2013 Anchorage, Alaska Canada thistle report

Department of Natural Resources, Division of Agriculture

Invasive Weeds Program

Heather A.M. Stewart

Summary

Cirsium arvense was first documented in Alaska in 1968 by the late Eric Hultén. It has consistently been identified in the Anchorage, Alaska area by the Alaska Exotic Plant Information Clearinghouse since 2002 (AKEPIC, 2013). However, consistent and quantitative inventory of its extent, changes in growth pattern and density have been documented for only a short period of time. Since 2011, GPS perimeter data have been collected by the Municipality of Anchorage and the Alaska state Division of Agriculture at known *C. arvense* infestation sites in the greater Anchorage area. This report summarizes the work done in 2013 by the Alaska state Division of Agriculture in *C. arvense* management, with emphasis on priority sites and refining objectives for future work.

Introduction and Background

Identification

C. arvense is a perennial plant with deep rhizomes that propagate laterally and can form new shoots. The plant can grow up to 2 meters tall and branch toward the top. Leaves are alternate, lance-shaped, hairless on the top side, and have white hairs underneath and are spiny-toothed. The flowers on *C. arvense* are pink to purple and rarely white with small heads of disk flowers only. The flowers are dioecious; male and female flowers are produced on separate plants and cross pollination is necessary for seed production. The bracts have purple tips and sharply pointed. Seeds are oblong, and flattened in shape and grow up to 4mm long. They are attached to a feathery white pappus for aiding in wind dispersal. In a particular patch of plants, vegetative reproduction from the root system accounts for most of the local growth.

Habitat

C. arvense is native to Eurasia; southeastern Europe, western Asia and northern Africa (Pojar and MacKinnon, 1994). It is commonly found growing along roadsides, lawns, gardens, abandoned fields, pastures, and disturbed areas; mainly agricultural lands. Some natural areas *C. arvense* has invaded include prairies, wet grasslands, and sedge meadows in the central plains area of the lower 48 states and Canada (AKEPIC, 2013). In eastern North America, other areas include swamps, ditches, lakeshores, and stream banks (Nuzzo, 1997).

History in Alaska

C. arvense has been considered a noxious weed in 35 states (USDA Plants database, 2014), and has been declared noxious in the state of Alaska since statehood in 1959 (11 AAC 34.020). In Alaska, *C. arvense* has been documented by Hultén to be growing in Anchorage, Juneau and Haines as early as 1968.

Since 2002, *C. arvense* has been consistently identified in other areas including Ketchikan, Kodiak Island, Kenai Peninsula, Sitka, and Stevens Village just north of Fairbanks (AKEPIC, 2013). Presently, *C. arvense* is predominantly invading urban areas along roadsides with few infestations in natural areas. Figure 1 shows these records since 2002 in the greater Anchorage area (AKEPIC, 2013), highlighting the 2013 field season infestations managed or monitored. In 2012, the Anchorage Cooperative Weed Management Area (CWMA) was the first to manage *C. arvense* with success in Anchorage on Municipality land with a systemic herbicide.

