Monitoring & Controlling Invasive Plants at Rohn Cabin: 2013 Update

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Summary

The Alaska Natural Heritage Program (AKNHP), University of Alaska Anchorage, visited Rohn Cabin 31 July 2013 to inventory and remove non-native plant species from BLM property at the site. This is the fourth year in which AKNHP has surveyed and treated non-native plants at Rohn Cabin. The ongoing treatment and survey activities occur for several reasons. First, this remote location is a hub of activity during the Iditarod Trail Sled Dog Race; many people and large amount of materials are introduced to the site, including straw for sled dog bedding, which is a known vector for invasive plant propagules. This is a relatively well-known stop along the Iditarod Trail, and successful weed treatment here may encourage invasive plant management at other checkpoints along the trail. Second, the site is surrounded by undisturbed spruce forest and thus acts as a natural laboratory to study whether the non-native species known to occur at the site are able to move into nearby pristine areas. Third, and most importantly, control actions at Rohn Cabin are intended to prevent the spread of invasive species into adjacent natural areas. Fourth, since the area receives follow-up treatments on a fairly regular basis, weed management activities can be evaluated for efficacy and consequently improve the knowledge base for weed management in remote areas. For example, mustard species (*Brassica rapa* and *B. napus*), chickweed (*Cerastium fontanum* ssp. *vulgare*), common plantain (*Plantago major*), timothy (*Phleum pratense*), and non-native bluegrasses (*Poa annua* and *P. pratensis*) have been eliminated from the site, showing a positive response to hand pulling, while foxtail barley (*Hordeum jubatum*) continues to spread undeterred by manual control efforts. Furthermore, there has been success at the cabin entrance, where weeds were cleared down to bare ground, and at the FAA site, which sees little human traffic. The meadow in front of the cabin and nearby forest, where sled dogs and bedding straw are in great abundance during the Iditarod Race, has become more heavily infested in 2013 than previously documented.

The 2013 surveys targeted the airstrip, FAA site, the area surrounding the cabin and outhouse, the meadow in front of the cabin, and neighboring forested areas (Figure 1). Overall, the 2013 survey found the number of non-native plant species and their abundances were similar to values in previous years. No new species were encountered. Non-native species richness declined after 2009, but has remained similar from 2011 to 2013. In the last three years, species composition has changed only slightly (Table 1).

Data from 2009, 2011, and 2012 can be accessed through the Alaska Exotic Plants Information Clearinghouse (AKEPIC) data portal, available at http://aknhp.uaa.alaska.edu/maps/akepic/. Data collected in 2013 will be available through AKEPIC in 2014. Additionally, a report including management recommendations for Rohn Cabin was written after the 2012 visit (Greenstein and Carlson 2013) and can be found on AKNHP's publications page at http://aknhp.uaa.alaska.edu/botany/akepic/publications/.

This document summarizes current populations, most recent control actions, and recommendations for future management. Specifically, we compare data collected July 2-3 and August 27-28, 2012, and July 31, 2013, but omit earlier data. Records collected prior to 2012 are not included because (a) earlier surveys only looked at two to three sites (cabin and end(s) of airstrip), and (b) species recognition and estimation of percent cover and population size is somewhat subjective and is dependent on level of expertise; consequently, data collected by different people across years can be somewhat inconsistent. By contrast, 2012 and 2013 data were collected, entered, and summarized by the same person (CG), lending increased consistency and reliability. The data are used here to describe current trends and

inform management recommendations. For reference, Appendix I includes recommendations from Monitoring & Controlling Invasive Plants at Rohn Cabin: 2012 Update (Greenstein and Carlson 2013), which was previously submitted to the Bureau of Land Management.

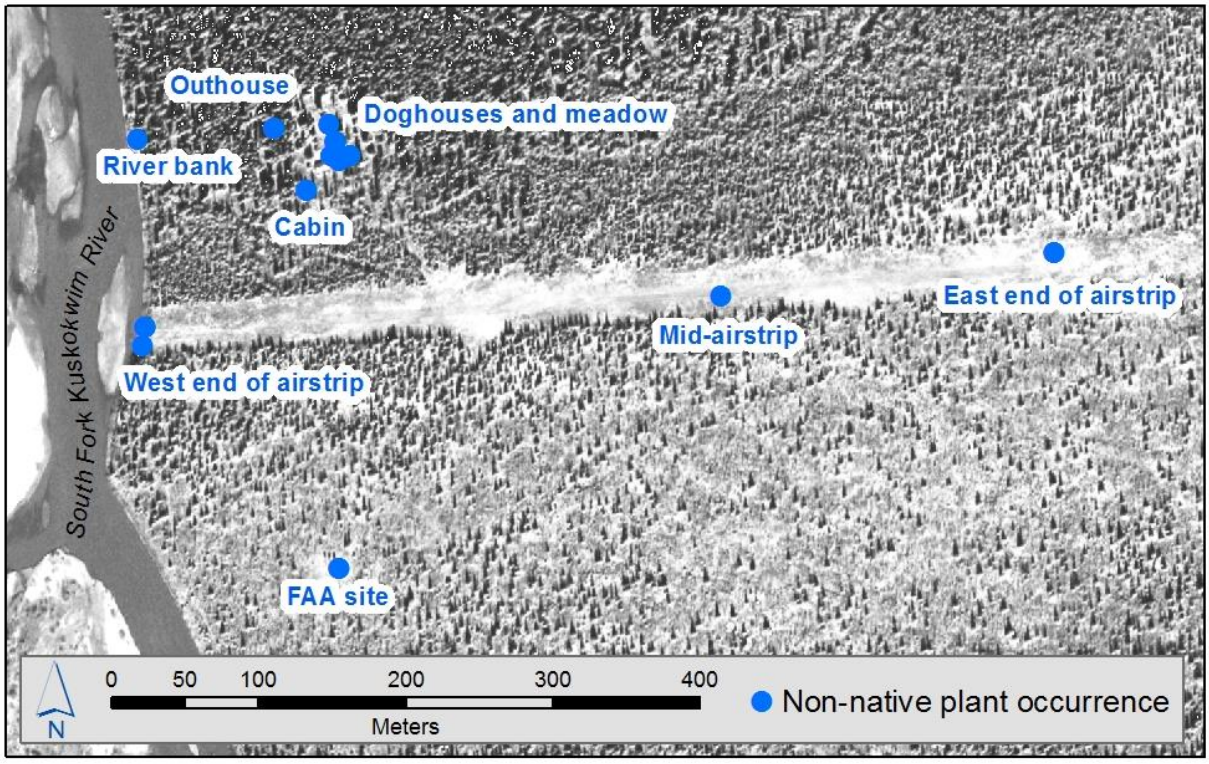

Figure 1 - Rohn Cabin site overview with non-native plant occurrences documented between 2009-2013

