Cirsium arvense (Canada thistle) management plan within the Anchorage Borough boundaries.

Shown in picture is a infestation in a wetland on Chester Creek, Anchorage. Photo taken in 2011.

Gino Graziano

Division of Agriculture Plant Materials Center

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SUMMARY

Cirsium arvense (Canada or creeping thistle) is widespread in Anchorage, yet has a limited distribution in Southcentral Alaska. The goal of this plan is to describe the state of *C. arvense* infestations in the Anchorage area, and develop strategies to increase inventory knowledge, manage priority infestations and generate awareness of the public to manage infestations on private property. The main management goal for *C. arvense* in the greater Anchorage area is to contain it, and slowly reduce the infestations to background levels. Management of *C. arvense* requires attention to the site and biology. Review of pertinent literature in this document describes the various approaches that are necessary to effectively manage *C. arvense* infestations.

INTRODUCTION

Impacts:

Canada or creeping thistle (*Cirsium arvense*) forms dense stands with creeping rhizomes. *C. arvense* appears to have allelopathic activity that inhibits the growth of other plants in close proximity to it (Stachon 1980). In other parts of North America *C. arvense* increases fire frequency (Zouhar 2001). *C. arvense* is also a host to several pests (Nuzzo 1997). As an agricultural weed it has significantly reduced crop yields.

The Alaska Natural Heritage Program invasiveness ranking system scores *C. arvense* as a 76 out of 100 (Carlson et al 2008), and climate suitability analysis indicates it can grow in South Coastal, Interior Boreal, and Arctic Alpine regions of Alaska. *C. arvense* has infested areas as far north as Stevens Village and Delta Junction where the local Soil and Water Conservation District took several years to successfully eradicate the plants and have not seen it since.

C. arvense has a wide range of suitable habitats that it is known to invade including prairies and wet grasslands, sedge meadows, sand dunes, stream banks, lakeshores, swamps, and woodlands (Nuzzo 1997). In Alaska it is found primarily on roadsides however, infestations are documented in wet blue joint reed grass (*Calamagrostis canadensis*) meadows in Anchorage and on beach fringes in Haines (Figure 1 AKEPIC 2011). *C. arvense* is expected to become increasingly invasive with climate change, as it responds to rising levels of CO_2 with increased growth and resistance to herbicides (Ziska 2004, Ziska 2002). Further CO_2 is known to often be higher in urban areas than the global averages taken from locations such as Mana Loa observatory. Presently *C. arvense* is most prevalent in urban areas, and with elevated CO_2 concentrations, *C. arvense* will be more difficult to control, providing more source populations to invade natural and agricultural areas (Ziska 2004).

Figure 1: *C. arvense* grows in a variety of habitats including, shown here, wet meadows (photo courtesy Alaska Natural Heritage Program) and beach fringes.

C. arvense has been declared noxious by 35 states (USDA Plants database 2011). It is a prohibited noxious weed in Alaska (11 AAC 34.020). Several Cooperative Weed Management Areas throughout the state have identified *C. arvense* as a priority species for control, eradication and prevention.

Biology and Identification of *C. arvense*:

C. arvense is a dioecious (separate male and female) plant with purple flowers or rarely white (Figure 2) flowers ½-3/4 in diameter. It is a perennial with deep roots that spread horizontally forming new shoots, growing between 1 and 4 feet tall. Leaves are alternate, lack petioles, and are variable showing shallow to deeply pinatifid or lobed shape. All leaves have spiny margins and soft, wooly hairs on the underside.

Figure 2: On left is the white flowered version of *C. arvense* located in Anchorage, Alaska along the Glenn Highway. On right is a close view of the characteristically spiny leaves, branching, and purple flowers (UAF Cooperative Extension Archive, University of Alaska - Fairbanks, Bugwood.org).

C. arvense reproduces by seed and vegetatively. *C. arvense* produces abundant amounts of seed, with pappus for wind dispersal. However, the pappus often falls off leaving most seeds near the parent plant. Seeds usually germinate in the first year but some may remain viable for up to 20 years (AKEPIC 2005). Vegetative spread is through creeping lateral roots and root fragments that break off from the parent plant.

Extent of *C. arvense* in Alaska and Anchorage:

Little *C. arvense* is known north of the Anchorage area, but efforts are underway to determine if infestations do exist where land managers may not have inventoried (e.g. off roads and public lands, agricultural lands etc.). *C. arvense* is prevalent in several Southeast Alaska communities such as Haines and Prince of Wales Island. *C. arvense* in Haines is nearly ubiquitous within the city. *C. arvense* has a limited distribution on the Kenai Peninsula where the Cooperative Weed Management Area has expended significant effort to eradicate the species, and may successfully do so in coming years.