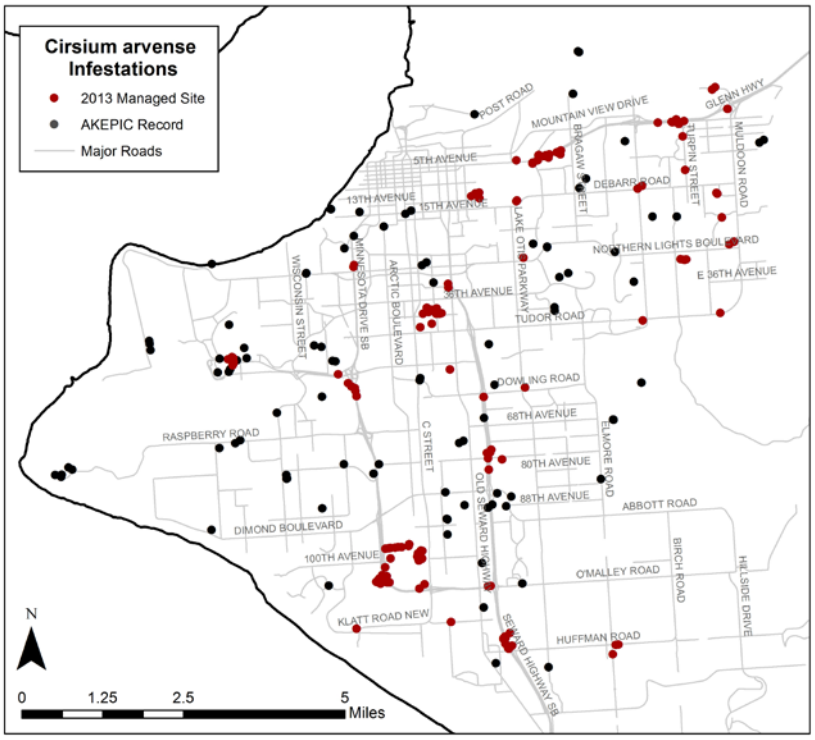

Figure 1. Overview map of Anchorage area with *C. arvense* infestations. Red: managed in 2013. Black: Managed by Municipality or on private property or not found based on record description.

Project Objectives

The *C. arvense* project efforts for the Anchorage area are to:

1. Identify high priority infestations of C. thistle in the Anchorage CWMA boundaries, and begin immediate control work.
2. Using AKEPIC records identify additional areas for management and inventory to fill gaps in these activities.
3. Develop a *C. arvense* management plan for the Anchorage area that identifies the location of priority infestations, how to determine priority, control methods appropriate for *C. arvense*, and an outreach strategy.

Methods

Surveying and Quantification

The Adaptive Cluster Sampling Method modified from Rew and Pokorny (Fig. 2, 2006) was utilized in the 2013 field studies of Canada thistle in the Anchorage area. This method excels at sampling rare populations and relatively new invaders, concentrating sampling efforts on “hotspots” and sampling all areas sampled rather than just locations. The adaptive sampling method prioritizes areas to survey by

focusing on roads, trails, campgrounds, and waterways. Biasing the survey to areas more likely to contain invasive plant species increases sampling efficiency and relevant to this study.

Due to the project sample area being in the Anchorage city limits, where 41% of Alaska's population resides (DOL, 2013) and urbanization is very evident, the Adaptive Cluster sampling method uses areas of human activity as a starting point for surveys. Invasive species are mapped as point features and the radius of the population is recorded. If infestations are large (radius or length greater than 40 m), and irregularly shaped, the perimeter of the infestation is walked and recorded directly as a polygon using a GPS unit. These polygons were used in a GIS to quantify the area (m^2) of the infestation. The distance between surveyors when sampling as area is calibrated in the field with known locations of *C. arvense* to ensure that the sampled area is covered adequately. Sites managed for the 2013 field season were determined by work completed in 2012 and in previous years that have been recorded in the Alaska Natural Heritage Program's AKEPIC database (AKEPIC, 2013).

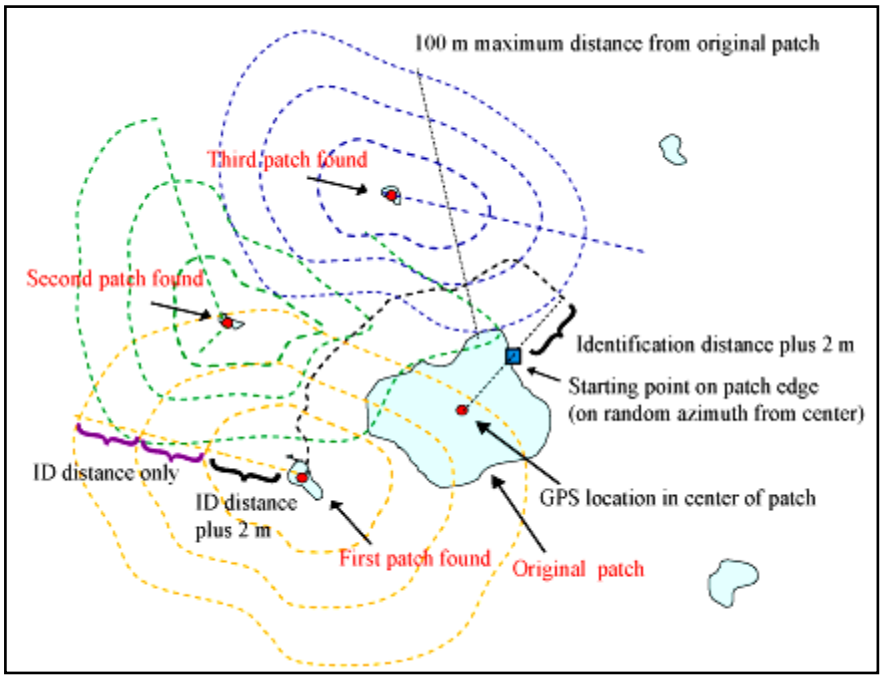

Figure 2. Adaptive Cluster Sampling Method modified from Rew and Pokorny (2006). Hypothetical map shows invasive plant patches (solid light blue areas), their boundaries (slid lines), and adaptive sampling walking paths (dashed lines) used for finding new patches of the same species.

