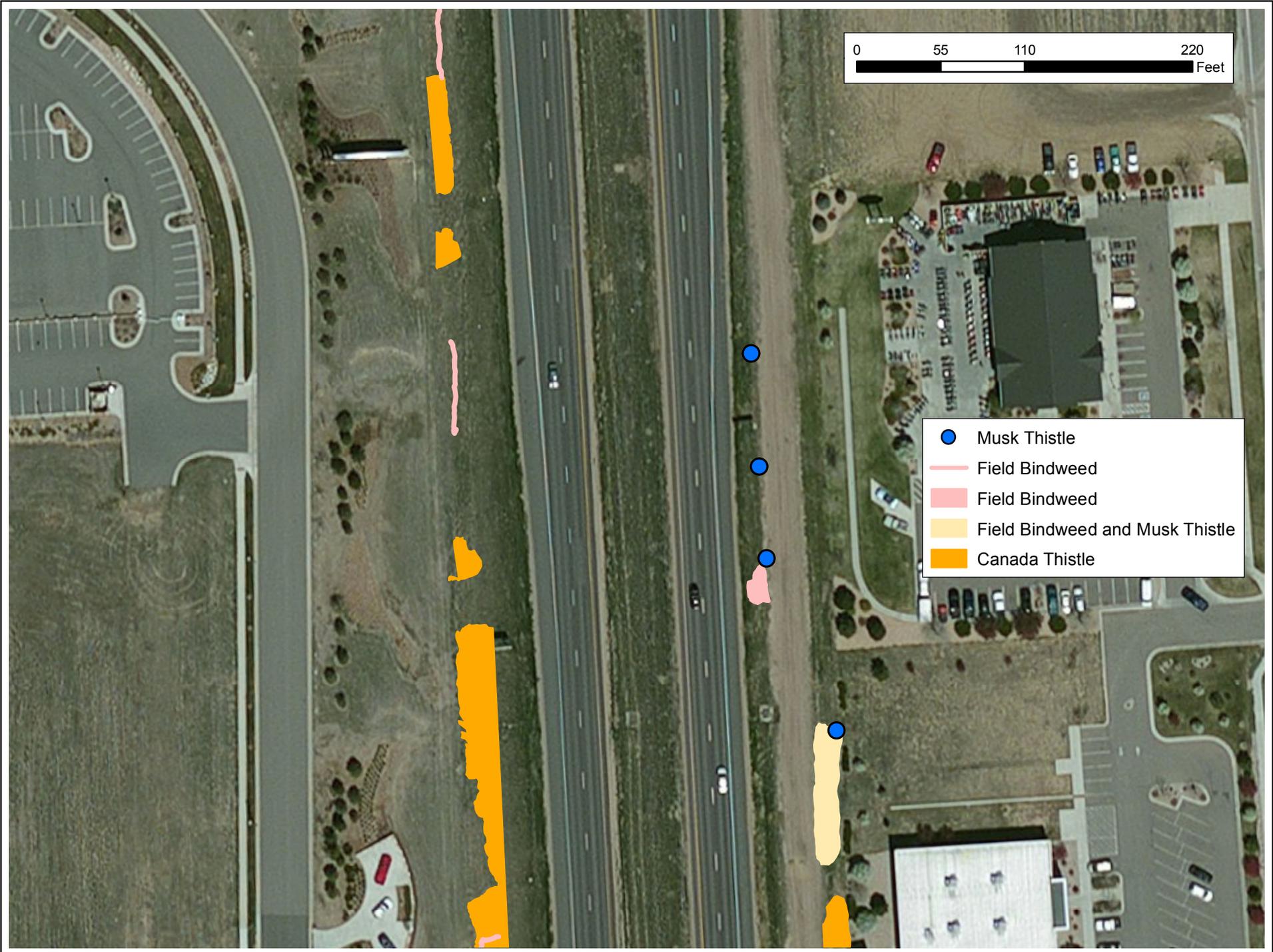


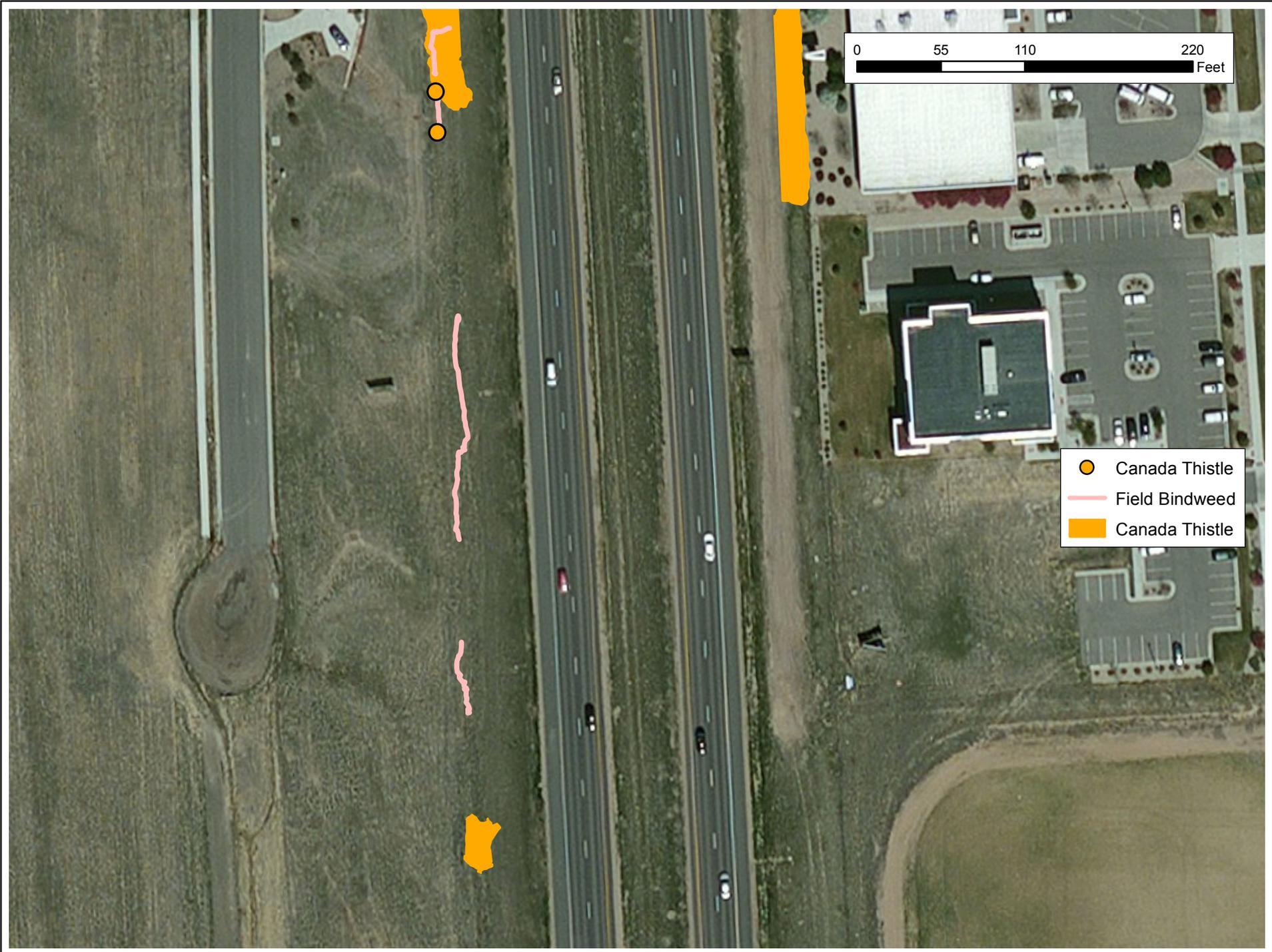




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