Funny River Fire invasive plant survey

Matthew L. Bowser and John M. Morton
U.S. Fish & Wildlife Service, Kenai National Wildlife Refuge, Soldotna, Alaska

October 1, 2015

Abstract

The 2014 Funny River Fire and related fire suppression activities provided ample opportunities for invasion of exotic plants into the interior of the Kenai National Wildlife Refuge. We surveyed helispots, cabins, horse trails, bulldozer lines, and masticated fuel breaks for exotic plants, documenting 53 occurrences of 14 exotic plant species. We found no exotic species that were new to this area; most weed species that we found had already been established locally. *Cerastium fontanum vulgare*, *Trifolium repens*, and *Matricaria discoidea* had begun to disperse along bulldozer lines, but they are unlikely become truly invasive in nearby undisturbed areas. *Crepis tectorum* had invaded newly bared ground at one site and burned ground at another site. Due to its currently growing population in the urban interface around the Refuge and its ability to exploit burned areas, *Crepis tectorum* may be able to exploit the Funny River Fire footprint to more rapidly invade the interior of the Refuge. Exposed mineral soil along bulldozer lines and burned soils will remain vulnerable to invasion by wind-dispersed weeds until they are revegetated with native plants.

Introduction

The Funny River Fire (AK-KKS-403140) was ignited on May 19, 2014 and spread to 196,610 acres, mostly within the Kenai National Wildlife Refuge (Saperstein et al., 2014; Helmes, 2015, Figure 1). As part of fire suppression efforts, 12.7 miles of bulldozer line were established (Newbould, 2014) in the vicinity of Funny River Road and near the trailhead of the Pollard Horse Trail. Bulldozer lines were subsequently rehabilitiated by adding water bars to control erosion, roughing up compacted soils, and placing slash over the lines. A 3.5 mile long, 200 ft. wide masticated fuel break had been constructed off of Funny River Road in winter 2012-2013 and was used for containment and burn-out operations during the Funny River Fire (Saperstein et al., 2014; Helmes, 2015).

Fire suppression efforts and the fire itself presented a high risk of fascilitating invasions of exotic plant species into relatively weed-free portions of the Kenai National Wildlife Refuge. Movement of vehicles, aircraft, and heavy equiment from distant areas to the fire may have acted as vectors of exotic species that had not previously existed in the vicinity of the Refuge. For exotic species that had already been present in the urban interface around the Refuge but that had not yet successfully invaded the interior of the Refuge, fire suppression activities, especially construction of bulldozer lines, could have enabled their expansion into the Refuge. Even without firefighting activities, burning of so large an area adjacent to the weed-infested urban interface opened up much potential habitat for some weedy species that have the capacity to exploit burned areas and exposed mineral soil. *Crepis tectorum* and *Melilotus officinalis*, both present on the Kenai Peninsula, have been shown to invade burned areas in Alaska (Villano and Mulder, 2008).

Methods

Surveys were conducted on July 20, 2015 using a Bell 206B Jetranger. We selected 34 sites: six cabins, 21 helispots, two spike camps, and seven sites along the Hanson Horse Trail (Figure 1, Table 1). All except the horse trail sites had previously been identified as places where fire suppression activities had occurred. The horse trail sites were those surveyed for invasive plants by Grimes (2006), also summarized in the appendix of Morton et al. (2007). Some of the cabin sites had been surveyed for weeds following the 2004 Glacier Creek Fire (Carlson and Cortés-Burns, 2005; Morton et al., 2007).

We visited 21 of the 34 sites, but at some sites there was not a suitable landing area. We performed on-the-ground surveys at 14 sites.

In addition, sections of bulldozer lines near their starting points from roads and trails were surveyed along Funny River Road on August 3 and in the vicinity of the start of the Pollard Horse Trail in Kasilof on August 4.

All observations were posted on inaturalist.org and will be submitted to AKEPIC (http://aknhp.uaa.alaska.edu/botany/akepic/).