For quantification of each infestation, stem counts were estimated for the entire infestation and recorded in an excel spreadsheet. Other information about the infestation's characteristics were also recorded using the AKEPIC (2013) datasheet. Quadrats of 1m by 1m were also taken at each site larger than 5m in diameter to quantify the density of that particular site. For quantifying the density most representatively, three quadrat measurements were taken; one in a relatively unpopulated area, one in the most populated area and the other in a moderately populated area. These three measurements were averaged out for each site and recorded. To quantify extents of the known infestations, the areas ($meter^2$) of each site were calculated. Other information, such as area overlap percentage, and year-to-year area differences were also calculated to assess changes in Canada thistle growth at each site. For the sake of reporting, calculated results will be reported with an emphasis on 4 priority sites. These sites were determined by size: greater than 50 m in length or diameter; and by location: close proximity to highly trafficked roads and highways.

Outreach

Community education, involvement and reporting are important components to understanding and surveying for invasive noxious weeds. Due to *C. arvense* being somewhat prevalent in the Anchorage area, community awareness allows for the prevention of spread, word-of-mouth responsiveness to newly identified infestations and instruction on how to manage on private property. This awareness was made possible by updated and produced outreach materials for Anchorage citizens. These included a rack card with information on how to identify *C. arvense*, why it is a problem, and contact information if it is found (Fig.3). A sticker with contact information and pictures of *C. arvense* was also produced (Fig. 3). Finally, a bus advertisement was also run between July and September on three city buses that provided public transportation around Anchorage. Before field work took place in the 2013 growing season, these materials, along with the Selected Invasive Plants of Alaska (2009) pocket booklet were distributed to greenhouses, nurseries, and garden centers in the Anchorage area. Selected Home Owner's Associations and Private companies with *C. arvense* on their property were also targeted audiences for discussions on managing their property's infestations. Communications ranging from formal meetings and letters to informal phone calls were conducted to make contact with these key community members. Field work and *C. arvense* management results were also presented at the 2013 Annual Invasive Species Conference in Fairbanks Alaska in November.

Figure 3. Outreach materials produced for dispersal in the Anchorage area.

Management

Several management practices were completed throughout the *C. arvense* growing season in 2013 including mechanical, and hand-digging of plants and rhizomes. Priority sites and large sites (>10 stems) were managed with multiple mechanical treatments throughout the season to prevent seed setting and for stressing the rhizome growth of *C. arvense*. Graglia et al. (2006) and Nuzzo (1997) demonstrate the effectiveness of mechanical and cultural treatment of *C. arvense* when mature leaves (~20 cm) are left on the shoot to prevent accelerated vegetative growth. Small sites (≤10 stems) were hand-dug with a shovel to completely remove the rhizomes. This material was carefully collected, placed in a two-layered

plastic bag and disposed of properly. If seed development was observed at a site, seed heads were clipped from the plant, placed in a two-layered plastic bag and disposed of properly. If seed heads were removed from a priority or large site, a follow-up mechanical treatment was also implemented to augment additional stress.

Previous successful work in Southcentral Alaska to manage *C. arvense* has involved multiple mowing treatments, followed by an application of an appropriate systemic herbicide in late Fall. While this project was prepared for application of a late fall herbicide treatment, excessive rain and low temperatures prevented this application in the 2013 field season.

Inspections were also conducted in nursery and greenhouses as well as garden centers throughout the season in the Anchorage area. Potted plants and ornamental landscaping pots were carefully inspected for *C. arvense* seedlings and rosettes as a result of contaminated potting soils and growing medium. If any *C. arvense* was found, a "Stop of Sale" was enforced on all product species in which the *C. arvense* was found to be growing in. With a project representative present, the entire stock of product was placed in a two-layered plastic bag and disposed of properly on site by facility staff.