Table 1 - Species presence at Rohn Cabin across years. Records from 2009 and 2011 were taken from AKEPIC, records from 2012 and 2013 were observed in surveys. The native species *Descurainia sophioides* and *Erysimum cheiranthoides* were previously considered to be nuisance species and were controlled by the BLM. We did not survey for these species in 2013. *Hordeum jubatum* is generally considered native to Alaska and Yukon, but its distribution and abundance has increased dramatically in the last 100 years and it occupies many new areas due to importation by people and goods. We include *H. jubatum* here and elsewhere in the report with non-native species.

Scientific name	Common name	Invasiveness rank[1]	2009	2011	2012	2013
Brassica napus	rapeseed mustard	47	x			
Brassica rapa	birdsrape mustard	50	x	x		
Bromus inermis ssp. *inermis*	smooth brome	62			x	
Capsella bursa-pastoris	shepherd's purse	40	x			x
Cerastium fontanum ssp. *vulgare*	big chickweed	36	x			
Chenopodium album	lambsquarters	37	x	x	x	x
Crepis tectorum	narrowleaf hawksbeard	56	x	x	x	x
Galeopsis tetrahit	brittlestem hempnettle	50	x	x	x	x
Hordeum jubatum	foxtail barley	63	x	x	x	x
Hordeum vulgare	common barley	39			x	
Matricaria discoidea	pineappleweed	32	x	x	x	x
Phleum pratense	timothy	54	x			
Plantago major	common plantain	44	x			
Poa annua	annual bluegrass	46	x			
Poa pratensis[2]	bluegrass	52	x			
Polygonum aviculare	prostrate knotweed	45	x		x	x
Taraxacum officinale	common dandelion	58			x	x

For photos and descriptions of non-native species found at Rohn Cabin, see Appendix III.

[1] The invasiveness rank is calculated based on a species' ecological impacts, biological attributes, distribution, and response to control measures. The ranks are scaled from 0 to 100, with 0 representing a plant that poses no threat to native ecosystems and 100 representing a plant that poses a major threat to native ecosystems. For more information see Carlson et al. 2008.

[2] AKEPIC records indicate this is either *Poa pratensis* subspecies *pratensis* or subspecies *irrigata.* Both are non-native.

Site descriptions and recommendations

The following site descriptions provide overall biomass for each species recorded, which is calculated by multiplying infestation size by percent cover. It provides a simple comparison between the relative abundance of different species and across years. See Appendix II for a detail description of infestation size, percent cover, and stem count for each species at each site.

Rohn Cabin entrance

Last year's attempt to control weeds at the cabin entrance by tarping and applying moss sod appears successful. Figures 2-4 show changes in ground cover at this site over time. The area that was previously covered in a dense mat of foxtail barley and pineappleweed has been converted to mostly bare ground, with two small patches of pineappleweed growing in it. There was still abundant foxtail barley growing around the sides of the cabin, and also several stems of lambsquarters and shepherd's purse (also documented here in 2009, but not 2011 or 2012). One single, small (2 inches) stem of prostrate knotweed was found at this site, at a similar size and abundance as the previous year. It is worth noting that foxtail barley was definitely growing here in July 2012, but was not documented because it did not have flowers at that time and could not be identified. It is also likely that narrowleaf hawksbeard is present here, but is inconspicuous in July prior to flowering, and was not documented in 2013.

We removed the remaining tarp and revealed a mat of dead foxtail barley. The wood chips and detritus that had been laid over the tarp were raked over the exposed ground. This site is now mostly bare ground. Colonization by seeds or runners from adjacent vegetation is likely, including foxtail barley and pineappleweed, as well as native non-nuisance species such as Canada bluejoint, fireweed, yarrow, and/or raspberries. This site will need to be monitored and likely treated again in the future and/or native seed could be sown.

Table 2 – Biomass of non-native species found at Rohn Cabin entrance, calculated by multiplying infestation size by percent cover

Species	July 2012	August 2012	July 2013
Capsella bursa-pastoris (shepherd's purse)			0.001
Chenopodium album (lambsquarters)		0.0001	0.001
Crepis tectorum (narrowleaf hawksbeard)		0.0001	
Hordeum jubatum (foxtail barley)		0.15	1
Matricaria discoidea (pineappleweed)	0.5	0.05	0.01
Polygonum aviculare (prostrate knotweed)	0.0001	0.0001	0.0001

New recommendations for 2013

Although tarping appears successful in the short-term, there will likely be a resurgence of foxtail barley in 2014, given the large seed bank in the area and continued soil disturbance at the cabin entrance. Fortunately, foxtail barley seeds remain viable for only a short period of time, with viability decreasing quickly after three years (Conn and Deck 1995). Herbicide spot treatments for foxtail barley may be necessary, given this species' abundance in the vicinity of Rohn Cabin, and the large amount of soil that would be disturbed by hand-pulling. Recommendations for type of herbicide, applications rates, and timing can be found in Appendix I, in last year's treatment recommendations for the cabin entrance (Greenstein and Carlson 2013).

Figure 2 - Cabin entrance July 2012, before (left) laying tarp and after (right). Pineappleweed is outlined in yellow, foxtail barley is outlined in red, and the native fireweed meadow is outlined in blue.

Figure 3 - Cabin entrance August 2012 before (left) and after (right) the tarp was relocated and exposed soil covered with moss sod. Remaining foxtail barley is outlined in red.