The greatest quantity of *C. arvense* in Alaska appears to be found within the city of Anchorage (Figure 3). In Anchorage *C. arvense* is fairly widespread, however most populations are small. A few infestations that are larger than one acre in size are present in Anchorage.

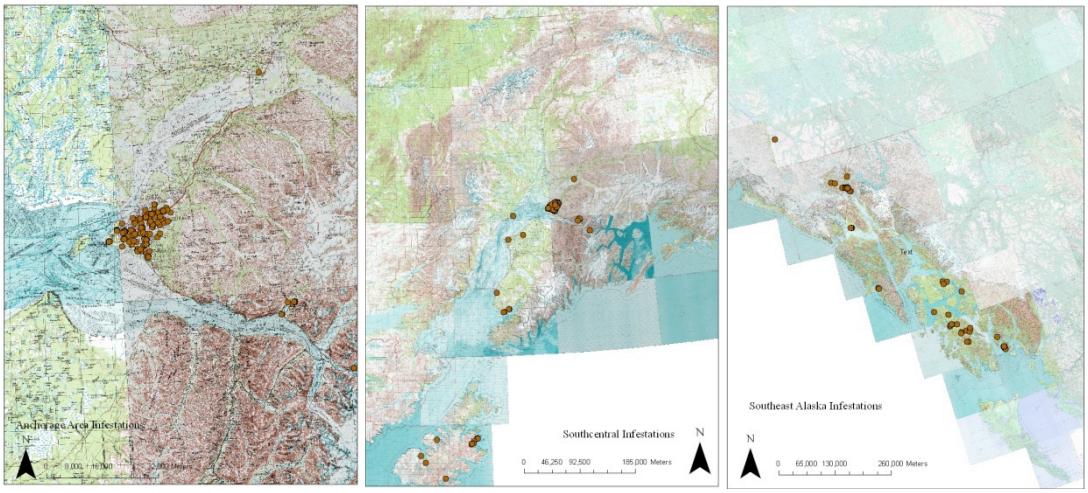

Figure 3: *C. arvense* distribution in Anchorage, Southcentral, and Southeast Alaska (AKEPIC 2011).

Some areas of the Anchorage Borough have not received significant inventory effort. Those areas include Eagle River, Chugiak/Peters Creek, and Indian. However, inventory of these areas was partially completed in 2010 by an intern with the Division of Agriculture and will be covered in large part by a roadside inventory being conducted by the Alaska Natural Heritage Program in 2011. Still greater information on private lands is needed to gain voluntary cooperation in management of *C. arvense*.

Why is management of *C. arvense* in Anchorage a priority in Alaska?

While *C. arvense* is fairly widespread in Anchorage, the known infestations appear to be a manageable size. Areas around Anchorage include agricultural communities (Mat-Su Valley) with little *C. arvense* present and areas that have identified eradication of *C. arvense* as a priority (Kenai CWMA). Anchorage infestations can serve as sources of new populations of *C. arvense* to these areas and are therefore considered a high priority. However, care should be taken to maintain diligence in surveying for and managing infestations on the Kenai Peninsula and the Mat-Su Valley to ensure that new populations are not establishing.

Anchorage borders natural areas including Chugach State Park, Chugach National Forest, Potters Marsh, the Anchorage Coastal Wildlife Refuge and the BLM Campbell Tract. *C. arvense* is not known to be present in any natural areas of these public lands. If it becomes established in these areas it may impact natural resources, wildlife and recreation.

While *C. arvense* management in Anchorage is a priority to prevent movement to surrounding areas it is imperative to remain vigilant with new infestations outside of Anchorage. Infestations in Tyonek, the remaining Kenai Peninsula infestations, the few in the Mat-Su Valley, and one in Stevens Village should remain a very high priority.

CONTROL PRACTICES

C. arvense is a difficult plant to manage due to extensive roots and persistent seedbank. Infestations are typically managed using one or more management techniques in an Integrated Vegetation Management (IVM) plan. IVM seeks to examine the biology of the pest organism, determine why the pest is there, and what environmental conditions exist at the site that allow establishment and should be considered when implementing control practices. IVM seeks to determine the most effective management approaches that prevent negative impacts to the environment and resources.

Chemical control and successful Integrated Vegetation Management (IVM) in Alaska

In Southcentral Alaska successful management of large infestations of *C. arvense* involves multiple mowing treatments, followed by an application of an appropriate systemic herbicide in September (Figure 4). During this time there is a brief window when most indigenous vegetation is senescing and not as susceptible to the herbicide treatment, while *C. arvense* is still actively photosynthesizing. The fall application is made more effective by subsequent frosts which trigger translocation of carbohydrates from leaves to roots and consequently the herbicide is translocated to the roots.