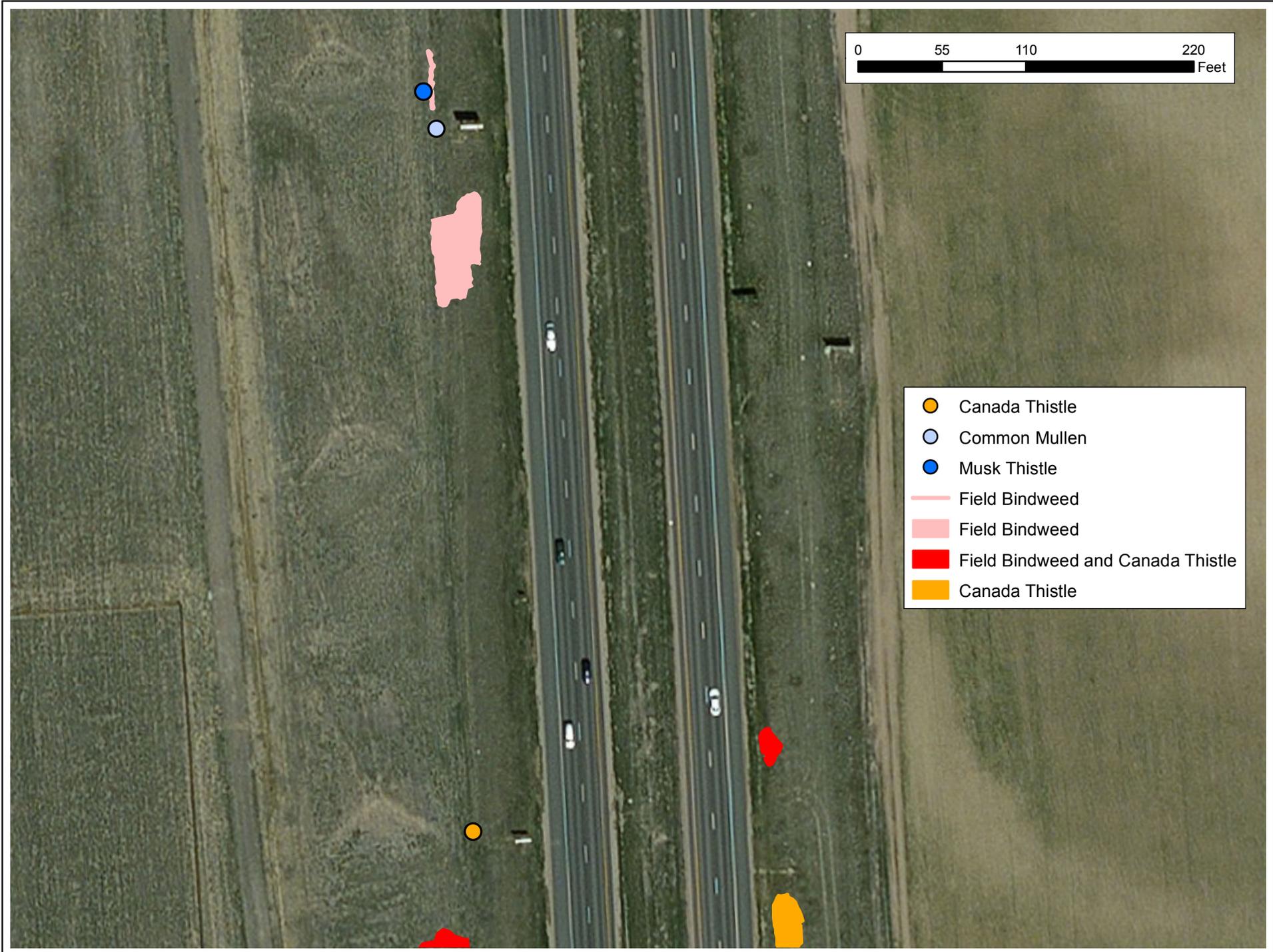
- Field Bindweed
- Canada Thistle
- Musk Thistle
- Scotch and Musk Thistle