Conclusions

Outreach

Approximately 700 rack cards were distributed throughout 2013 to about 12 nurseries and greenhouses, conference attendees, and to the Anchorage Cooperative Weed Management Area (CWMA). About 200 stickers have also been dispersed to these same community educational outreach efforts. The bus advertisement generated 12 reports to the main invasive species contact phone number; three of which were confirmed *C. arvense* sites in the Anchorage area after following up with the public reporter. The largest of the sites reported was behind an Anchorage firehouse along Jewel Lake Rd., and had approximately 500+ stems, and was covering 205 m^2. Although most reports were not the target *C. arvense* species, the follow-up contacts were a great way to interact with the public, provide more education on invasive species in the Anchorage area, establish a productive working relationship between resident "field staff" and project coordinators, and emphasize the agency's appreciation for community reporting.

Total Management

AKEPIC reports 304 separate *C. arvense* infestations in the Anchorage area. However, some of these infestations are at very close proximity with one another and could represent the same infestation. For example, two separately reported AKEPIC sites are within 7 m of each other and both fall into the mapped perimeter of a recorded priority site. So, with this in consideration, it is estimated that ~29% of AKEPIC's Anchorage *C. arvense* records were managed in 2013 by Division of Agriculture staff. In the 2013 field season, a total of 47 infestation sites (Fig. 1), amounting to 0.12 km^2 (~30 acres) in the Anchorage area were surveyed, quantified, and managed. Ten of these were newly found infestations; 2830 m^2 (0.7 acres). Mechanical management began the 12th August until early October. The first flower of *C. arvense* was seen the 10th of July at priority site 2.

Priority Sites

Priority site 1 (Fig. 4) is located along the Seward Highway on the southbound exit for Huffman road (-149.851895, 61.109120). It is 78 m in length on a western-facing slope in disturbed sediments. This site in within a right-of-way and periodically mowed by the Department of Transportation in the growing season. However, it was also mowed twice by project staff and had a portion of the infestation hand-pulled due to accessibility in a landscaped area. Both of these areas have ~300 stems and cover 447 m^2. The average density for this site is 65% cover of *C. arvense*. Since 2011, priority site 1 has decreased in size by 3548 m^2, and has an overlapping area of 2011 by 36%.

Priority site 2 (Fig. 5) is located west of Minnesota Drive Expressway and east of Concord Hill Drive in a disturbed area (-149.908318, 61.126663). This site has two larger infestations and other small infestations along private property fence lines. The Concord Hills subdivision adjacent to the infested areas has recently become developed with houses. Based on the unnatural terrain and young sediments, the infestation areas are speculated to have been a topsoil dump and equipment holding area for construction equipment. The larger site just east of 104th avenue is a man-made berm covering 538 m^2 with ~500 stems, and the rest of the area covers 378 m^2 with ~350 stems. The average density of *C. arvense* at site 2 is 76%. Since 2011, priority site 2 has decreased in size by 168 m^2 and overlaps previous extents by 56%.