Figure 4 - July 2013 follow-up treatment; exposed mat of dead foxtail barley (left), and weed-free cabin entrance (right)

Doghouses and meadow

The area around the doghouses (Figure 5) is still heavily infested with non-native plants. Foxtail barley dominates, with lambsquarters and hempnettle also present in large numbers. Pineappleweed is less abundant. This year foxtail barley stems were found moving into the forest on the north side of the meadow. Lambsquarters were spreading throughout the meadow and in greater quantity, density, and size than what was observed in 2012. As predicted last year, the countless stems of hempnettle less than 10 inches tall observed in 2012 appeared this year as fewer stems of large mature plants 2-3 feet tall. Pineappleweed was present in small numbers, presumably because it is short and is easily outcompeted by larger adjacent plants. A few stems of narrowleaf hawksbeard were found in the meadow, at the edge of the clearing in front of the cabin, which were not in this area in 2012. All stems were pulled by hand, with the exception of foxtail barley, for which the inflorescences were cut and bagged; digging plants out by the roots would cause extensive soil disturbance and was judged to do more harm than good. As previously mentioned, foxtail barley was surely present in July 2012, but was not documented because it could not be identified for lack of flowers. The presence of a single stem of common barley in August 2012 is an indication that this taxon is being introduced with sled dog bedding straw, but it is not adequately aggressive, well-adapted, or as numerous as foxtail barely to gain a foothold in this ecosystem.

Table 3 – Biomass of non-native species found around the doghouses and in the meadow, calculated by multiplying infestation size by percent cover

Species	July 2012	August 2012	July 2013
Chenopodium album (lambsquarters)	0.5	0.01	1
Crepis tectorum (narrowleaf hawksbeard)			0.001
Galeopsis tetrahit (brittlestem hempnettle)	0.1	1	1
Hordeum jubatum (foxtail barley)		1	1
Hordeum vulgare (common barley)		0.001	
Matricaria discoidea (pineappleweed)		0.001	1

New recommendations for 2013:

The foxtail barley population in and around the meadow is expanding and more aggressive management strategies may be needed to control it. Herbicides are likely the only way to effectively treat foxtail barley in the meadow, forest to the north of the meadow, and area surrounding the cabin and outhouse. Bagging inflorescences will reduce the seed bank, but not kill the plants. Removing this grass by the roots could limit the population, but it would generate a large amount of soil disturbance. Tarping would not be effective around the doghouses, because plants are too widely dispersed.

Figure 5 – At first glance the meadow in front of the cabin appears to be densely covered with fireweed and other native species (left). However on closer inspection, non-native species are interspersed, including abundant foxtail barley, lambsquarters, and hempnettle (right).

Outhouse and vicinity

The distribution of foxtail barley scattered throughout the forest surrounding the outhouse (Figure 6) was similar to last year. One stem of narrowleaf hawksbeard was also found. As we learned last year, there is likely more narrowleaf hawksbeard around, but it does not become easily visible until later in August, when their yellow flowers emerge. Basal rosettes are difficult to see through the dense fireweed and native grasses.

Table 4 – Biomass of non-native species found in the vicinity of the outhouse, calculated by multiplying infestation size by percent cover

Species	July 2012*	August 2012	July 2013
Crepis tectorum (narrowleaf hawksbeard)		0.001	0.001
Hordeum jubatum (foxtail barley)		0.5	1

*The outhouse area was not specifically surveyed on the July 2012 site visit.

New recommendations for 2013

As recommended for previous sites, the scattered stems of foxtail barley could be most effectively controlled with herbicides. The few stems of narrowleaf hawksbeard can be hand-pulled, as it is easily removed with minimal soil disturbance.

Figure 6 – Outhouse within a white spruce forest. Ground cover consists mostly of fireweed, with scattered stems of foxtail barley and narrowleaf hawksbeard.

South Fork of the Kuskokwim River

The forest behind the cabin extending to the river bank (Figure 7) was surveyed again in 2013. This area has been weed-free every time it was surveyed. Future establishment of non-native species in this area is unlikely and it should be considered a lower priority area.

No new recommendations for 2013.

Figure 7 - South Fork of the Kuskokwim River bank

East end of airstrip

No weeds were found here in 2012 or 2013. However, this area should continue to be a priority for surveying as it sees a lot of human traffic.

No new recommendations for 2013.

West end of airstrip

Two stems of foxtail barley were found at the bottom of the river bank, about one foot from the river. These were removed. On the west end of the airstrip itself, no weeds were found in 2012 or 2013. However, this area should continue to be a priority for surveying as it sees a lot of human traffic.

No new recommendations for 2013.

Mid-airstrip, south side

A small cluster of smooth brome was found near the middle of the airstrip (Figure 8) in 2012, but early detection and rapid response appear to have been successful in eradicating it. The population of approximately 30 stems in a two foot radius was hand-pulled in 2012. This area should continue to be a priority for surveying as it sees a lot of human traffic and associated gear and goods.

No new recommendations for 2013.

Figure 8 – Airstrip, removing smooth brome and looking west (left) and looking east (right)

FAA site

Only a few basal rosettes of common dandelion were found in 2013. These can be distinguished from the widely distributed and abundant horned dandelion, which is native, by the presence of wider leaves which are less deeply lobed and are more robust in appearance. About nine stems of common dandelion were found and all were pulled.

Table 5 – Biomass of non-native species found at the FAA site, calculated by multiplying infestation size by percent cover

Species	July 2012*	August 2012	July 2013
Crepis tectorum (narrowleaf hawksbeard)		0.001	
Taraxacum officinale (common dandelion)		0.001	0.0001

*The FAA area was not specifically surveyed on the July 2012 site visit.

No new recommendations for 2013.

Figure 9 - FAA site

Conclusions and recommendations

General recommendations for continued surveys and treatment at Rohn Cabin were provided in the 2012 summary report. These are still valid and remain as our best suggestions for management. They are as follows:

- Upon visiting the Rohn Cabin site, begin monitoring and treatment activities at areas with the least abundance or likelihood of finding weeds. Start with the FAA site, airstrip, and survey areas behind the cabin and elsewhere where weeds have not yet been reported. Next, move into areas with known, dense populations, including the cabin entrance, outhouse, and doghouses. This will help avoid unintentionally spreading seeds into uninfested areas.