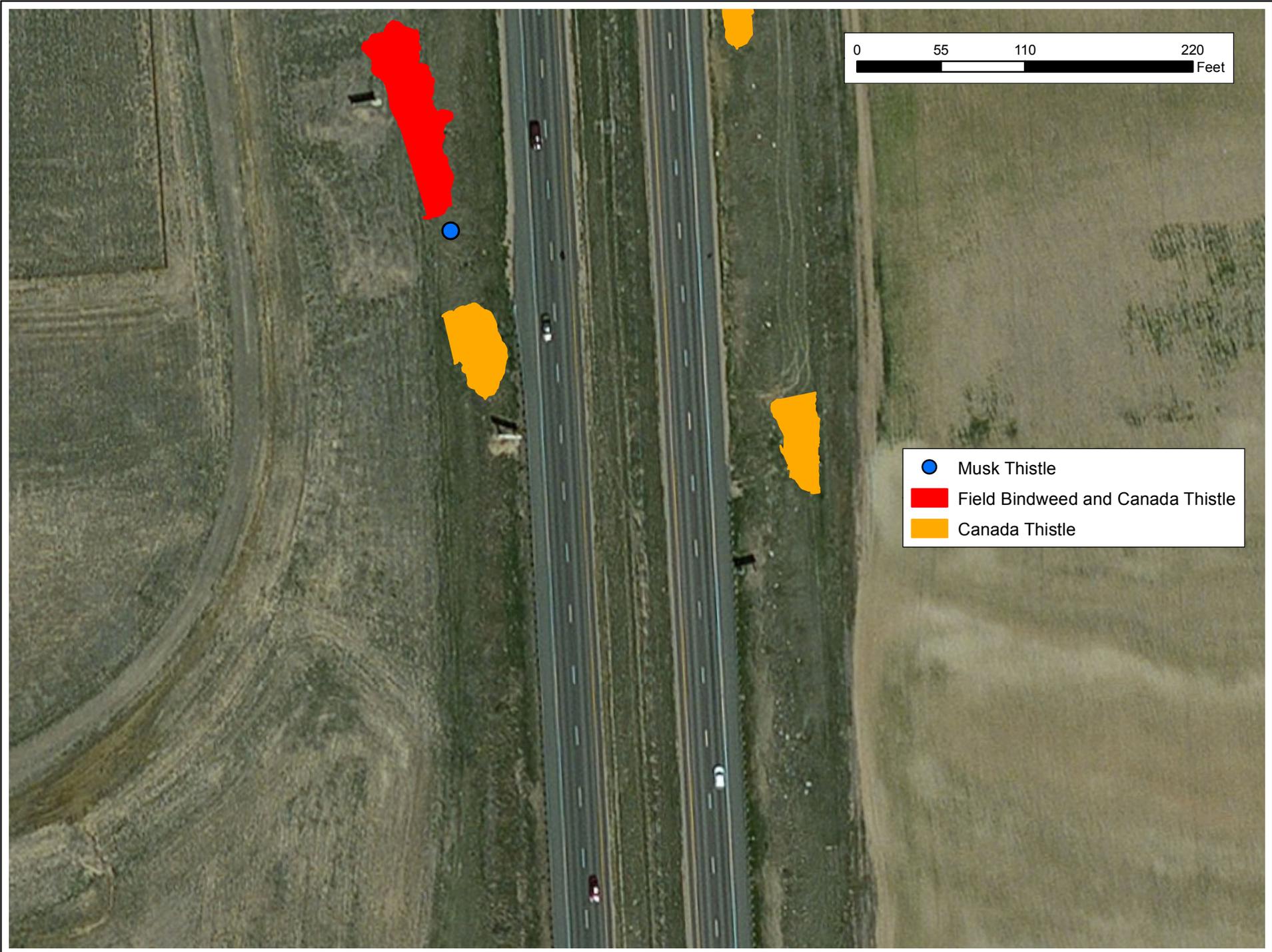




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Feet

- Canada Thistle
- Field Bindweed
- Canada Thistle





Appendix B
Noxious Weed Fact Sheets



its root system, and quickly form dense stands. Each fragmented piece of root, 0.25 inch or larger, is capable of forming new plants. The key to controlling Canada thistle is to eliminate seed production and to reduce the plant's nutrient reserves in its root system through persistent, long-term management.

Canada thistle is one of the most troublesome noxious weeds in the U.S. It can infest diverse land types, ranging from roadsides, ditch banks, riparian zones, meadows, pastures, irrigated cropland, to the most productive dryland cropland. Large infestations significantly reduce crop and cattle forage production and native plant species. It is a host plant to several agricultural pests and diseases. Canada thistle prefers moist soils, but it can be found in a variety of soil types. It has been found at elevations up to 12,000 feet.

Effective Canada thistle control requires a combination of methods. Prevention is the most important strategy. Maintain healthy pastures and rangelands, and continually monitor your property for new infestations. Established plants need to be continually stressed. Management options become limited once plants begin to produce seeds. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Canada thistle (*Cirsium arvense*) is a non-native, deep-rooted perennial that spreads by seeds and aggressive creeping, horizontal roots called rhizomes. Canada thistle can grow 2 to 4 feet in height. The leaves are oblong, spiny, bright green, and slightly hairy on the undersurface. Unlike other noxious biennial thistles which have a solitary flower at the end of each stem, Canada thistle flowers occur in small clusters of 1 to 5 flowers. They are about 1 cm in diameter, tubular shaped, and vary from white to purple in color.