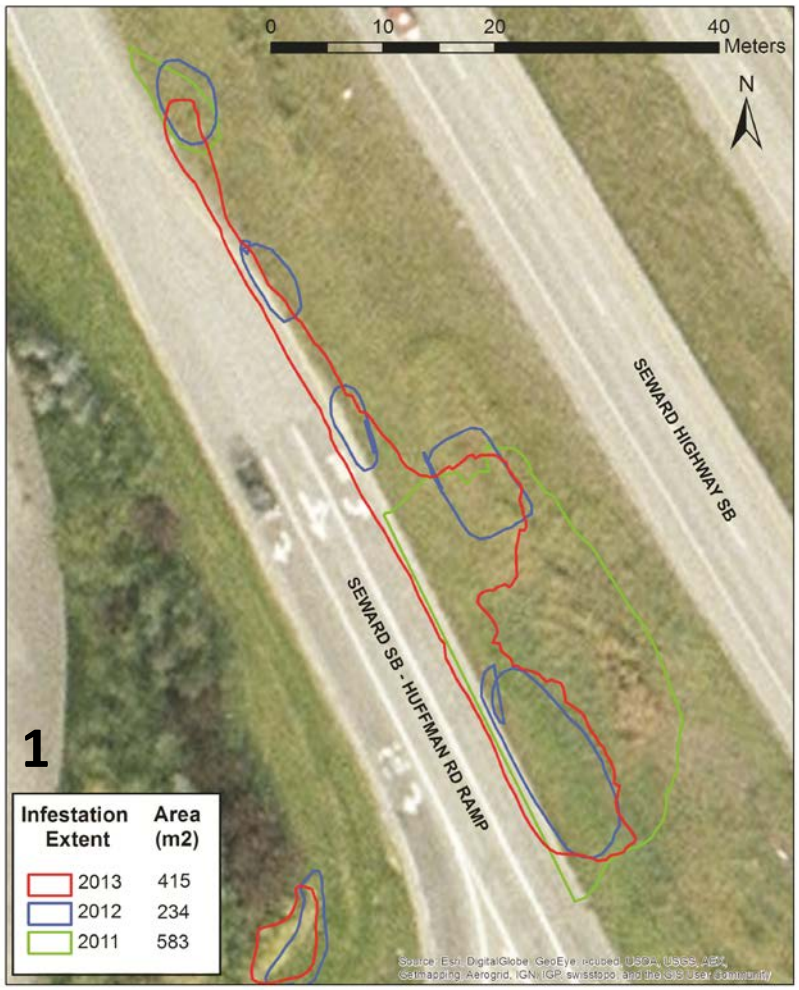

Figure 4. Priority site 1 located at -149.851895, 61.109120. Perimeters of the infestation are outlined by year since 2011.

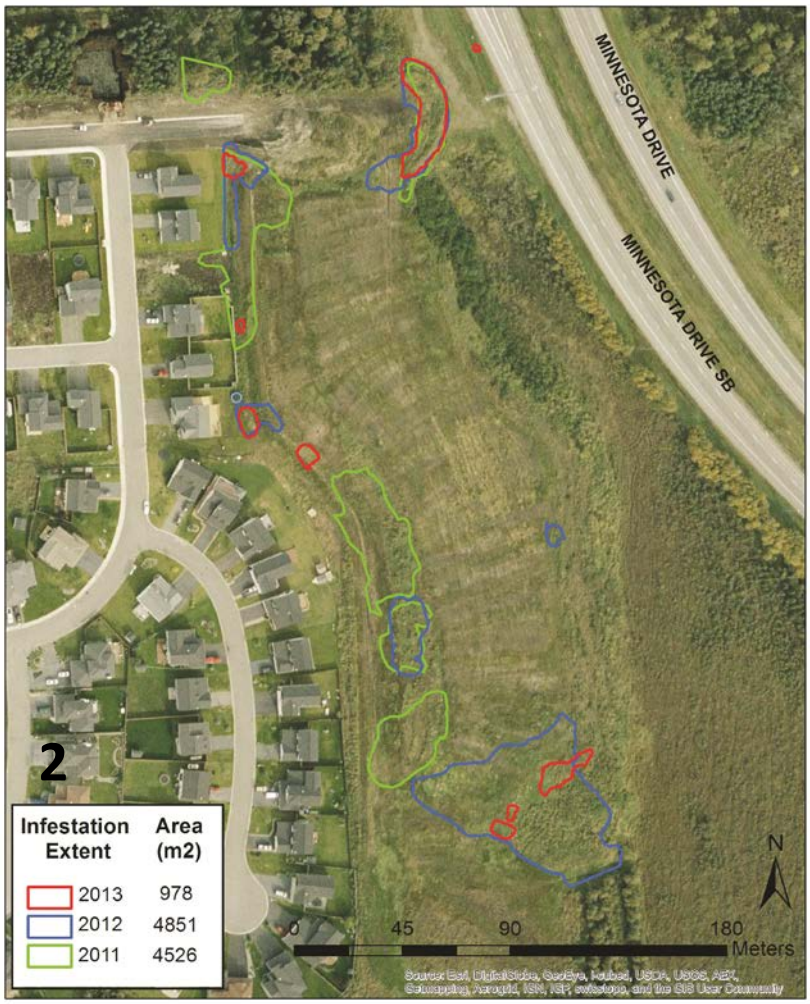

Figure 5. Priority site 2 located at -149.908318, 61.126663. Perimeters of the infestation are outlined by year since 2011.