On infestations with reduced densities mowing is only practical if the surrounding desired vegetation will withstand the impact. Such vegetation may include grasses such a brome

(*Bromus inermis*) or timothy (*Phleum pretense*), red fescue (*Festuca rubra*) and other common lawn grasses. If mowing is not practical the most effective approach may be to use two herbicide applications, one in early spring and the second in the fall.

Herbicide choice and concentration are important considerations for *C. arvense* management. The highest label rate concentrations of certain chemicals such as glyphosate may be less effective if the herbicide kills the plant shoots before the chemical is assimilated in the roots (Boerboom and Wyse 1988). Careful monitoring of *C. arvense* control work is necessary to adjust chemicals used and IVM. There are several different ecotypes of *C. arvense* and each may respond differently to the same herbicide (Frank and Tworkoski 1994). Varying the herbicides used and careful monitoring of herbicide effect in the treated area is important to prevent one ecotype from becoming dominant in an infestation where two or more ecotypes are present (Frank and Tworkoski 1994). When varying herbicides used it is best to choose products with different modes of action to ensure that each *C. arvense* ecotype is not resistant to the chosen product.

Referencing relevant control research and the experiences of land managers in similar areas will help determine effective chemicals and rates. Table 1 (page 8) was developed in 2011 as a general list of effective chemicals for *C. arvense* management. Before selecting a chemical control read current labels for registration on the site and recommended application rates. Consult the Alaska Department of Environmental Conservation for a list of chemicals registered in Alaska, and to determine if a permit is necessary. Table 2 below describes chemicals that are generally ineffective on *C. arvense* or present too high of environmental risk for use in some habitats.

Figure 4: Mowing multiple times during a growing season followed by an early fall application of herbicide resulted in significant reduction in size and percent cover of infestations in the Homer area. This technique increases herbicide effectiveness and results in greater control while using less herbicide (Photos courtesy Caleb Slemmons, Homer SWCD).

Table 1: Recommended herbicides (Nuzzo 1997)

Active ingredient	Ex. Trade names	Timing	Selective
Clopyralid	Stinger, Transline	Fall	Yes, kills only certain broad leaf plants
Clopyralid + 2,4-D	Curtail	June	Yes, kills all broad leaf plants
Aminopyralid*	Mileston VM	Fall	Yes, kills all broad leaf plants
Glyphosate	Roundup	Fall	Non-selective
Chlorsulfuron	Telar	Spring	Non-selective

Always adhere to label requirements for rates and registration of a product for the site. Consult the Alaska DEC to determine if above listed products are currently registered for use in Alaska.

*Aminopyralid was not included in the Nuzzo 1997 review, however is effectively used on *C. arvense* in Alaska, and is an EPA reduced risk herbicide due to decreased mobility in water.

Table 2: Herbicides not recommended (Nuzzo 1997)

Active ingredient	Trade names	Reason
Picloram	Tordon	water soluble, persistent, not registered in Alaska
Dicamba	Banvel	Limited and varied effectiveness, persistent
Metsulfuron	Ally	Ineffective
2,4-D	Many products	Variable effect on thistle
Bentazon	Basagran	Is applied at height of 20cm when other vegetation is susceptible

Non chemical, cultural and solarization

The deep extensive root system of *C. arvense* makes pulling or digging an ineffective control practice. However, if excavation of all roots is possible, typically using large equipment, digging can be effective. Mowing as described previously can stress *C. arvense* if applied frequently. In vegetation that remains vigorous when regularly mowed the concentration of *C. arvense* may decrease after sustained mowing. When mowing it is beneficial to not remove the entire shoot, leave 20 cm or 9 leaves per shoot, because mature leaves will prevent sprouting new shoots from adventitious roots (Nuzzo 1997). This may not be as important if the area will receive a broadcast chemical treatment, or if the area has high (nearly 100%) humidity (Hunter et al 1985).

Solarization, in the context of completely eliminating the sunlight available may be an effective practice. This is being applied to limited extent on perennial sowthistle (*Sonchus arvensis*) infestations in the Mat-Su Valley. A durable fabric, such as Typar©, that allows water to penetrate, but not light should be used to cover the infestation. If no chemicals will be used to treat the edges, placing fabric several feet beyond the edge of the infestation is necessary to prevent new shoots from sprouting around the edge of the fabric.

Fasten the fabric to the ground using 8-12 inch galvanized spikes and washers, or duckbill anchors in areas where water flow threatens the material. Solarization material must be inspected regularly to ensure that it remains in place, and is not damaged. It may require annual replacement. Erosion issues on streambanks may arise from the use of this fabric as all vegetation and consequently roots under the fabric will deteriorate and destabilize the soils. However, well secured fabric will provide some stability to the soil. It is unknown how long the material should remain in place for effective control.