Canada thistle emerges from its root system from late April through May. It flowers in late spring and throughout the summer. It produces about 1,000 to 1,500 seeds per plant that can be wind dispersed. Seeds survive in the soil for up to 20 years. Additionally, Canada thistle reproduces vegetatively through



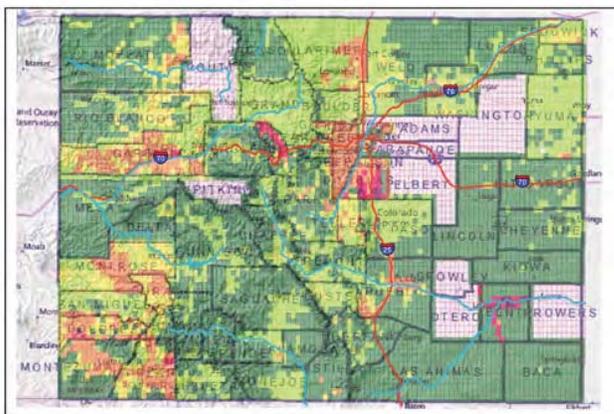
Canada thistle
Cirsium arvense

2013 Quarter Quad Survey

Canada Thistle
Cirsium arvense

2013 Quarterquad Survey
Distribution and Abundance
in Colorado

129,572+ Infested Acres



Distribution Legend: 0 acres 1-10 acres 11-50 acres 51-300 acres 301-999 acres >1000 acres Not Reported
Acreage estimates supplied by County Weed Coordinators and compiled by the Colorado Department of Agriculture.

Canada thistle is designated as a “List B” species as described in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, (303) 869-9030.

Key ID Points

1. Cluster of 1-5 white to purple flowers on a stem.
2. Floral bracts are spineless.
3. Small flowers that are 1 cm in diameter.
4. Perennial, rhizomatous plant with spiny, oblong, green leaves.

Integrated Weed Management Recommendations

Integrated weed management is imperative for effective Canada thistle control. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores, and eventually die. Mowing or grazing can be followed up with herbicide application. Avoid hand-pulling and tilling which can stimulate the growth of new plants.



CULTURAL

Prevention is the best control strategy. Maintain healthy pastures, riparian areas, and rangelands. Prevent bare ground caused by overgrazing, and continually monitor your property for new infestations. Establishment of select grasses can be an effective control.

BIOLOGICAL

Cattle, goats, and sheep will graze on Canada thistle when plants are young and succulent in the spring. Follow up grazing with a fall herbicide application. Insects are available, and provide limited control. Currently, collection and distribution methods for Canada thistle rust (*Puccinia punctiformis*) are being refined. For more information on Canada thistle biocontrol, contact the Colorado Department of Agriculture - Palisade Insectary at (970) 464-7916.

MECHANICAL

Due to Canada thistle's extensive root system, hand-pulling and tilling create root fragments and stimulate the growth of new plants. Mowing can be effective if done every 10 to 21 days throughout the growing season. Combining mowing with herbicides will further enhance Canada thistle control.

CHEMICAL

The table below includes recommendations for herbicides that can be applied to rangeland and some pastures. Treatments may be necessary for an additional 1 to 3 years because of root nutrient stores. Always read, understand, and follow the label directions.

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid (Milestone)	5-7 oz/acre or 1 teaspoon/gal water	Apply in spring until flowering and/or to fall regrowth. Add 0.25% v/v non-ionic surfactant (equivalent to 0.32oz/gal water or 1 qt/100 gal water). Can also add chlorsulfuron (Telar) at 1 oz/acre to the mix.
Aminoclopyrachlor + chlorsulfuron (Perspective)	5.5 oz product/acre + 0.25% v/v non-ionic surfactant	Apply in spring from rosette to flower bud stage and/or fall regrowth. Important: Applications greater than 5.5 oz product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not permitted for use in the San Luis Valley.
Clopyralid + triclopyr (Prescott; others)	3 pints product/acre or 1.25 oz/gal water	Apply in spring until flowering and/or fall regrowth. Add 0.25% v/v non-ionic surfactant.

Canada thistle

Cirsium arvense

Common mullein

Colorado Department of
Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us



Key ID Points

Identification and Management



Identification and Impacts

Common mullein (*Verbascum thapsus*) is a biennial forb native to Europe and Asia. The first year of the plant it produces a basal rosette. Basal rosettes can grow to 30 inches in diameter. The leaves are light-green in color and are covered in fine soft hairs. The woolly leaves are alternate and overlapping each other and can grow over a foot long. In spring of the second year the plant bolts an erect stem, that grows 2 to 6 feet tall. The flowers of the plant are borne in terminal spikes. These terminal spikes may reach up to 20 inches in length. The flowers are sulfur-yellow in color and have five petals. The flowers range from 3/4 of an inch to 1 1/2 inches in diameter. Numerous two chambered fruits produce 100,000 to 250,000 seeds per plant. Flowering and seed production typical occur from June to August. The plant has a deep taproot along with a fibrous root system.

Habitats for Common mullein are roadsides, waste places, right-of-ways, pastures, hay fields, and abandoned lands. It prefers gravelly soil types, but can grow in other soil types. Livestock will avoid eating

Common mullein, due to the hairy leaves of the plants. The plants were originally introduced as a medicinal plant. The Europeans used the flowers for tea, and the leaves for many remedies like burns and rashes. Both the Europeans and the Indians smoked the dried leaves to treat bronchitis.

The key to effective control of Common mullein is preventing the production of seeds. This plant is difficult to control due to the large amount of seed produced and seed bank left in the soil. Mechanical, cultural, biological and chemical treatments can be successful if utilized together in an integrated weed management plan. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Common mullein is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © All Photos from Kelly Uhing, Department of Agriculture; Except Bottom left Mary Ellen (Mel) Harte, United States

Verbascum thapsus

**CULTURAL**

Cultural control can be effective in assistance with other treatment options. Once the parent plants have been removed, cultivating the area with desirable grasses and forbs may outcompete Common mullein seedlings. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

**BIOLOGICAL**

Gymnetron tetrum, a seed eating weevil, biological control has been found in eastern Washington State and is currently working on populations there. The weevil has not yet been approved for use in Colorado. Contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

**MECHANICAL**

Hand pull or dig when soil is moist, prior to flowering and seed production can be effective. If flowers are present, bag specimens carefully so as not to scatter any potential seeds. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment and the seed production of Common mullein is key to controlling populations. If the population is established, using a combination of cultural, chemical, biological and mechanical treatments can aid in suppressing population size. Since plants produce thousands of seed treatments need to occur over an extended period of time.