- A thorough accounting and accurate identification of species around Rohn Cabin is necessary to track progress between years. All non-native plant populations should be documented in detail to ensure effective monitoring, assess the efficacy of control over time, and allow for changes to treatment approaches where appropriate. A change of three sampling locations in 2009, two in 2011, and six in 2012 reflects the survey strategies of different botanist involved on each trip. It would be beneficial to have the same botanist do surveys each year.

- All weeds should be collected (prior to fruiting) in contractor bags or doubled-up garbage bags and flown off site for disposal. On site disposal by burning bags of weeds in a contained unit, such as a burn barrel may be an acceptable alternative if transportation costs and volume of weeds are too high.

- BLM staff and volunteers visiting Rohn Cabin in the summer should take care to clean boots, gear, and equipment before leaving Anchorage or other cities, to avoid transporting weed seeds from the urban center to the site.

- Timing a weed collection trip for late July or early August would be ideal. The first week of July is too early to scout for invasive species. By the last week of August some mustards have already set seed, but other species can still be managed. Treatment of some species may require springtime tillage, so a trip may also be necessary in late May or June.

- Iditarod Trail Race considerations
  - Certified weed-free straw is currently required for special use permits at Rohn Cabin. This should be a permanent requirement and should continue to be enforced.
  - Offer dog team owners in the area information on where weed-free straw for dog bedding is available.
  - Encourage those using snow machines on-site to inspect and clean their machines before bringing them to the cabin.
  - Encourage those working in support of the Iditarod Race to clean their boots and gear

before leaving for Rohn Cabin; seeds can be transported even in winter.

- Provide training and educational materials regarding plant identification, impacts, and preventative actions to the public, and to those involved with Rohn Cabin activities. Update educational materials in the Rohn Cabin binder, including plant identification and prevention practices.

- Although the yellow-flowered mustards *Descurainia sophioides*, *Erysimum cheiranthoides,* and *Erysimum inconspicuum* are considered introduced to the Rohn Cabin site, they are native to Alaska and found in habitats similar to Rohn Cabin. *Descurainia sophioides* and *Erysimum cheiranthoides* can form high-density weedy patches on disturbed substrates that can be counter to management goals. *Erysimum inconspicuum*, on the other hand, is not known to us to form dense patches and is unlikely to interfere with management goals. We recognize that the first two species may be targeted for control, but we recommend that clearly non-native taxa are higher priorities.

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Appendix I – Management recommendations from Greenstein and Carlson 2013 (Monitoring & Controlling Plants at Rohn Cabin: 2012 update)

Rohn Cabin entrance

• *Brassica napus, Brassica rapa, Capsella bursa-pastoris, Cerastium fontanum* ssp. *vulgare, Chenopodium album, Crepis tectorum, Galeopsis tetrahit, Phleum pratense, Plantago major, Poa pratensis* ssp. *pratensis* or ssp. *irrigata*, *Polygonum aviculare*

These species were either not present at the cabin entrance on the 2012 visits, or were present in low numbers that could be easily hand pulled. Future control efforts should be on the lookout for these species, and should remove them by digging the plant and roots out by hand. If they are not eradicated from the cabin entrance by 2015, a new approach should be considered.

• *Descurainia* cf. *sophioides*, *Erysimum cheiranthoides*

These species were present in somewhat larger numbers, but consensus of their nativity is lacking. The *Descurainia* present at Rohn appears to be the native *Descurainia sophioides*. These plants have a pubescence that some authors (Hultén 1968) consider consistent with the non-native *D. sophia*. The total constellation of traits, however, is a good fit for more recent treatments of the native *D. sophioides*. This native species can behave in a very weedy manner and often reaches very high densities following fire and in human-disturbed areas. *Erysimum cheiranthoides* is generally considered to include native and non-native genotypes in Alaska, and because of the species' widespread nature and presence in undisturbed areas it is not included on AKNHP's non-native species list. Regardless of its statewide rarity, *E. cheiranthoides* is often introduced into new areas by human activity. Assuming removal of weedy regionally introduced species such as these is a BLM goal, we recommend hand pulling prior to flowering over multiple years. These species behave primarily as biennials and are easily pulled by hand; if they are removed prior to seed drop, control of populations should be attainable. Additionally, reducing open mineral soil by encouraging other plant establishment will limit recruitment of the seed bank. Overall, because these species are native to the state and widespread, we place a low priority on their control and elimination.

• *Hordeum jubatum, Matricaria discoidea*

These form a dense mat in front of the cabin. *Matricaria discoidea* is only weakly invasive, having little documented negative effects on ecosystems (see Carlson et al. 2008), and does not persist without disturbance and/or trampling. It is included here because it forms a near continuous mat with *Hordeum jubatum* at the cabin entrance.

Hordeum jubatum is native to Alaska, but has spread dramatically in recent decades due to anthropogenic disturbance. It is a perennial weed and difficult to control. It has fibrous, shallow roots that form dense mats but do not penetrate very deep. Tarping this population was tried on the August 2012 visit to Rohn Cabin, but there is no literature suggesting this is an effective method. If the method is successful, then we recommend that it should be implemented in the future, until the seed bank is depleted. Seeds remain viable for only a short period of time, with viability quickly decreasing after three years (Conn and Deck 1995).

Tarping perhaps slowed down the reproduction and spread of *Hordeum jubatum*, but more than likely additional control measures will be needed. Spring tillage can control this plant, due to the absence of rhizomes or stolons (Conn and Deck 1995). Tilling will increase weed seed germination and emergence, so all weeds at the site will need to be removed before setting seed. However, as weed emergence increases, the longevity of the seed bank decreases (Roberts and Feast 1972, 1973). Consequently, the long-term benefits should outweigh the short-term costs of necessary follow-up treatments in the same growing season after tillage (Conn 2006).

Species growing in the vicinity of the *Hordeum jubatum* mat at the cabin entrance and in the meadow that would be affected by tilling include *Chenopodium album, Descurainia sophioides*, *Erysimum cheiranthoides,* and *Galeopsis tetrahit.* These are all annuals that reproduce by seed only. Therefore tilling any or all of these species will have roughly the same outcome; seed emergence will initially increase, but the seed bank will be exhausted more quickly. The duration of seed viability varies between species (AKEPIC Species Biographies), but all favor disturbed areas and are unlikely to persist after native plants reclaim sites.