Biological control

Typically the first concern to consider with biological control agents is the non-target impacts to native vegetation. Most biocontrols are suspected to impact closely related organisms. In Southcentral Alaska there are no native *Cirsium* species. However, the native *C. edule* and *C. foliosum* have ranges in portions of Southeast Alaska making biocontrol less appropriate there.

Several biological control agents are available for *C. arvense* management. However, none of them are very effective in North America because the life cycles of the biocontrols are not synchronized with *C. arvense* resulting in damage but not death. Further, *C. arvense* has ineffective natural enemies in its native range, and those that do feed on it generally consume little plant material (Nuzzo 1997).

Table 3: Available Biocontrol for *C. arvense*

Insect type	Scientific name	Type of control
Beetle	*Ceutrorhynchs litura*	Stem, root miners and gallers
Beetle	*Trichosirocalus horridus**	Root crown feeder
Fly	*Urophora cardui*	Stem, root miners and gallers

Table 3 lists some of the approved biocontrols that impact *C. arvense*.
*Feeds on bull thistle in addition to *C. arvense*.

A combination of mechanical, biological and chemical controls may prove effective. First, managers must consider if the area infested by *C. arvense* is sufficient to support a released population of biocontrol agents. To support a biocontrol the infestation should cover at least 1 acre (0.40 hectares), however larger is more desirable. The infestation should be contiguous, uniform, dense, and not subject to human disturbances that would remove or mow the thistles (Winston 2008).

In Anchorage, it does not appear that sufficient coverage of the landscape with *C. arvense* exists to provide area wide control with the release of biocontrol agents, however, treating an individual infestation may be possible. Some potential sites are found in Figure 5. Most of these sites are subject to periodical roadside mowing. One site is between 5 and 7 acres of thistle in a large empty privately owned waste area behind a subdivision. Further contact with the landowner is necessary to ensure that no plans exist to disturb the site. More careful inventory of the infestation is necessary to determine if the density over the area is suitable.

Figure 5: Infestations in Anchorage with potential for biocontrol (shown in blue) based on a size of at least 1 acre (AKEPIC 2011).

Grazing is a form of biocontrol that has some effect, similar to mowing. Goats will eat *C. arvense* if confined to the area where it infests. If desirable vegetation is present, however, they will eat that as well and potentially cause more damage than careful mowing and/or herbicide treatment. Animals also can impact the soils through trampling making the site less suitable for revegetation and promoting additional *C. arvense* to occupy the site.

Revegetation

All weed management projects are not complete until a revegetation plan is implemented. The plan will vary by site, land ownership, and management goals. It is imperative to ensure that the site is revegetated with an aggressive desired species to prevent any remaining *C. arvense* from germinating and re-invasion of the site by other invasive species. The best references to revegetation with native plant material can be found at www.plants.alaska.gov/revegetation.php. In urban and agricultural settings native vegetation may not be desirable. An appropriate forage or sod forming grass should be used to prevent thistle from reinvading the site. Passive

revegetation of a site is not likely to succeed in natural settings because bare ground will allow for *C. arvense* to regenerate from seed. However, in a lawn, pasture, or meadow where broadleaf herbicides are used, and grasses remain vigorous the grasses will quickly occupy the areas where *C. arvense* was present.

Legal considerations for control practices

A variety of control practices are applicable to *C. arvense* management. Each of these control practices may involve permits or informal permission from one or more state or federal agency to implement. Table 4 outlines the agencies to contact for different management practices in different land settings. The following sections provide more detail about permits or permissions needed for the management practices in these settings.

Table 4: Agencies to contact for *C. arvense* management activities

Land management	Infestation near Water	Activity	Infestation size	Agencies to contact
Right of Way	Yes/No	Herbicide treatment	Any	DEC and DOT
Right of Way	No	Mowing, digging or tarping	Any	DOT
National Forest	No	Any	Any	Chugach National Forest
Municipal	Yes	Herbicide	Any	Municipality, DEC
Municipal	No	Any	Any	Municipality
BLM	No	Any	Any	BLM
State	No	Herbicide	<1acre	State land manager*
State	Yes	Herbicide	<1 acre	State land manager* and DEC
State	Yes/No	Herbicide	>1acre	State land manager* and DEC
State	No	Tarping or digging	Any	State land manager*
State	Yes	Tarping	Any	DMLW, ADFG, ACOE

*State land manager refers to the relevant Department or Division with management authority for that particular state land. Examples include the Divison of Mining, Land and Water, Division of Parks and Department of Fish and Game. Contact the Alaska Public Information Center to determine which agency or division manages the infested state lands.