Common mullein

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Chlorsulfuron (Telar XP)	1-3 oz/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
2,4-D Picloram (Grazon P+D *this is a Restricted Use Pesticide*)	4 pts/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT apply near trees/shrubs/high water table.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1-2 qts/acre	Apply to rosette stages to early growth stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT Apply near trees/shrubs/high water table.
Metsulfuron (Cimmaron)	1.0 oz/acre	Apply to rosette stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.

Photos © Top to Bottom; Kelly Uhing, Colorado Department of Agriculture; Whitney Cranshaw, Colorado State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture

Downy brome-Cheatgrass

Colorado Department of Agriculture

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(303) 869-9030
weeds@state.co.us

Identification and Management



will over winter as a seedling. In the spring it will bolt and produce seed, using valuable moisture and shading desirable plants. Once Cheatgrass reaches maturity and dries, it becomes a major fire hazard. Large infestations can increase fire frequency in rangelands. Seed viability ranges 2 to 5 years for cheatgrass, increasing the chances of taking over a disturbed site.

Identification and Impacts

The key to effective control of Cheatgrass preventing the establishment of the plant through proper grazing and management techniques. If the plant has become established, using an integrated management approach can prove to be an effective control method. Details on the back of this sheet can help to create a management plan compatible with your site ecology.



Downy brome or Cheatgrass (*Bromus tectorum*) is an annual or winter annual, native to the Mediterranean region. Cheatgrass ranges in height from 2 to 36 inches. Each plant contains multiple stems that are erect in nature. The inflorescences are born and the end of the stems, and are multi-branched. They appear in a slender, dense, and usually drooping manner. At maturity, they appear greenish purple in color. The spikelets are slender, 3/8 to 3/4 of an inch long and are nodding. The awns on the end of the spikelets are usually 3/8 to 5/8 of an inch long. The sheaths of the leaves are flat blades and densely covered in with soft hairs. Cheatgrass reproduces solely by seed. The root system is fibrous and fleshy.

Cheatgrass is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

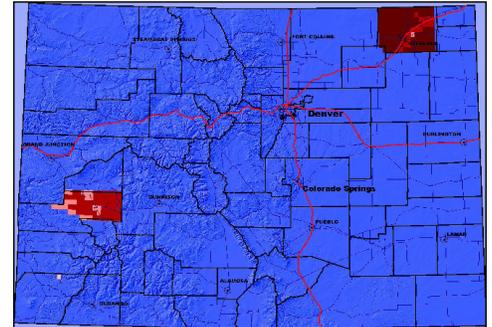


Key ID Points

Habitats for Cheatgrass include; roadsides, waste areas, misused pastures, rangelands, cultivated fields, and eroded sites. When plants are green animals will graze as forage. When the plant dries, the sharp seed can injure grazing animals getting caught in the mouth, nose, and eyes of the animal. It is a competitive grass with native grasses and forbs, because it germinates in the fall and

Bromus tectorum

Downy brome 2002 Quarterly Survey Distribution and Abundance in Colorado 121,024+ infested acres (two counties reporting)



Photos © From Bottom left; (Next 2) Steven Dewey, Utah State University; Richard Old XIV Services Inc.; Chris Evans, River to River CWMA; All Bugwood.org; Map Crystal Andrews, Colorado Department of Agriculture

**CULTURAL**

Preventing the establishment of Cheatgrass by planting desirable grasses and forbs can prove to be an effective control method. Properly maintaining grazing lands will also reduce the risk of infestations. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

**BIOLOGICAL**

Research is currently being conducted on certain molds to be used as a biocontrol. But currently there is not any approved biological control agents approved for the use on Cheatgrass. For more information please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

**MECHANICAL**

Fire, tillage, mowing and grazing have been proven to help reduce plant populations once established. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment of Cheatgrass through proper grazing management techniques proves to be the most effective control method. If infestations are already established using a combination of mechanical and chemical control methods proves to be effective control options, following these treatments with cultural control methods will reduce the size of infestations.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Imazapic	4-10 oz/Acre	Fall application prior to a hard freeze is optimum or during early spring growth. Add non-ionic surfactant 0.32oz/gal water or 1qt./100 gal water.
Glyphosate *Non-selective herbicide*	4-5 qts/Acre or 4-5 oz/gal water	Apply in fall or early spring. Add non-ionic surfactant 0.32oz/gal water or 1 qt./100 gal water.

Downybrome-Cheatgrass



Field bindweed

Colorado Department of
Agriculture

305 Interlocken Pkwy
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(303) 869-9030
weeds@state.co.us



Key ID Points

1. Leaves are shaped like arrowheads.
2. Flowers are funnel-shaped, white to pink, and have two small bracts one inch below the flower base.

Field bindweed Identification and Management



Identification and Impacts

Field bindweed (*Convolvulus arvensis*) is a non-native deep-rooted perennial that reproduces from seed and creeping, horizontal roots (rhizomes). Field bindweed stems are prostrate (grows low to the ground) and twining, and grow up to 6 feet long. Leaves are distinguishable by their arrowhead shape. The flowers are bell or trumpet-shaped, white to pink in color, and are about 1 inch long. Field bindweed seeds can remain viable in the soil for up to 40 years.

Field bindweed emerges from its root system in the spring. Flowering occurs from June to September and until the first fall frost. The number of seeds produced per plant ranges from 25 to 300 and seed production is variable depending on environmental conditions. Field bindweed is an extremely difficult noxious weed to control because, in part, of its taproot that may go 20 feet deep into the soil, and which repeatedly gives rise to numerous long rhizomes.