If tarping and tillage are not effective, it may be necessary to use herbicide. The most effective method for controlling *Hordeum jubatum* in Alaska, as determined by Conn and Deck (1995), is to use a combination of 1.1 kg/ha glyphosate, 2.2 kg/ha ammonium sulfate, and 0.5% nonionic surfactant, applied between early August and mid-September. Timing is important, as efficacy greatly increases after plants flower and seeds mature; herbicides are least effective while stems are undergoing seed fill. As previously mentioned, seeds remain viable for up to three years, so follow up treatments will be needed for at least that long, or until the population is contained or eradicated.

Given the abundance of native plants in the surrounding area, there should be enough dispersal to reestablish native vegetation on disturbed sites without human intervention. However, if it is observed that this is not occurring, areas disturbed by weed removal could be reseeded manually. Ideally, seeds of native *Calamagrostis canadensis* should be collected at Rohn Cabin the summer of 2013 and stored for future use.

Doghouses and meadow

- *Chenopodium album, Descurainia* cf. *sophioides, Galeopsis tetrahit, Hordeum jubatum*

These species are found in the greatest numbers and density immediately surrounding the middle and northernmost doghouses. Densities decrease farther away from the doghouses, but stems can still be found reaching into the surrounding meadow. The recommendations provided for *Hordeum jubatum* at the cabin entrance apply to the central dense patch of weeds in the meadow. If tarping, tilling, or herbicide use takes place, this central patch can be delineated by where the ratio of non-native to native plants is 50:50. Areas with less than 50% non-native plants should be hand pulled, and the central patch of dense weeds should be treated with one or more of the aforementioned methods.

- *Erysimum cheiranthoides , Hordeum vulgare, Matricaria discoidea*

Few stems of these species were found around the doghouses in the meadow. The stems found within the central dense patch discusses above would be treated along with the aforementioned species. Those solitary stems creeping into the meadow should be hand pulled.

Outhouse and vicinity

- *Descurainia* cf. *sophioides*

This weedy species native to Alaska, yet locally introduced, is also found immediately around the outhouse, along the front and sides. This and other unwanted plants will likely continue to be a modest problem at this site, due to frequent disturbance and trampling. For now, we recommend implementing hand pulling to keep weeds in check. Should the abundance or diversity of unwanted plants increase in the future, more aggressive management strategies may be needed.

- *Crepis tectorum, Hordeum jubatum*

These were found scattered throughout the undergrowth in the vicinity of the outhouse. The best approach for removing these dispersed stems is to pull each out by the roots. However, this is a time consuming process, and plenty of time should be allowed to completely survey the area. The density, infested area, and number of stems should be documented on each visit; if it appears this method is not effective, more aggressive management strategies may be needed in the future.

- *Elymus trachycaulus*

There is a dense patch of grass behind the outhouse, which at first glance may resemble non-native *Elymus repens* (quackgrass). However, this is the native *Elymus trachycaulus*, which is unusually wide-leaved and robust, and should not be removed.

South Fork of the Kuskokwim River

- *Erysimum inconspicuum*

Although the BLM has requested removing all yellow-flowered mustards from the vicinity of Rohn Cabin, this is a native and non-weedy species. The river bank is the only place this plant was found; it was nowhere near disturbed sites or other weedy mustards. It is recommended that *Erysimum inconspicuum* is not removed.

East end of airstrip

- *Crepis tectorum, Descurainia* cf.*sophioides*

These two species were not found on the 2012 site visit (although they were noted on earlier visits) and may have been eradicated from this location. The east end of the airstrip should be monitored on each visit, and if weeds reappear, they should be hand pulled. We recommend collecting *Descurainia* specimens in late flower to fruit to confirm that they are not the species alien to Alaska.

West end of airstrip

- *Poa annua, Poa pratensis*

These grasses were not found on the 2012 site visit (although they were noted on earlier visits), and may

have been eradicated from this location. The west end of the airstrip should be monitored on each visit, and if weeds reappear, they should be hand pulled. If *Poa pratensis* is relocated, we recommend collection of material for identification as the subspecies identity is unclear for this site.

Mid-airstrip, south side

- *Bromus inermis* ssp. *inermis*

Only found in 2012, this young population was discovered and pulled early enough that it may not reappear in 2013. If it does, hand-pulling is recommended, ensuring all roots are removed. A 20 m radius around the population should be carefully surveyed to look for any outlying stems.

FAA site

- *Crepis tectorum, Descurainia* cf. *sophioides*, *Taraxacum officinale*

On the 2012 visit there were extremely few stems of each of these species. Monitoring and hand pulling at this site should continue until no weeds are found for three consecutive years. There is relatively little traffic at this site and therefore little opportunity for reintroduction of weed seeds or propagules.

Appendix II – Infestation size, percent cover, and stem count at each site

Cabin entrance

Species	July 2012	August 2012	July 2013
Capsella bursa-pastoris (shepherd's purse)			
infestation size (acres)	-	-	0.001
percent cover	-	-	1
stem count	-	-	6-25
Chenopodium album (lambsquarters)			
infestation size (acres)	-	0.01	0.001
percent cover	-	0.01	1
stem count	-	1-5	6-25
Crepis tectorum (narrowleaf hawksbeard)			
infestation size (acres)	-	0.01	-
percent cover	-	0.01	-
stem count	-	1	-
Hordeum jubatum (foxtail barley)			
infestation size (acres)	-	0.01	1
percent cover	-	15	1
stem count	-	500+	500+
Matricaria discoidea (pineappleweed)			
infestation size (acres)	0.01	0.01	0.01
percent cover	50	5	1
stem count	151-500	51-150	151-500
Polygonum aviculare (prostrate knotweed)			
infestation size (acres)	0.01	0.01	0.001
percent cover	0.01	0.01	1
stem count	1-5	1	1