Priority site 3 (Fig. 6) is located on the south side of the Glenn Highway between Airport Heights Drive and Bragaw Street intersections (-149.814665, 61.219177). The infestation is roughly 100 m in length, and covers 2256 m^2. The average density of the infestation is 60% with ~500+ stems. This infestation is situated within the Glenn Highway right-of-way. Although the area has a dirt foot path, it is not trafficked by many people and parts of the infestation are situated within a wooded area. The location of this infestation being behind a garden center that was required to remove contaminated product deserves more investigation. A few white flowers were also observed at this infestation site. Priority site 3 has increased in area since 2011 by 790 m^2 and has the greatest overlapping of 76%.

Priority site 4 (Fig. 7) is located on the north side of the Glenn Highway just east of the Mountain View Drive intersection (-149.820961, 61.218381). Priority site 4 infestation runs parallel to the highway for 270 m, and covers a total area of 4902 m^2. The southwestern part of the infestation area aggressively grows in dense stands of raspberry bushes and devils club while the *C. arvense* closest to the highway grows in sandy disturbed sediments. The density of *C. arvense* is averaged to 83%. The infestation has 500+ stems and includes a patch of white flowers. Site 4 has increased in area since 2011 by 336 m^2, and overlaps previous areas by 67%.

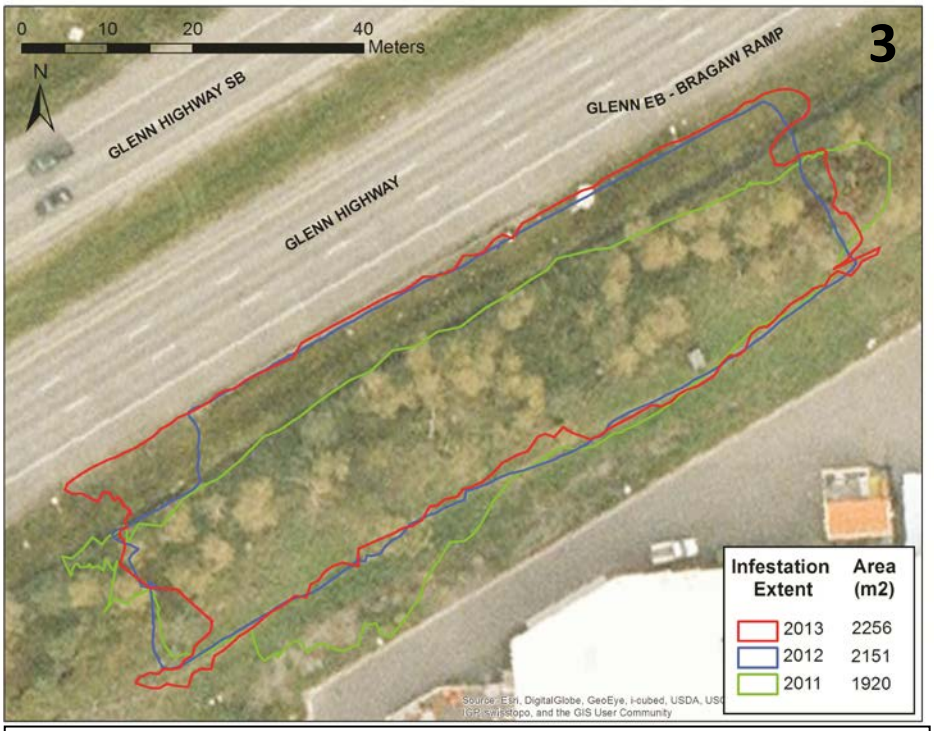

Figure 6. Priority site 3 located at -149.814665, 61.219177. Perimeters of the infestation are outlined by year since 2011.