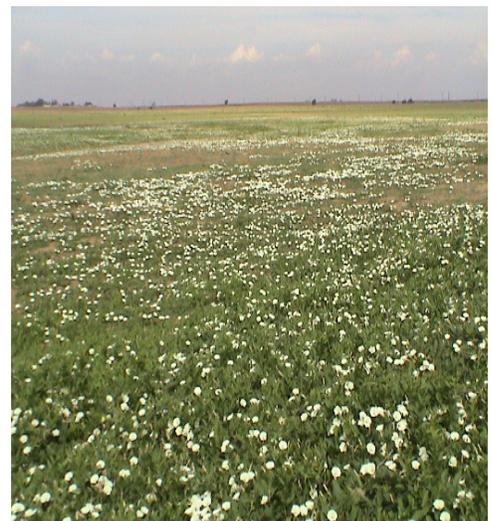
Field bindweed is a problem throughout Colorado. It is one of the most competitive perennial weeds. It is widespread in cultivated areas, pastures, lawns, gardens, roadsides, and waste areas from 4,000 to 8,000

feet in elevation.

To successfully manage field bindweed, containment and persistence in controlling existing stands are necessary in order to exhaust the root system and deplete the soil seed bank. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores and eventually die. Of all control methods, prevention is most important. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. A healthy cover of desirable perennial plants will assist in discouraging field bindweed establishment.

Field bindweed is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species.

On the back of this sheet are field bindweed management recommendations. For more information, visit www.ag.state.co.us/csd/csdhome.html. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



White flower © Mary Ellen Harte, Invasive.org.
All other photos © Kelly Uhing.

Convolvulus arvensis



CULTURAL

Establishment of selected grasses can be an effective cultural control of field bindweed. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for **weed invasions**.



Bindweed mite damage

BIOLOGICAL

The bindweed gall mite, *Aceria mahlerbae*, has proven to be effective in reducing field bindweed infestations. This is an option for large infestations. To obtain a mite release, contact the Colorado Department of Agriculture, 970-464-7916.



MECHANICAL

Cutting, mowing, or pulling has a negligible effect unless the plants are cut below the surface in the early seedling stage. Well-established populations have a large seed bank in the soil that can remain viable for over 40 years.

Integrated Weed Management:

Field bindweed requires active management once it is established because of its potential to regenerate rapidly. Even small infestations should be viewed as a serious threat and managed aggressively.

Contain and persistently control infestations in order to exhaust the root system and deplete the soil seed bank.

Maintain a healthy cover of perennial plants to discourage field bindweed establishment.

HERBICIDES: The following are recommendations for herbicides that can be applied to range and pasturelands. *Rates are approximate and based on equipment with an output of 30 gallons per acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!*

HERBICIDE	RATE	APPLICATION TIMING
Clarity + 2,4-D Amine	1 qt./acre or 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/shrubs or where soils have rapid permeability. DO NOT apply when outside temperatures will exceed 85 degrees. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Tordon 22K *this is a Restricted Use Pesticide*	1 qt./acre or 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/shrubs or where soils have rapid permeability. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Roundup Ultra *non-selective herbicide, will kill all vegetation*	4 - 5 qts./acre or 4 - 5 oz/gal water	Apply at full-bloom and/or fall. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water. Use caution when applying near grasses or other desirable vegetation.

Field bindweed



Musk thistle

Colorado Department of
Agriculture

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(303) 869-9030
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Key ID Points

1. Broad, spine-tipped bracts located under the flower
2. Flowering heads are terminal, solitary, and usually nodding
3. Grows up to 6 feet tall

Musk thistle Identification and Management



Identification and Impacts

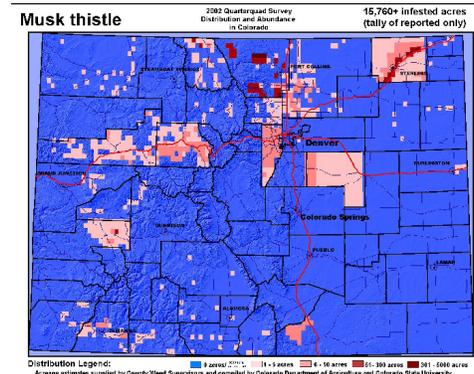
Musk thistle (*Carduus nutans*) is a non-native biennial forb that reproduces solely by seed. A biennial is a plant that completes its lifecycle within two years. During the first year of growth, musk thistle appears as a rosette in spring or fall. During the second year in mid to late spring, the stem bolts, flowers, sets seed, and the plant dies. Musk thistle produces many flower heads. The terminal, or tallest, shoots flower first, then lateral shoots develop in leaf axils. A robust plant may produce 100 or more flowering heads. A prolific seed producer, musk thistle can produce up to 20,000 seeds per plant, only one-third being viable. Because musk thistle reproduces solely from seed, the key for successful management is to prevent seed production.

Musk thistle can grow up to 6 feet tall. The leaves are spiny, waxy, and dark green in color with a light green midrib. The flowers are purple, large in size (1.5 to 3 inches in diameter), nodding, and terminal. The flowers are surrounded by numerous, lance-shaped, spine-tipped bracts. You can expect to see flowers from late May and June. Seed set usually occurs in June or July and effective management options will then become limited.

Habitats for Musk thistle include disturbed, overgrazed areas. Once a pasture is infested, the livestock carrying capacity for that area is significantly decreased. The plant may also occur on rangeland, roadsides, ditches, riparian areas, and trails.

The key to effective control of Musk thistle is to prevent the plant's seed production. Planting desirable grasses and forbs to out compete Musk thistle can also be effective. Dense Musk thistle stands can be treated by spot treatments of herbicides and by a persistent mechanical program. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Musk thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © Kelly Uhing, Colorado Department of Agriculture; map above by Crystal Andrews, Colorado Department of Agriculture.