Doghouses and meadow

Species	July 2012	August 2012	July 2013
Chenopodium album (lambsquarters)			
infestation size (acres)	0.01	0.1	1
percent cover	50	0.01	1
stem count	151-500	1-5	500+
Crepis tectorum (narrowleaf hawksbeard)			
infestation size (acres)	-	-	0.001
percent cover	-	-	1
stem count	-	-	1-6
Galeopsis tetrahit (brittlestem hempnettle)			
infestation size (acres)	0.01	0.1	1
percent cover	10	10	1
stem count	1-5	500+	500+
Hordeum jubatum (foxtail barley)			
infestation size (acres)	-	0.1	1
percent cover	-	20	1
stem count	-	500+	500+
Hordeum vulgare (common barley)			
infestation size (acres)	-	0.1	-
percent cover	-	0.01	-
stem count	-	1-5	-
Matricaria discoidea (pineappleweed)			
infestation size (acres)	-	0.1	1
percent cover	-	0.01	1
stem count	-	1-5	500+

Outhouse and vicinity

Species	July 2012	August 2012	July 2013
Crepis tectorum (narrowleaf hawksbeard)			
infestation size (acres)	N/A*	0.1	0.001
percent cover	N/A	0.01	1
stem count	N/A	6-25	1-5
Hordeum jubatum (foxtail barley)			
infestation size (acres)	N/A	0.1	1
percent cover	N/A	5	1
stem count	N/A	51-150	51-150

West end of airstrip

Species	July 2012	August 2012	July 2013
Hordeum jubatum (foxtail barley)			
infestation size (acres)	-	-	0.001
percent cover	-	-	1
stem count	-	-	1-5

Mid-airstrip, south side

Species	July 2012	August 2012	July 2013
Bromus inermis ssp. *inermis* (smooth brome)			
infestation size (acres)	-	0.001	-
percent cover	-	1	-
stem count	-	26-50	-

FAA site

Species	July 2012	August 2012	July 2013
Crepis tectorum (narrowleaf hawksbeard)			
infestation size (acres)	N/A*	0.1	-
percent cover	N/A	0.01	-
stem count	N/A	1	-
Taraxacum officinale (common dandelion)			
infestation size (acres)	N/A	0.1	0.001
percent cover	N/A	0.01	0.001
stem count	N/A	1	6-25

Appendix III – Photos and descriptions of non-native species found at Rohn Cabin

Sunflower Family (Asteraceae)

Common dandelion • *Taraxacum officinale*

Invasiveness Rank: 58 points — Species Code: TAOF

Description:

Stems

- Unbranched, unlike narrowleaf hawksbeard (*Crepis tectorum*)
- Flowering stalks are leafless and hollow
- All leaves are basal and lobed

Inflorescence

- Single flower per stem, unlike narrowleaf hawksbeard (*Crepis tectorum*)
- Involucral bracts are
  - NOT distinctly horned (unlike native horned dandelion (*Taraxacum ceratophorum*) found at Rohn
  - Outer rows are reflexed or spreading (unlike most native dandelions)
  - NOT blackish-green (unlike some native dandelions)

Fruits

- Straw-colored achenes
- White pappus

Habitat: disturbed areas

At Rohn, common dandelion is found at the FAA site.

Narrowleaf hawksbeard • *Crepis tectorum*

Invasiveness Rank: 56 points | Species Code: CRTE3

Description:
Winter annual, 0.3-0.9 m tall
Leaves

- Some form a basal rosette
- Stem leaves have extensions at the base that appear to clasp the stem

Inflorescence

- Involucral bracts arranged in two rows
- Involucral bracts are densely hairy on the inside

Habitat: disturbed sites including forest clearings, abandoned fields, agricultural fields, pastures and roadsides

At Rohn, found in the forest and meadow around the cabin and outhouse

Sunflower Family (Asteraceae)

Pineappleweed • *Matricaria discoidea*

Invasiveness Rank: 32 points | Species Code: MADI6

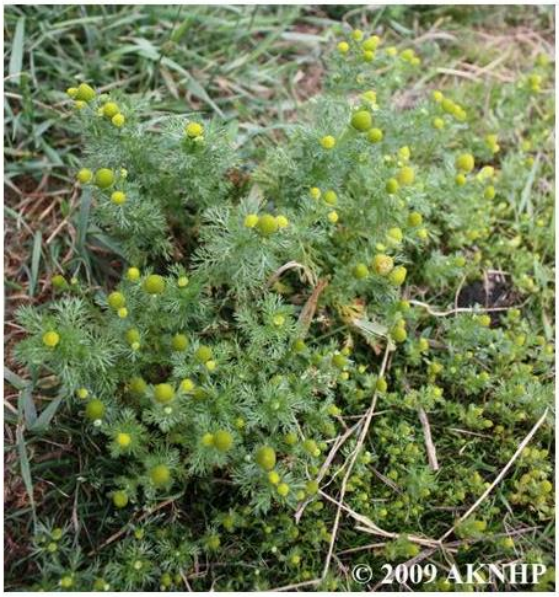
Description:
Annual, <30 cm tall
Leaves

- Divided several times into narrow segments
- Strong odor when crushed, similar to chamomile
- Similar in appearance to native yarrow (*Achillea*) but leaves are less feathery and produce a different scent

Inflorescence

- Cone-shaped flowers
- Greenish-yellow

Habitat: compacted soils of roadsides, farmyards and waste areas
At Rohn, pineappleweed is found at the cabin entrance and in the meadow



Field mustard • *Brassica rapa*

Invasiveness Rank: 50 points | Species Code: BRRA

Description:
Winter annual or biennial
0.3-1.2 m tall
Stems and leaves

- Smooth and green
- Lower leaves < 30 cm long with a large terminal lobe and smaller lateral lobes
- Upper leaves are small, clasping, and are not lobed
- Underside of leaves are hairy

Inflorescence

- Deep yellow
- 6-11 mm long
- When open, flowers equal or over-top buds

Fruits

- Siliques are 3.8-6.4 cm long
- Borne on long pedicles
- Pods do not have hairs
- Pods have a conspicuous beak 13-19 mm long and round in cross-section

Habitat: cultivated fields, abandoned cabins, roadsides; beaches and other naturally disturbed sites along the coast
At Rohn, this species has not been seen since 2009, when it was found at the cabin entrance

Rapeseed • *Brassica napus*

Invasiveness Rank: 47 points | Species Code: BRNA

Description:
Similar to *Brassica rapa* (see previous page)
Inflorescence

- Gold to cream-colored to pale yellow
- Petals are broadly egg-shaped, 10-16 mm long and 6-9 mm wide
- When open, flowers do not overtop buds

Habitat: abandoned gardens, old home sites, roadsides, waste areas
At Rohn, this species has not been seen since 2009, when it was found at the cabin entrance

Brassica napus is an important oil (rapeseed or canola oil) and vegetable crop (rutabaga) that easily escapes cultivation. In temperate North America it is a widespread and naturalized weed.