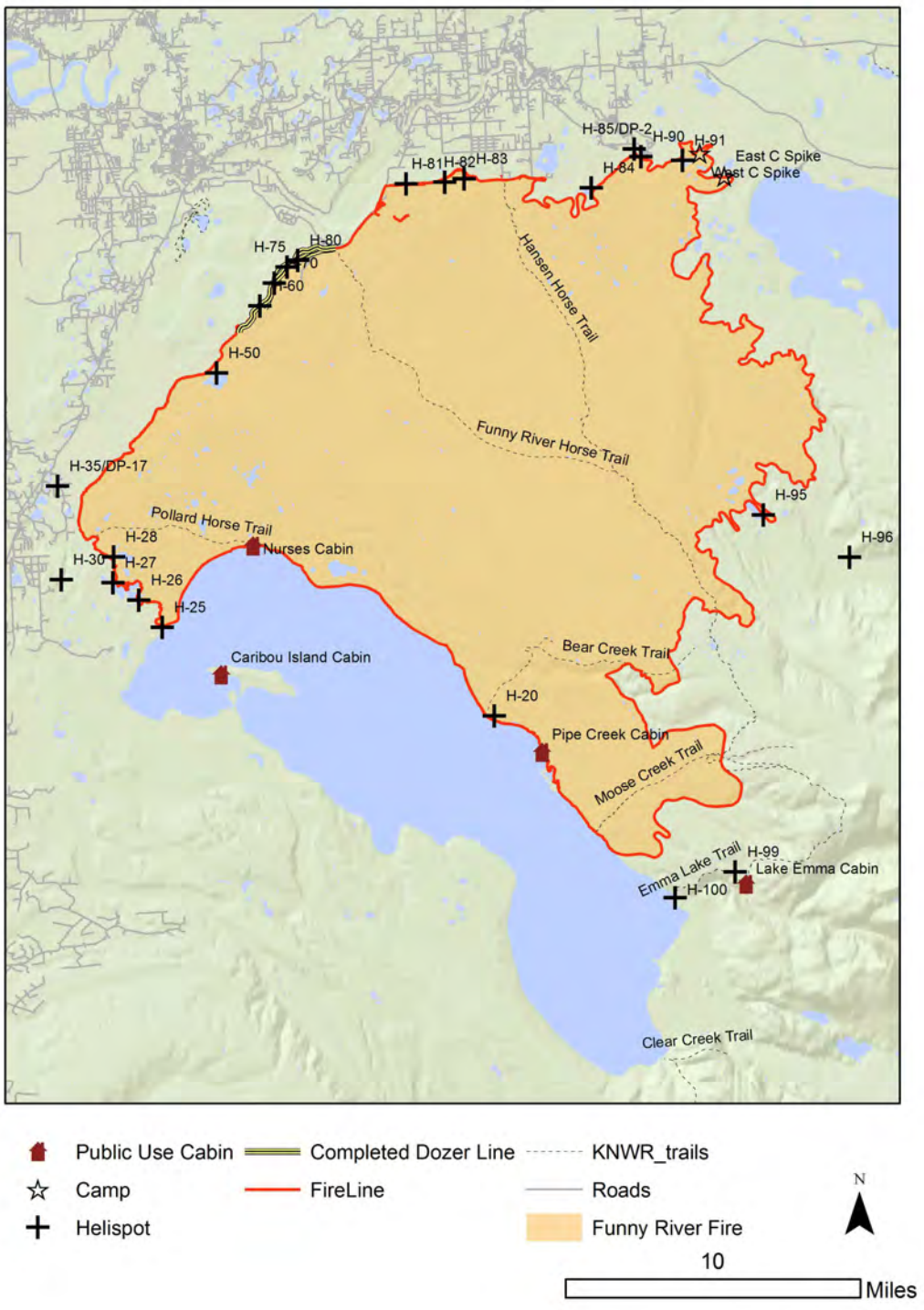

Figure 1: Map of sampling locations.

Table 1: Site data.