Herbicide treatment

Under the legal requirements at the time of this publication a DEC pesticide use permit is required for most of the priority infestations of *C. arvense* in the Anchorage area because they are present on state owned rights of way (18 AAC 90.500 http://www.dec.state.ak.us/eh/pest/permit.htm). Permits are required on state owned rights of way regardless of the size of the treatment area. There are no known *C. arvense* infestations on state lands that are not within a right of way, other than those at the Anchorage airport. Infestations on private, municipal or federal lands do not require a DEC pesticide use permit.

However, federal lands have a different set of guidelines involving the National Environmental Policy Act that must be followed. DEC pesticide use permits may also be necessary if an application to an infestation affects more than one property owner (18 AAC 90.500 http://www.dec.state.ak.us/eh/pest/permit.htm). Contact the DEC to ensure all legal considerations are covered.

Biocontrol

The Division of Agriculture should be consulted prior to the release of any biocontrol agent as it has state regulatory authority over all pests of plants (11 AAC 34.145). The Animal Plant Health Inspection Service (APHIS) should also be contacted to ensure they have no regulatory concerns with the introduction.

General control practices

Land management agencies generally have some form of permit to conduct activities on the lands they manage. For example the DOT requires a "Temporary Construction Permit" to implement a project within a right of way. If a permit is not necessary, agencies such as State lands or State parks will require notification of the activities occurring on the lands they manage. However, other permits may apply if the infestation is within or near a navigable waterway or associated with fish habitat. The Municipality of Anchorage also has its own permit process for activities on their lands.

INVENTORY AND MONITORING

Anchorage is probably one of the more significantly inventoried areas of the state. Some gaps in inventory knowledge do exist, however. The communities of Indian, Chugiak, Peters Creek, Eagle River and Eklutna are all underserved by current inventory knowledge (Figure 6). This is general knowledge based on the absence of data-points for any species in these Anchorage bedroom communities. These areas are also home to many horse owners whose feed is a potential pathway for introduction.

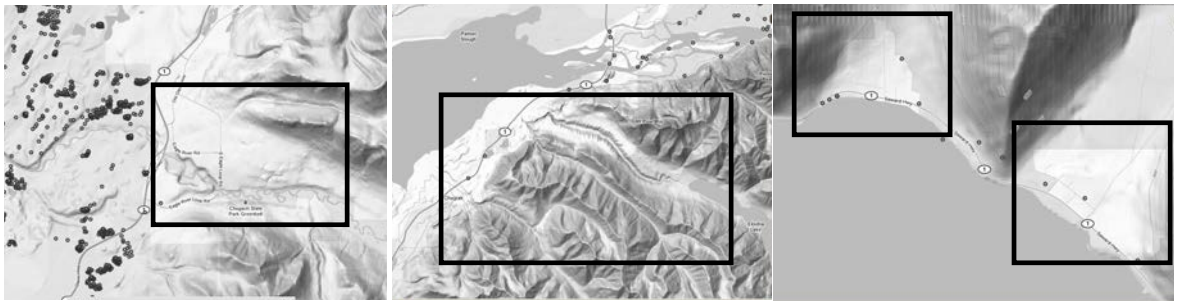

Figure 6: Maps of under inventoried area. Eagle River (left), Chugiak, Peter's Creek and Eklutna (center) and Indian (right). Maps generated from the AKEPIC data portal, download May 2011 (http://aknhp.uaa.alaska.edu/maps/akepic/). Areas in need of additional inventory are generally within the boxes inserted on the maps.

The Alaska Natural Heritage Program conducted a survey of Anchorage area roads during the summer of 2011. This survey covered most primary and secondary roads from Eklutna road to Potter. This inventory should provide additional information about the distribution of weeds in these under inventoried areas. The community of Indian and the Chugach State Park are additional areas in need of directed inventory work. In the State Park focus should be given to areas frequented by horse riders, bicyclists and hikers.

Citizen monitoring and reporting is an important component to any program. Even when a species is somewhat prevalent, like *C. arvense*, and most infestations reported may be those managers are aware of, the citizen contacts are worth while. Frequently citizen monitoring alerts managers to infestations they are not aware of. Citizen monitoring should be encouraged through distribution of outreach materials with contact information to report an infestation.

For the next 5 years inventory of underserved areas should continue. Additional focus should be given to areas of recent landscape activity particularly if topsoil was brought to the site or trees and shrubs imported to Alaska were used in the landscaping. Areas along the primary pathways of spread should be frequently inventoried and monitored to ensure that those infestations are not spreading beyond their original boundaries. Popular horse trails should be inventoried in the near future to ensure that horses have not spread *C. arvense* to the State Park, BLM lands or National Forest. Inventories should occur in late July or early August to ensure all plants are flowering and easy to detect.