Shepherd's purse • *Capsella bursa-pastoris*

Invasiveness Rank: 40 points | Species Code: CABU2

Description:
Annual or winter annual
Has a mix of simple and other types of hairs
Leaves

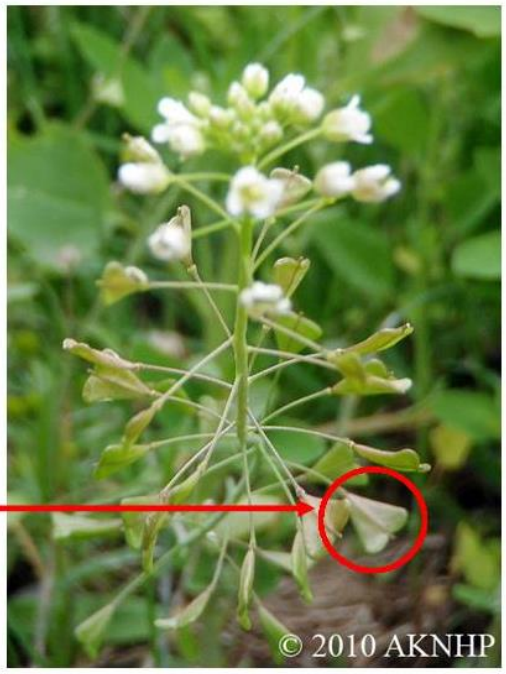
- Slightly to deeply lobed
- Basal rosette is composed of entire to dissected leaves
- Stem leaves are clasping and arrow-shaped at the base

Inflorescence

- White

Fruits

- Heart-shaped silicles
- Silicles are almost as long as they are broad



Habitat: roadsides, cultivated fields, waste areas
At Rohn, shepherd's purse is found at the cabin entrance

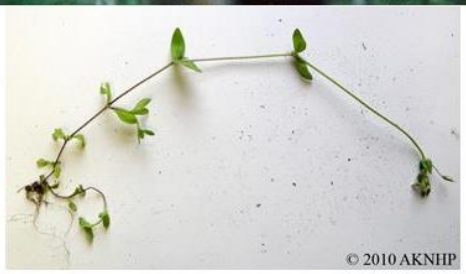
Big chickweed • *Cerastium fontanum* ssp. *vulgare*

Invasiveness Rank: 36 points Species Code: CEFOV2

Description:
Biennial or perennial
Stems and leaves
- Hairy

Inflorescence
- Petal tips have two lobes
- Petals are equal to or slightly longer than sepals
- Sepals are hairy; hairs are not longer than the sepal tip

Habitat: roadsides, waste places, gardens, fields
At Rohn, this species has not been seen since 2009, when it was found at the cabin entrance



Lambsquarters • *Chenopodium album*

Invasiveness Rank: 37 points Species Code: CHALA

Description:
Annual
Stems
- Often turn reddish as the plant matures

Leaves
- Triangular with irregular lobes
- Green on top and white-mealy on the bottom
- Taste like spinach

Inflorescence
- Clustered in panicles
- Five tiny, greenish sepals

Fruits
- Seeds are black, shiny, circular, flattened, and enclosed in a thin, white, papery envelope

Habitat: disturbed soils in clearings, burns, river bars, waste places, and cultivated soil
At Rohn, lambsquarters is found in the meadow and around the cabin

Mint Family (Lamiaceae)

Bristlestem hempnettle • *Galeopsis tetrahit*

Invasiveness Rank: 50 points | Species Code: GATE2

Description:

Stems

- Square
- Swollen below nodes
- Bristly

Leaves

- Opposite, with each pair at a 90° angle from the pair above/below
- Ovate
- Margins are broadly serrated
- Leaf base is wedge-shaped

Inflorescence

- In leaf axils
- Purplish-pink or white
- Pubescent
- Middle lobe is notched

Habitat: disturbed sites, roadsides, forests; moist soil
At Rohn, hempnettle is found in the meadow

Common plantain • *Plantago major*

Invasiveness Rank: 44 points | Species Code: PLMA2

Description:
Annual, biennial or perennial
Leaves
- Ovate
- 3-5 prominent ribs
- Smooth margins
- Basal rosette only

Inflorescence
- Small and clustered in spikes
- Greenish-white, turning brown

Fruits
- Ovate capsule that splits around the middle
- >6 seeds per capsule

Habitat: cultivated fields, lawns, roadsides, waste areas, open woods and valleys; mid-montane locations
At Rohn, this species has not been seen since 2009, when it was found at the cabin entrance

Most botanists specializing in northern floras think there were, or still are, native populations of *Plantago major*

Prostrate knotweed • *Polygonum aviculare*

Invasiveness Rank: 45 points Species Code: POAV

Description:

Annual

Stems

- Trailing
- <1 m long
- Silvery papery sheaths at leaf bases

Leaves

- Green to bluish-green to gray-green
- Leaves linear to oblong
- Stem leaves are 1-4 times longer than branch leaves; largest leaves are 2.5-6 cm long
- Sessile or with short petiole

Inflorescence

- 3-6 flowers clustered in the axils of reduced upper leaves
- Tepals are reddish brown with white, pink, or red margins
- Tepals resemble petals and are not keeled

Fruits

- Achenes are dull and mostly included within the calyx
- 2.2-3 mm long
- Dark brown

Habitat: human and naturally disturbed sites

At Rohn, prostrate knotweed is found at the cabin entrance

Grass Family (Poaceae)

Smooth brome • *Bromus inermis* ssp. *inermis*

Invasiveness Rank: 62 points | Species Code: BRINI

Description:

Perennial

Roots

- Rhizomes

Leaves

- Sheath closed with a small v-shaped notch
- Ligules 1-2 mm long and brownish at the base