site label	site type	latitude	longitude	visit type	no visit reason
Caribou Island Cabin	cabin	60.23842164	-151.0665843		time constraints
H-100	cabin	60.11911701	-150.6294094	boots on ground	
H-20	cabin	60.21216666	-150.7988333	boots on ground	
Lake Emma Cabin	cabin	60.12403057	-150.5585829		no landing site
Nurses Cabin	cabin	60.30052453	-151.0295338		time constraints
Pipe Creek Cabin	cabin	60.19343497	-150.7531959	boots on ground	
H-25	helispot	60.26283265	-151.1230417	boots on ground	
H-26	helispot	60.2765	-151.1448333	boots on ground	
H-27	helispot	60.28549999	-151.1698333	boots on ground	
H-28	helispot	60.29818132	-151.1679374	on ground from helo	too wet to walk; low invasion potential
H-30	helispot	60.28816668	-151.2207667		outside of Kenai NWR
H-35/DP-17	helispot	60.3337861	-151.2206881		outside of Kenai NWR
H-50	helispot	60.3856008	-151.0581591	from air	too small to land
H-60	helispot	60.41736666	-151.0119333	on ground from helo	
H-70	helispot	60.42819999	-150.99675	boots on ground	
H-75	helispot	60.43571666	-150.9831667	from air	
H-80	helispot	60.43881667	-150.97225	boots on ground	
H-81	helispot	60.47361111	-150.8611111	from air	
H-82	helispot	60.47361111	-150.8225	boots on ground	
H-83	helispot	60.47467	-150.80301	boots on ground	
H-84	helispot	60.46733335	-150.677	boots on ground	
H-85/DP-2	helispot	60.48514999	-150.6321334		outside of Kenai NWR
H-90	helispot	60.48133332	-150.626		outside of Kenai NWR
H-91	helispot	60.47846667	-150.5847666	boots on ground	
H-95	helispot	60.3036	-150.5227		time constraints
H-96	helispot	60.28065001	-150.4397667		time constraints
H-99	helispot	60.1302	-150.5688667	boots on ground	

Table 1: Site data.

site label	site type	latitude	longitude	visit type	no visit reason
PICNIC	horse trail	60.41261	-150.72031	boots on ground	
Camp III	horse trail camp	60.30522	-150.63208		time constraints
FRCAMP	horse trail camp	60.35484	-150.69901		time constraints
FRCAMP2	horse trail camp	60.35562	-150.69753		time constraints
HIGHCAMP	horse trail camp	60.2587	-150.57373		time constraints
East C Spike	spike camp supply drop site	60.46973333	-150.5440833	from air	tight landing; burned in Card Street Fire, completely black at present
West C Spike	spike camp supply drop site	60.48158334	-150.5675166	from air	the site was wet with low invasion potential

Results

Results summary

We documented 53 occurrences of 14 exotic plant species (Table 2) at 12 sites (Table 3). Eight sites that we surveyed thoroughly were weed-free. Most weeds were found at cabins, near roads, or along established trails.

Only along the fuel break (H-81 and H-83) and at Torpedo Lake were exotic plants found that were distant from structures, roads, and trails. Only *Crepis tectorum* and *Lupinus polyphyllus* were found at these sites.

Photographs and observation data are available via an inaturalist project at http://www.inaturalist.org/projects/funny-river-fire-weed-survey.

Table 2: Checklist of exotic plant species observed. Botanical name (ANHP): botanical name as given by ANHP (2015). Botanical name (inaturalist): botanical name used by inaturalist.org. Rank: invasiveness ranks from ANHP (2015).

botanical name (ANHP)	botanical name (inaturalist)	common name	rank
Cerastium fontanum ssp. *vulgare* (Hartman) Greuter & Burdet	*Cerastium fontanum vulgare*	common mouse-ear chickweed	36
Chenopodium album L. var. *album*	*Chenopodium album*	lambsquarters	37
Crepis tectorum L.	*Crepis tectorum*	narrowleaf hawksbeard	56
Linaria vulgaris P. Mill.	*Linaria vulgaris*	common toadflax	69
Lupinus polyphyllus Lindl. ssp. *polyphyllus*	*Lupinus polyphyllus*	bigleaf lupine	71
Matricaria discoidea DC.	*Matricaria discoidea*	pineappleweed	32
Phleum pratense L.	*Phleum pratense*	cultivated timothy	54
Plantago major L.	*Plantago major*	common plantain	44
Poa annua L.	*Poa annua*	annual bluegrass	46
Silene latifolia Poir.	*Silene latifolia*	white campion	42
Stellaria media (L.) Vill.	*Stellaria media*	common chickweed	42
Taraxacum officinale F.H. Wigg.	*Taraxacum officinale*	common dandelion	58
Trifolium hybridum L.	*Trifolium hybridum*	alsike clover	57
Trifolium repens L.	*Trifolium repens*	white clover	59

Site accounts

Included below are accounts of the sites where exotic plants were found.