EDUCATION AND OUTREACH

Education and outreach is an integral part to any weed management strategy. It is important to increase public awareness of *C. arvense*, its impacts, identification/reporting, and control practices. With this knowledge the public is empowered to manage infestation on their lands, and avoid spreading infestations to new areas. Educating the public has an added benefit of acceptance of control practices whether those are an unsightly solarization project, chemical application, or simply removing a field of pretty purple flowers.

C. arvense outreach in Anchorage has primarily involved mailing rack cards (Figure 7) to residences in the Anchorage area with information about the weed. Other members of the CWMA typically highlight *C. arvense* as a high priority even placing it on a bus advertisement that sought to increase general awareness. It seems that the public is becoming generally aware of the issue through these rack cards and other outreach efforts because several phone calls are received during the summer about *C. arvense*.

The next steps in outreach for Anchorage should include directed efforts with land managers, landscapers and nursery providers.

Figure 7: *C. arvense* rack card

PREVENTION

Preventing new *C. arvense* infestations from occurring in Anchorage and other parts of Alaska is essential to successful control, containment or eradication efforts. *C. arvense* is abundant in other parts of North America, and therefore is known to occur in several commodities that are transported to Alaska including hay/straw, nursery products and grass seed (Conn 2008, Conn 2010, Conn 2010). *C. arvense* may also contaminate gravel, fill material and non-pelletized animal feeds. Precautions should be made to reduce the risk of moving contaminated materials to or within Alaska.

C. arvense is on the Alaska prohibited noxious weeds seed list (11 AAC 34.020) which makes it illegal to transport *C. arvense* or anything contaminated with propogative portions of *C. arvense* anywhere in the state (11 AAC 34.077). It is very difficult to catch violations of this law without significant effort to inspect potentially contaminated commodities. When regulatory inspectors find a violation the Division of Agriculture will quarantine and witness treatment of items contaminated with *C. arvense*. Increasing inspections could prevent additional introductions of *C. arvense* through commodities.

Hay and straw material are available as certified weed free products inspected according to the North American Weed Management Association (NAWMA) standards, which include *C. arvense* as a weed prohibited from a certified product. Some other states have different protocols than NAWMA for certifying hay or straw as weed free. Certified weed free product is available locally, and since *C. arvense* is rare outside of Anchorage the probability that *C. arvense* is present in the material is seriously reduced. Non-pelletized animal feeds such as grain can be certified weed free in the same way as hay and straw, although has not been targeted by the Alaska Weed Free Forage program.

Straw fiber filled tubes used for erosion control should be made from certified weed free material in order to prevent introduction of *C. arvense*. Ideally the facilities and storage area for making the fiber filled tubes should be treated as a storage area by NAWMA standards and inspected to ensure the certified weed free material is not infested during or after processing.

Fill material including gravel, compost and topsoil could be contaminated with *C. arvense*. This is particularly probable if an infested empty lot is developed and topsoil from the site moved to a new location. While it is possible that gravel material could be infested with *C. arvense*, we have not observed any infestations near gravel quarries or storage areas, however, significant survey effort has not been conducted in Southcentral Alaska gravel quarries. NAWMA has a protocol to certify gravel as weed free. The method could also be used for dirt fill material or compost. Presently there is no weed free gravel inspection program in Alaska, however, it should be available in 2012.

Grass seeds and other forms of seed should not contain any *C. arvense* based on samples of seed taken as required by applicable seed laws. All packages, bags or containers of seed should identify the percentage of weed seed, and identify what those weeds are. None of the weeds should be on the State of Alaska's Prohibited Noxious Weed Seed list (11 AAC 34.020). Despite these steps some imported seed purchased and tested by the Agricultural Research Service did have a small amount of *C. arvense* present as a contaminant (Conn 2010). Purchasing locally produced seed may be the best way to minimize the potential of accidental introduction of *C. arvense* when using grass seed.

Long-lived trees and shrubs imported from parts of North America with ubiquitous *C. arvense* infestations are a significant carrier of *C. arvense* in comparison to other nursery products (Figure 8 Conn 2008). These products have less of a chance of having *C. arvense* and other weeds in their root balls if they were produced locally, purchased or shipped to Alaska as bare root. It is possible to wash the roots of some trees and shrubs to rid them of any possible weeds prior to planting or shipment. If root washing is performed the soil from the roots should be contained and disposed of, or washed into a place where any sprouting weeds will be monitored for and immediately controlled.

Figure 8: *C. arvense* as a contaminant of nursery stock at an Anchorage store.

PRIORITIES FOR MANAGEMENT

The priority areas for management of *C. arvense* in the general Anchorage area include the highways exiting town to prevent the infestations from spreading to neighboring communities, and infestations which threaten sensitive habitats or agricultural lands. The infestations documented in the Anchorage area are described in Table 5. Care should be taken to review AKEPIC data prior to treatments to ensure no new adjacent infestations were uncovered by the AKNHP surveys previously mentioned. After effective IVM plans are in place for these infestations, management of additional nearby infestations should occur, continuing to broaden out to as many infestations as available funding will allow.