Carduus nutans

**CULTURAL**

Establishment of selected grasses can be an effective cultural control of Musk thistle. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for weed invasions.

**BIOLOGICAL**

Livestock tend to avoid grazing on musk thistle, although horses and cattle have been known to eat the flowerheads. Biological control insects, such as the seed head weevil and the crown weevil are effective on large infestations. When used together, these insects provide fair to good control. Contact the Insectary, Colorado Department of Agriculture to get complete information at 970-464-7916. Or visit www.colorado.gov/ag/csd.

**MECHANICAL**

Any mechanical or physical method that severs the root below the soil surface will kill Musk thistle. Mowing or chopping is most effective when Musk thistle plants are at full-bloom. Be sure to properly dispose of the flowering cut plants since seeds can mature and become viable after the plant has been cut down.

Integrated Weed Management:

The key to managing Musk thistle is to prevent seed production. Dense Musk thistle stands can be treated by spot use of herbicides and by a persistent mechanical program. Due to the long seed viability of musk thistle, up to 10 years, control methods may have to be repeated for many years to completely eliminate an infestation.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

HERBICIDE	RATE	APPLICATION TIMING
Picloram (Tordon 22K - *Restricted use chemical*)	1 pint/acre + 0.25% v/v non-ionic surfactant	Apply in spring to rosettes.
Aminopyralid (Milestone)	5 fl. oz./acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes.
Metsulfuron (Escort XP)	1 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring from rosette through very early flower growth stages. (Can prevent viable seed formation if applied no later than the first viable flowers begin to open.)
Chlorsulfuron (Telar)	1 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring from rosette through very early flower growth stages. (Can prevent viable seed formation if applied no later than the first viable flowers begin to open.)

Musk thistle





that can grow to become independent plants. Once rosettes emerge in the spring, remaining root buds slough-off until they develop again in late summer. Additionally, root fragments can develop into new plants.

Russian knapweed is allelopathic, which means it contains a toxic substance that inhibits the growth of competing plants. This weed may also be toxic to horses resulting in serious injury or possibly death of the animal. Russian knapweed displaces native vegetation and reduces forage values on range and pasturelands.

Habitat for Russian knapweed includes roadsides, ditch banks, riparian zones, pastures, rangeland, saline soils, clear cuts, and cropland. It typically invades degraded areas and sites with full sun.

The most effective method of control for Russian knapweed is to prevent its establishment through proper land management. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. If Russian knapweed is already established, using an integrated weed management approach proves to be effective. Russian knapweed can be managed with herbicides or biocontrol insects, but long-term control must include planting competitive plant species to occupy bare ground once infested by the weed. Details on the back of this sheet can help to create a management plan compatible with your site ecology.



© Steve Dewey USU



Black, scaly root



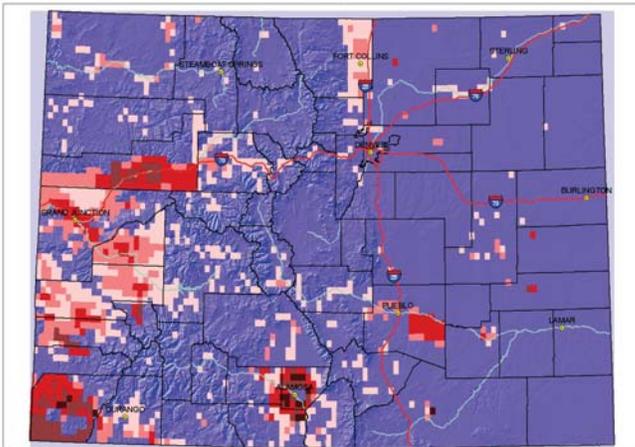
Russian knapweed (*Acroptilon repens*) is a non-native, deep-rooted perennial that spreads by aggressive, creeping, horizontal roots (rhizomes) and seeds. The roots are brown to black with a scaly appearance. Russian knapweed can grow up to 3 feet in height. The stems and leaves are covered with short gray hairs. The flowers are urn-shaped, pink to purple in color, and are solitary at the tips of the upper branches. Russian knapweed can be distinguished from other knapweeds by the smooth, papery, rounded bracts that surround the flowers. Russian knapweed emerges in early spring after soil temperatures remain above freezing. It produces flowers from June to August and sets seed in late summer to early fall. The seeds are viable for two to three years. Russian knapweed reproduces primarily from its root system. Buds on the horizontal roots can form adventitious shoots, August through the winter,

Russian knapweed

Acroptilon repens

2008 Quarter Quad Survey

Russian knapweed
Acroptilon repens
2008 Quarterquad Survey
Distribution and Abundance
in Colorado
132,466+ Infested Acres



Distribution Legend: 0 ACRES/QUAD 1-5 6-50 51-300 301-1000 1001-5000
Acreage estimates supplied by county weed supervisors and compiled by the Colorado Department of Agriculture

Russian knapweed is redesignated as a “List B” species in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information, visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-869-9030.

Key ID Points

1. Distinguished from other knapweeds by the flower’s smooth, papery bracts.
2. Roots are brown to black with scaly appearance.
3. Rosettes and lower leaves deeply lobed.
4. Upper leaves are smaller, smooth margined, and not lobed.

Integrated Weed Management Recommendations

Russian knapweed

Acroptilon repens

The most effective control for Russian knapweed is to prevent its establishment through proper land management. An integrated weed management approach can be effective when dealing with Russian knapweed. It can be managed with herbicides or insects, but long-term control must include planting competitive plant species to occupy bare ground once infested by the weed.



CULTURAL

Maintain healthy pastures and prevent bare spots caused by overgrazing. Bare ground is prime habitat for weed invasions. Establishing sod-forming grasses or vegetation with dense shade can be an effective cultural control of Russian knapweed. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL

The gall midge, *Jaapiella ivannikovi*, is a fly that lays eggs in the shoot tips of Russian knapweed. It forms galls that reduce flowering, seed production, and stunts the plants' growth. This biocontrol will stress the stand of Russian knapweed but will not likely eliminate it. The Colorado Department of Agriculture - Palisade Insectary, 970-464-7916, is currently establishing this biocontrol. It is not yet available to the public.