Tustumena Lake, Andrew Berg cabin (H-100)

Here we found *Phleum pratense* and *Stellaria media*. *Phleum pratense* had been observed here in 2006 by Morton et al. (2007). *Stellaria media* had not been found here previously. We failed to find *Lolium perenne* and *Matricaria discoidea*, both reported from this site in 2005-2006 by Morton et al. (2007).

Tustumena Lake Wilderness Lodge at Bear Creek (H-20)

Until recently a privately-owned inholding, this structure and its environs had not been surveyed for weeds. Here we found *Chenopodium album*, *Linaria vulgaris*, *Ph. pratense*, *Plantago major*, *Silene latifolia*, *St. media*, *Taraxacum officinale*, and *Trifolium repens* (Table 3).

Kasilof, Pollard Horse Trail west of refuge boundary

Slightly west of the Kenai National Wildlife Refuge boundary, the Pollard Horse Trail and bulldozer line intersecting it included seven exotic plant species (Table 3). All of these were well-established along trails here, having apparently been present in the area for some time. Notably, *Cerastium fontanum vulgare*, *M. discoidea*, and *Tr. repens* had recently dispersed along the bulldozer line into areas where they were otherwise absent (Figure 2).

Figure 2: Bulldozer line along Pollard Horse Trail infested with *Cerastium fontanum vulgare* (http://www.panoramio.com/photo/122287258).

Hanson Horse Trail

Lupinus polyphyllus, *Ph. pratense*, and *Plantago major* had been observed here previously by Grimes (2006). Of these, we saw all except *Lu. polyphyllus*. In addition, we found *M. discoidea*, *Poa annua*, and *Ta. officinale*.

Funny River Road, woodcut road

Taraxacum officinale and *Crepis tectorum* grew along this gated gravel road, but we found no exotic plants along the bulldozer line diverging from the road to the southwest.

Figure 3: Bulldozer line off of the woodcut road (http://www.panoramio.com/photo/122251894).

Funny River Road, bulldozer line across from Campfire Drive

Here we found *Lu. polyphyllus*, *Trifolium hybridum*, and *M. discoidea*. Only *M. discoidea* was found away from the road. We pulled all individuals of this small (< 0.25 m^2) infestation.

Funny River Road, refuge boundary near Funny River Waste Transfer site

Along this fuel break were *Cr. tectorum*, *Lu. polyphyllus*, *Pl. major*, and *Ta. officinale*. Notably, one individual of *Cr. tectorum* had spread into the blackened, burned ground south of the fuel break (Figure 4).

Figure 4: *Crepis tectorum* growing on burned ground (http://www.inaturalist.org/observations/1831990).

Funny River Road, fuel break at refuge boundary (H-81)

Lupinus polyphyllus was the only exotic species here.

Funny River Road, fuel break at refuge boundary (H-83)

Lupinus polyphyllus and *Cr. tectorum* were the only exotic plants we found here. The single *Crepis* appeared to be a new colonist to this recently bared fuel break (Figure 5). We pulled it.

Figure 5: *Crepis tectorum* in a fuel break (http://www.inaturalist.org/observations/1790186).

Fuel break off of Lake Road

Several species of common exotics occurred along this longstanding fuel break (Table 3).

Funny River, Kyee Street

Exotic plants typical of the area grew along the road (Table 3).

Torpedo Lake (H-91)

Lupinus polyphyllus was the only exotic plant we found here.

Observation data and maps

Table 3: Exotic plant observations. Botanical name (inaturalist): botanical name used by inaturalist.org. Id (inaturalist): observation record ID from inaturalist.org.

latitude	longitude	date	botanical name (inaturalist)	id (inaturalist)
Tustumena Lake, Andrew Berg cabin (H-100)				
60.117455	-150.6300683	7/20/2015	*Phleum pratense*	1788040
60.11722222	-150.6297222	7/20/2015	*Stellaria media*	1788034
Tustumena Lake Wilderness Lodge at Bear Creek (H-20)				
60.21209667	-150.7996583	7/20/2015	*Chenopodium album*	1789900
60.21199667	-150.7983933	7/20/2015	*Linaria vulgaris*	1790120
60.21114333	-150.8012317	7/20/2015	*Phleum pratense*	1789889