Table 5: Priority *C. arvense* infestations for management in the Anchorage area

Site name	Latitude	Longitude	Size (acres)	Location Description
Muldoon off ramp*	61.22639	-149.73456	½	On the North side of the off ramp headed East on the Glenn highway
Turpin exit*	61.22419	-149.76063	½	At the exit sign and along the wooden fence of the Municipality Septic transfer facility
Turpin bus stop*	61.22090	-149.75623	1/100	South of the Turpin road exit at the bus stop located by 2nd avenue.
Airport Heights S. side*	61.21911	-149.81507	2	East of the Airport Heights light in the ditch near the Merrill Field Airport, border of AK Regional Hospital and Merrill Field, and behind the Home Depot and Northway Mall
Airport Heights N. side*	61.21838	-149.82096	3	East of the Airport Heights light on the Glenn Hwy along the fence (both sides) in a drainage lagoon, and behind the McDonalds.
Seward hwy. median*	61.15266	-149.85577	½	In the highway median between 74th and 76th street just north of Dimond blvd.
33rd ave. near Seward hwy	61.19059	-149.86943	1/100	On the West side of the Moose's Tooth restaurant near 34th avenue.
Dimond*	61.14090	-149.85747	1	Before the Dimond road exit near the fence on the highway and behind the Sams Club.
Huffman road exit*	61.11137	-149.85406	1	Along both sides of the exit behind the Carrs grocery store.
Chester Cr.- Muldoon	61.12085	-149.73548	1/100	Just west of Muldoon at the East end of a bike path along Chester Creek.
Chester Cr. – Aiport Heights*	61.19904	-149.82877	1/100	South and east of mile 3.5 Chester Creek trail in a wet bluejoint reedgrass meadow.
Girdwood Alyeska	60.97066	-149.09628	1	Alyeska hotel located by the tram circle along the left side when facing the mountain
Potter Marsh area			1	Near Bird TLC in Anchorage bordering Potter's Marsh.

*See attached maps (Figures 9 – 15) for images of infested areas. Latitude and longitude are presented in NAD 83 datum.

Figure 9 Muldoon off-ramp- The infestation is shown in light blue between the east bound off-ramp that heads south on Muldoon and the Glenn highway.

Figure 10 Turpin exit- Infestations shown in teal and blue. The area within the septic transfer station was inventoried by the Anchorage Weed Management Coordinator, and has *C. arvense* present.

Figure 11 Airport Heights- Infestations shown in pink, blue, green and teal. The blue line over the large teal colored infestation that is furthest to the east depicts the expansion in length of the infestation in 2011.

Figure 12 Chester Creek infestation in Airport Heights- Infestation shown in red is found along the creek in a wet bluejoint (*Calamagrostis canadensis*) meadow with the presence of some sweetgale (*Myrica gale*) and herbs. Viereck vegetation classification of this site is III.A.2.c Bluejoint shrub. The infestation is difficult to access without waders, and disturbance here is likely due to river action.