MECHANICAL

Mowing several times before the plants bolt stresses Russian knapweed and forces it to use nutrient reserves stored in the root system. However, mowing alone will not eliminate the infestation and it can stimulate shoot sprouting the following year. Mowing combined with a fall herbicide application will enhance control. Tilling and disking can create root fragments that can sprout. However, repeated deep tillage (1 foot) over 3 years can kill much of the root system.

CHEMICAL

The following are recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. Please read label for exact rates. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid (Milestone)	5-7 oz/acre	Apply in the fall when above-ground stems die back and root buds are highly susceptible; can also apply in the bud to senescence stages. Add non-ionic surfactant @ 0.32 oz/gal water or 1 qt/100 gal water.
Aminocyclopyrachlor + chlorsulfuron (Perspective)	4.75 to 8 oz product/A + adjuvant	Apply in the fall when above-ground stems die back and root buds are highly susceptible; can also apply in the bud to senescence stages. Important: Applications greater than 5.5 oz product/A exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1 qt/acre or 1 oz/gal water	Apply in the fall when above-ground stems die back and root buds are highly susceptible; can also apply in spring to bud/early flower stage and/or fall rosette. Add non-ionic surfactant @ 0.32 oz/gal water or 1 qt/100 gal water.



Colorado Department of Agriculture - Conservation Services
 305 Interlocken Parkway
 Broomfield, CO 80021
 (303) 869-9030
www.colorado.gov/ag/weeds



Scotch thistle

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Key ID Points

1. Flower heads cluster 2-5 and are purple to dark red in color.
2. Leaves are alternate, stalkless and hairy underneath.

Scotch thistle Identification and Management



Identification and Impacts

Scotch thistle (*Onopordum acanthium* or *O. tauricum*) is a non-native biennial forb that reproduces solely by seed. A biennial is a plant that completes its lifecycle within two years. During the first year of growth, Scotch thistle appears as a rosette in spring or fall. Rosettes can be 1 to 2 feet in diameter. During the second year in mid to late spring the stem bolts, flowers, sets seed, and the plant dies. A prolific seed producer, Scotch thistle can produce up to 14,000 seeds per plant.

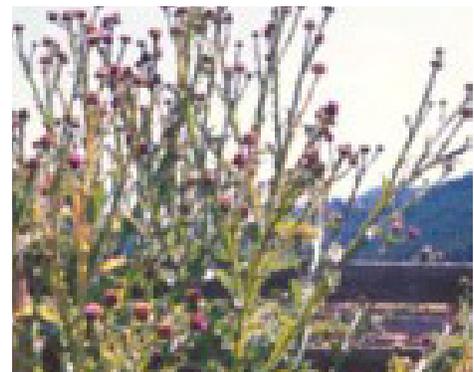
Scotch thistle can grow up to 12 feet tall. Stems are numerous, branched, and have broad, spiny wings. The leaves of species *acanthium* are large, grayish-green, spiny, and covered with fine dense hair giving the leaf a woolly appearance. The leaves of the species *tauricum* are similar in size, but are not hairy, smooth and bright green. On both species, the leaves have a distinct mid-rib. The flowers are violet to reddish in color, numerous (70-100/plant), and are surrounded by spine-tipped bracts. The plants flower from mid-June to September.

Due to the robust, spiny nature of Scotch thistle, this plant can act as a living barbed wire fence, making areas impassible for wildlife, livestock,

and people. Scotch thistle invades rangeland, overgrazed pastures, roadsides, and irrigation ditches. It also prefers high-moist soil areas adjacent to creeks and rivers.

The key to effective control of Scotch thistle is maintaining healthy pastures and rangeland, guarding against disturbance or overuse, and as with most biennials limit seed production. To reduce seed production, plants with buds or flowers should be collected and immediately disposed of or destroyed. Chemical control is most effective when plants are in rosette stage, spring or early fall. Mechanical controls can be used to eliminate small patches or plants in a later growth stage. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Scotch thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © Map above: Crystal Andrews, Colorado Department of Agriculture; All other photos: Kelly Uhing, Colorado Department of Agriculture.

Onopordum acanthium or *O. tauricum*

**CULTURAL**

Establishment of selected grasses can be an effective cultural control of Scotch thistle. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for weed invasions.

**BIOLOGICAL**

Urophora stylata, a fly predator, is used to help control this thistle. The female fly lays eggs in the seed head of the thistle. The maggot then consumes the seed in the flower. This species has overwintered in Colorado but the limited numbers will not allow for general redistribution. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

**MECHANICAL**

Any mechanical or physical method that severs the root below the soil surface will kill Scotch thistle. Mowing or chopping is most effective when Scotch thistle plants are at full-bloom. Be sure to properly dispose of the flowering cut plants since seeds can mature and become viable after the plant has been cut down.

Integrated Weed Management:

Scotch thistle is best controlled in the rosette stage. For small infestations, Scotch thistle can be controlled by severing its taproot 1-2 inches below the ground. Control can be enhanced by a follow-up application of herbicides to the surviving rosettes. It is imperative to prevent seed production. Do not allow Scotch thistle flowers to appear.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Picloram (Tordon 22K - *Restricted Use*)	1 pint/acre + 0.25-0.5% v/v non-ionic surfactant	Apply spring or fall in the rosette stage.
Aminopyralid (Milestone)	7 fl. oz./acre + 0.25-0.5% v/v non-ionic surfactant	Apply spring or fall in the rosette stage.
Metsulfuron (Cimarron X-tra)	2 oz. product/acre 0.25-0.5% v/v non-ionic surfactant	Apply rosette to early bolt stages of growth. (Spring)

Scotch thistle