continued on next page…

latitude	longitude	date	botanical name (inaturalist)	id (inaturalist)
60.21209667	-150.7996583	7/20/2015	*Plantago major*	1790121
60.21209667	-150.7996583	7/20/2015	*Silene latifolia*	1789902
60.21209667	-150.7996583	7/20/2015	*Stellaria media*	1789896
60.21209667	-150.7996583	7/20/2015	*Taraxacum officinale*	1789907
60.21156833	-150.8021883	7/20/2015	*Taraxacum officinale*	1789894
60.21156833	-150.8021883	7/20/2015	*Trifolium repens*	1789891
60.21238667	-150.7998967	7/20/2015	*Trifolium repens*	1790102
Kasilof, Pollard Horse Trail west of refuge boundary				
60.30982167	-151.1864667	8/4/2015	*Cerastium fontanum vulgare*	1835750
60.30968	-151.1974783	8/4/2015	*Cerastium fontanum vulgare*	1835772
60.309405	-151.1865867	8/4/2015	*Lupinus polyphyllus*	1835745
60.30962333	-151.1879167	8/4/2015	*Matricaria discoidea*	1835763
60.30972	-151.196555	8/4/2015	*Matricaria discoidea*	1835805
60.309295	-151.1887967	8/4/2015	*Phleum pratense*	1835767
60.30973833	-151.1865683	8/4/2015	*Plantago major*	1835758
60.30969833	-151.1861033	8/4/2015	*Poa annua*	1835742
60.30958	-151.1974467	8/4/2015	*Trifolium repens*	1835777
60.30977667	-151.1865567	8/4/2015	*Trifolium repens*	1835755
Hanson Horse Trail				
60.4125	-150.7205556	7/20/2015	*Matricaria discoidea*	1790237
60.41251167	-150.7200733	7/20/2015	*Phleum pratense*	1790250
60.41269	-150.7205783	7/20/2015	*Plantago major*	1790240
60.41258333	-150.7204767	7/20/2015	*Poa annua*	1790373
60.41258333	-150.7204767	7/20/2015	*Taraxacum officinale*	1790374
Funny River Road, woodcut road				
60.42986667	-150.9695633	8/3/2015	*Crepis tectorum*	1831845
60.44738167	-150.9439767	8/3/2015	*Crepis tectorum*	1831836
60.439735	-150.9558667	8/3/2015	*Taraxacum officinale*	1831920
Funny River Road, bulldozer line across from Campfire Drive				
60.46018	-150.8940917	8/3/2015	*Lupinus polyphyllus*	1831961
60.45960333	-150.8937967	8/3/2015	*Matricaria discoidea*	1831944
60.46035167	-150.8935233	8/3/2015	*Trifolium hybridum*	1831970
Funny River Road, refuge boundary near Funny River Waste Transfer site				
60.47337167	-150.8785267	8/3/2015	*Crepis tectorum*	1831990
60.473245	-150.8754683	8/3/2015	*Lupinus polyphyllus*	1831987
60.47361111	-150.8766667	8/3/2015	*Plantago major*	1831977
60.47333333	-150.8783333	8/3/2015	*Taraxacum officinale*	1831993
60.47333833	-150.8766167	8/3/2015	*Taraxacum officinale*	1831981

continued on next page…

latitude	longitude	date	botanical name (inaturalist)	id (inaturalist)
Funny River Road, fuel break at refuge boundary (H-81)				
60.47335333	-150.8607217	7/20/2015	*Lupinus polyphyllus*	1790180
Funny River Road, fuel break at refuge boundary (H-83)				
60.47455667	-150.8045033	7/20/2015	*Crepis tectorum*	1790186
60.47455667	-150.8045033	7/20/2015	*Lupinus polyphyllus*	1998712
Fuel break off of Lake Road				
60.47343167	-150.7379217	8/3/2015	*Lupinus polyphyllus*	1832010
60.47353167	-150.71521	8/3/2015	*Lupinus polyphyllus*	1832037
60.47338	-150.73797	8/3/2015	*Matricaria discoidea*	1832028
60.47340667	-150.737895	8/3/2015	*Phleum pratense*	1832016
60.47347	-150.7154567	8/3/2015	*Plantago major*	1832045
Funny River, Kyee Street				
60.47342333	-150.716095	8/3/2015	*Crepis tectorum*	1832139
60.473695	-150.715375	8/3/2015	*Lupinus polyphyllus*	1832132
60.47246	-150.715655	8/3/2015	*Plantago major*	1832158
60.47347	-150.7154567	8/3/2015	*Poa annua*	1832119
60.47333667	-150.715385	8/3/2015	*Matricaria discoidea*	1832182
60.47390167	-150.71658	8/3/2015	*Taraxacum officinale*	1832153
Torpedo Lake				
60.47849667	-150.5854033	7/20/2015	*Lupinus polyphyllus*	1790211