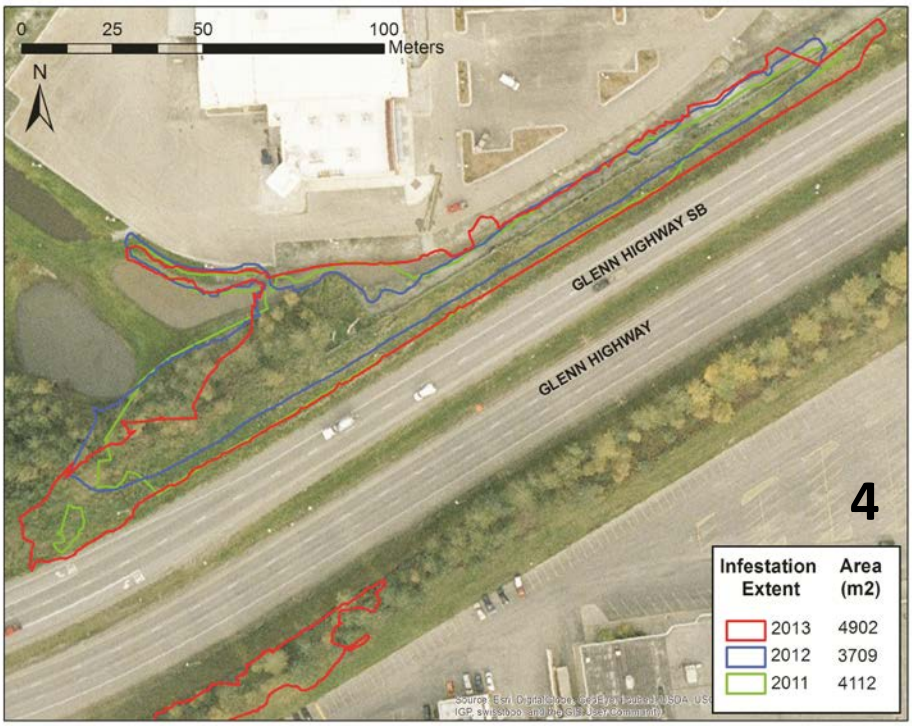

Figure 7. Priority site 4 located at -149.820961, 61.218381. Perimeters of the infestation are outlined by year since 2011.

Discussion

Although site 1 has decreased in size, there appears to be more rosettes surfacing along what were probably established rhizomes from previous years. These shoots propagated from 5 stems reported in 2010 (AKEPIC, 2103) to 300 (including the landscaped area) stems in 2013. So, although the areas are decreasing, the *C. arvense* stands are becoming more densely populated. . Site 2 significantly decreased in extent and was not seen fully mature until late in the growing season, suggesting possible competition of native grasses becoming established within the site. This is also consistent with results of interspecific plant competition from non-crop plants in grassland communities (Graglia, et. al, 2005). However, a location along a man-made berm at Site 2 was measured up to 85% cover and had the first flowering plant of the 2013 season of any Anchorage *C. arvense* site, indicating a well-established and a mature infestation. The overlapping area of the berm was 87%, confirming an advanced site. Due to sites 3 and 4's close geographic proximity, it is suggested that their increase in extent is in response to a lack of mechanical management; mowed once per growing season, or being located in a microclimate of ideal growing conditions. Border extents Site 3, are measured to be up to 7 meters from previous years Although this work gives preliminary results of quantifying Anchorage's *C. arvense* infestations, these outcomes left us with questions for further investigation quantifying densities, the effectiveness of mechanical management and ideal Alaskan growing conditions of *C. arvense*.

Should areas of high overlapping percentages be target sites for herbicide applications in 2014? Is mechanical control on less dense sites reducing areas of newly established infestations? *C. arvense* has been estimated to grow up to 5.5m by rhizomes (Boersma et al., 2006). How much of this newly established areas are a result of new growth or just due to inconsistency of field data collection?

Future Work

A complete understanding of *C. arvense* behavior in the Anchorage area is still relatively unknown. While persistent management practices will continue in the future, our objectives to better understand how *C. arvense* responds to variable management options is crucial to making decisions to include the most effective management techniques.

Refined Objectives

1. Maintain existing goals of the project
    a. Continue coordination with Department of Transportation for priority site mowing and implantation of their Integrated Vegetation Management Plan
    b. Manage *C. arvense* to background levels, include a herbicide application in 2014
    c. Emphasize objective 2: follow up on *all* AKEPIC recorded sites at least once in the field season for monitoring
2. Perform systematic surveys in the Matanuska-Susitna valley
    a. Minimum of 20 miles of road surveys
    b. Minimum of 10 park's parking lots, trailheads, and campgrounds

3. Determine herbicide effectiveness vs. mechanical management in field studies
    a. Target location: Concord Hills subdivision berm site
    b. Garlon 3A, Milestone, Mechanical, Control (no herbicide)
4. Test for seed viability in developmentally/seasonally variable Canada thistle plants
5. Determine if priority infestation sites are dominantly dioecious or contain both dioecious and hermaphroditic plants
    a. This will determine if the infestations reproduce by seed and vegetatively or just vegetatively. If infestations are dominantly dioecious, then the management strategy of seed head clipping should be reevaluated.
    b. Seed viability tests (objective 4) will also be an assessment of reproducibility to determine mode of management

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