Inflorescence

- Spikelets are large and resemble a flattened cigar; there are no native grass species at Rohn that resemble smooth brome. However, native Pumpelly's brome (*Bromus pumpellianus*) looks identical but is densely hairy, and is found in natural areas throughout Alaska.
- 2+ florets per spikelet
- Lemmas are smooth or very faintly hairy on nerves and at the base
- Lemmas may or may not have awns; if present are < 2 mm long

Habitat: roadsides, meadows, open woods, forest clear cuts
At Rohn, smooth brome was found mid-airstrip on the south side in 2012 only

Grass Family (Poaceae)

Traits of *Hordeum* species in Alaska:

- 3 spikelets per node but the two lateral ones are often reduced to awns
- Each spikelet has one flower
- All spikelets have 2 glumes

Foxtail barley • *Hordeum jubatum*

Invasiveness Rank: 63 points | Species Code: HOJU

Nativity of this species is disputed. Foxtail barley is most likely to have been present in eastern interior Alaska prior to European contact. However, it appears to have spread dramatically in the last half century. It is considered a nuisance weed due to the ability of awns to become lodged in the noses and mouths of animals.

Description:

Perennial

Leaves

- No auricles, unlike common barley (*H. vulgare*)

Inflorescence

- Turn purple to tawny and disarticulate (come apart) at maturity
- Awns of lemmas are 1-6 cm long

Habitat: waste places, roadsides, river banks, lake shores, wetlands

At Rohn, foxtail barley is abundant in the meadow, at the cabin, and in the forest surrounding the outhouse

Common barley • *Hordeum vulgare*

Invasiveness Rank: 39 points Species Code: HOVU

Description:
Annual
Leaves

- Well-developed auricles, <6 mm, unlike foxtail barley (*Hordeum jubatum*)

Inflorescence

- Do not disarticulate at maturity, unlike foxtail barley (*H. jubatum*)
- Awns are absent on sterile florets
- Awns of lemmas, when present, are long, 3-18 cm

Habitat: disturbed roadsides, agricultural fields; contaminant of straw
At Rohn, common barley was found in 2012 in the meadow

Timothy grass • *Phleum pratense*

Invasiveness Rank: 54 points | Species Code: PHPR3

Description:

Leaves

- Sheath of the upper leaf on the stem is not inflated, unlike native alpine timothy (*P. alpinum*)

Inflorescence

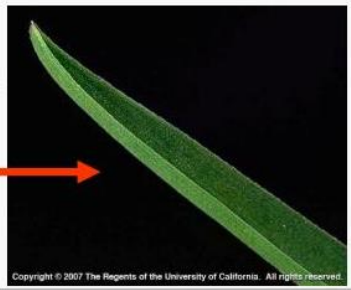
- Long, cylindrical, spike-like panicle; native alpine timothy (*P. alpinum*) has a shorter, ovoid panicle
- Glumes have awns (unlike *Alopecurus* species)

Habitat: meadows and roadsides

At Rohn, timothy grass was found in 2009 at the cabin entrance

Traits of *Poa* species in Alaska:

- There are many *Poa* species that are native to Alaska that can grow in disturbed sites alongside their non-native counterparts
- All *Poa* species have leaves with a boat-shaped blade tip and are abruptly contracted at the tip
- This is a difficult group to key out correctly



Kentucky bluegrass • *Poa pratensis* ssp. *pratensis*

Invasiveness Rank: 52 points Species Code: POPR

Description:

Perennial

30-100 cm tall (typically taller than *P. pratensis* ssp. *irrigata*)

Grows in tufts

Roots

- Strongly rhizomatous, mat-forming

Stems

- Smooth, not glaucous

Leaves

- Not glaucous (unlike *P. pratensis* ssp. *irrigata*)
- Soft, flat or folded
- 2-4 mm wide
- Often numerous basal leaves

Inflorescence

- Panicle 10-35 cm long
- Panicle branches are more or less scabrous
- Several to many spikelets per branch
- Spikelets crowded, each 3-6 mm long and with 3-5 flowers
- 3-5 inflorescence branches per node, with the lowermost branches in whorls of 4-5 (unlike *P. pratensis* ssp. *irrigata,* which has 1-2)
- Anthers 1-2 mm long
- Tuft of hair at the base of the lemma

Habitat: disturbed sites; lawns, waste areas; drier sites than *P. pratensis* ssp. *irrigata*

At Rohn, bluegrass was found in 2009 at the east end of the airstrip

Spreading bluegrass • *Poa pratensis* ssp. *irrigata*

Invasiveness Rank: 52 points Species Code: POPR

Description:

8-30 cm tall (typically shorter than *P. pratensis* ssp. *pratensis*)

Roots

- Strongly rhizomatous, mat-forming

Leaves and stems

- Somewhat glaucous (unlike *P. pratensis* ssp. *pratensis*)
- Leaf blades are flat

Inflorescence

- 1-2 branches per node (less than *P. pratensis* ssp. *pratensis*)
- Panicle branches are more or less scabrous
- Panicles have few spikelets per branch
- Glumes are somewhat glaucous
- Anthers 1-2 mm long
- Tuft of hair at the base of the lemma

Habitat: disturbed sites; lawns, waste areas; wet, sandy ground

At Rohn, bluegrass was found in 2009 at the east end of the airstrip

Annual bluegrass • *Poa annua*

Invasiveness Rank: 46 points Species Code: POAN

Description:
Annual or biennial
2-20 cm tall
Grows in tufts
Stems

- Ascending
- Smooth

Leaves

- Basal leaves are light green or yellowish-green, soft, smooth, flat or folded, and much shorter than stems
- 1-2 stem leaves (most leaves are basal)
- Sheaths are smooth and hyaline

Inflorescence

- Spikelets purple to green to yellowish-green
- Spikelets have 3-6 flowers
- Glumes are narrow, acute, unequal, and boat-shaped
- Lower glumes have 1 nerve, upper glumes have 3 nerves
- Lemmas have 5 nerves
- No tuft of hairs at the base of the lemma
- Anthers <1 mm long

Habitat: lawns, waste areas, roadsides
At Rohn, annual bluegrass was found in 2009 at the east end of the airstrip