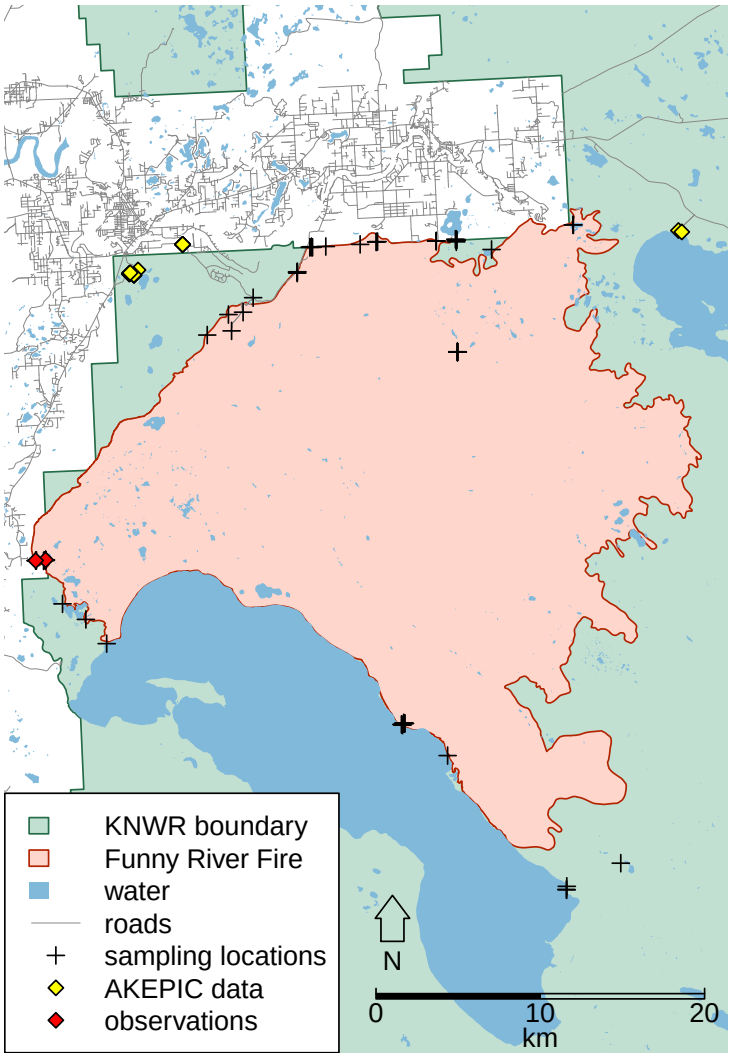

Figure 6: Map of observations of *Cerastium fontanum vulgare*. KNWR boundary: Kenai National Wildlife Refuge boundary. AKEPIC data: data downloaded from AKEPIC (http://aknhp.uaa.alaska.edu/botany/akepic/) on September 24, 2015. Observations: records from the present dataset.