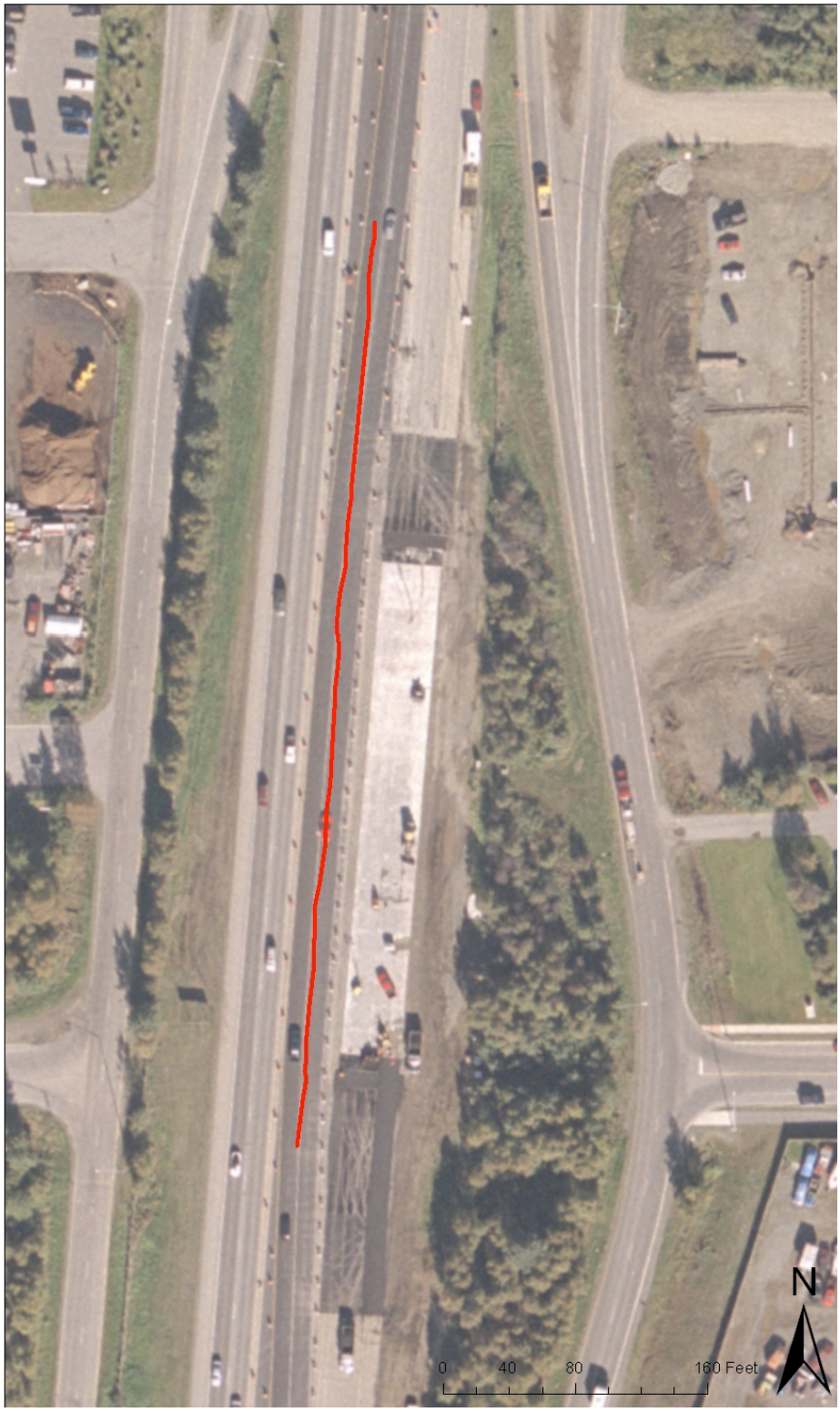

Figure 13 Seward highway median infestation- The Infestation is located in the median of the highway and shown here in red. Note that the aerial image used is outdated. The grass median was added after the construction visible on the east side of the highway.

Figure 14 Dimond- The infestation is located on the Seward highway before the Dimond blvd. exit. The infestation spans from the highway west across the bike path, and down a slope behind the Sam's Club.

Figure 15 Huffman exit- Infestation is located on the Huffman exit southbound on the Seward highway are shown in dark and light blue, green and pink. In 2011 construction was done in the area, but remained on Huffman road and did not appear to disturb the infestations. The AKNHP found *C. arvense* on the Northbound onramp in 2011.

Action Strategies:

1. Prevention

a. Actively monitor nursery products at stores for contamination with *C. arvense*.

b. Encourage use of certified weed free forage and straw for feed, bedding and erosion control.

c. Wherever possible root wash trees and shrubs used in plantings on public properties if they are imported from areas that have significant *C. arvense* infestations.

d. Continue working with DOT to time mowing so that it is completed before seeds are developed.

2. Control

a. Actively manage infestations along highways to prevent the spread of *C. arvense* outside of the Anchorage area.

b. Pursue Pesticide Use Permits from the Department of Environmental Conservation for management of *C. arvense* infestations.

c. Begin managing infestations that are invading or threaten to invade sensitive habitats such as riparian areas and wetlands.

d. Encourage homeowners to manage *C. arvense* present on their properties, including cost share for larger infestations.

e. Determine if biocontrol is feasible by inventorying larger infestations and contacting land managers about use of the area for release of biocontrol agents.

3. Education

a. Make the public aware of *C. arvense* problems by highlighting it in general invasive weed outreach.

b. Develop and deliver materials to the public specifically about *C. arvense*.

c. Develop a homeowner guide to managing *C. arvense*.

d. Develop materials for landscapers pertaining to *C. arvense* that explains the issue, legal status and various control and prevention techniques.

e. Encourage citizen participation in reporting *C. arvense* infestations.

4. Inventory and Monitoring

a. Complete inventory of areas outside of Anchorage which are under inventoried, including, Eagle River, Chugiak, Peters Creek, Eklutna, and Indian.

b. Continue regular inventory in Anchorage to identify additional high priority wetlands and rivers.

c. Inventory riparian areas and wetlands to determine if additional *C. arvense* has spread to these areas.

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