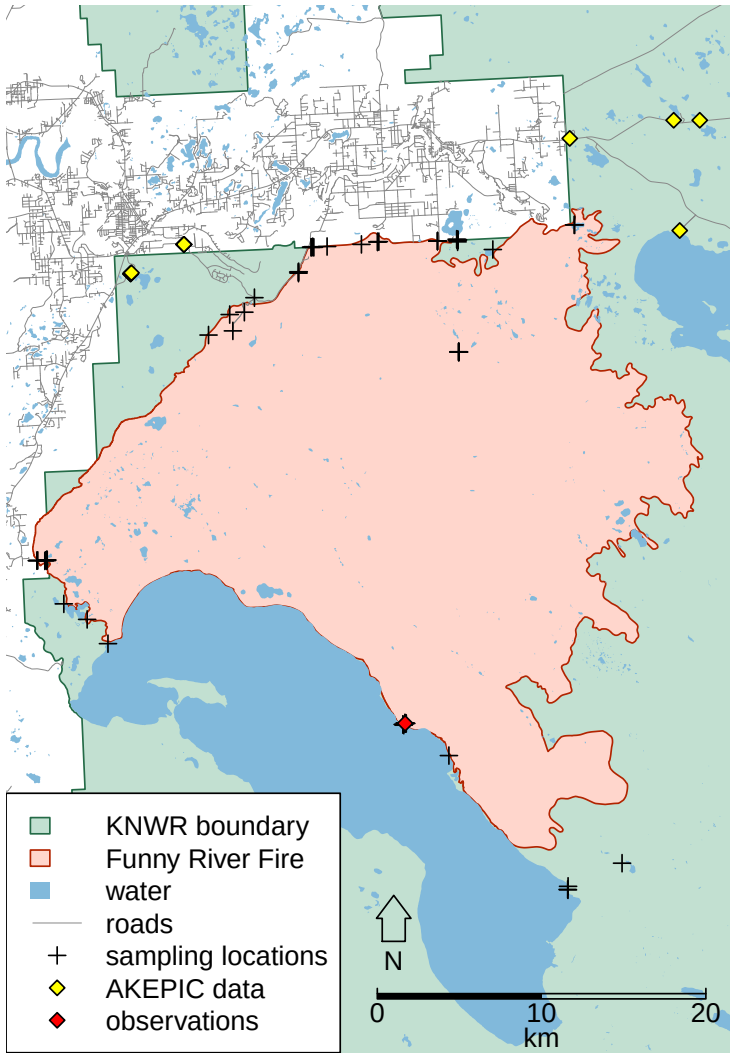

Figure 7: Map of observations of *Chenopodium album*. See legend definitions from Figure 6.

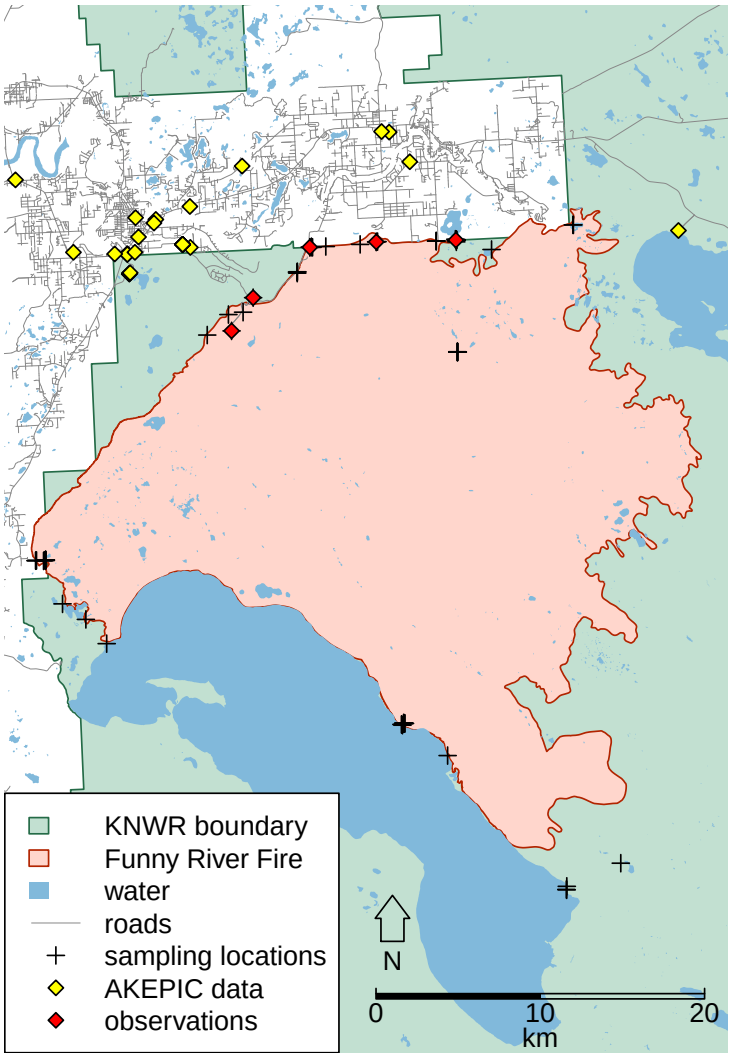

Figure 8: Map of observations of *Crepis tectorum*. See legend definitions from Figure 6.

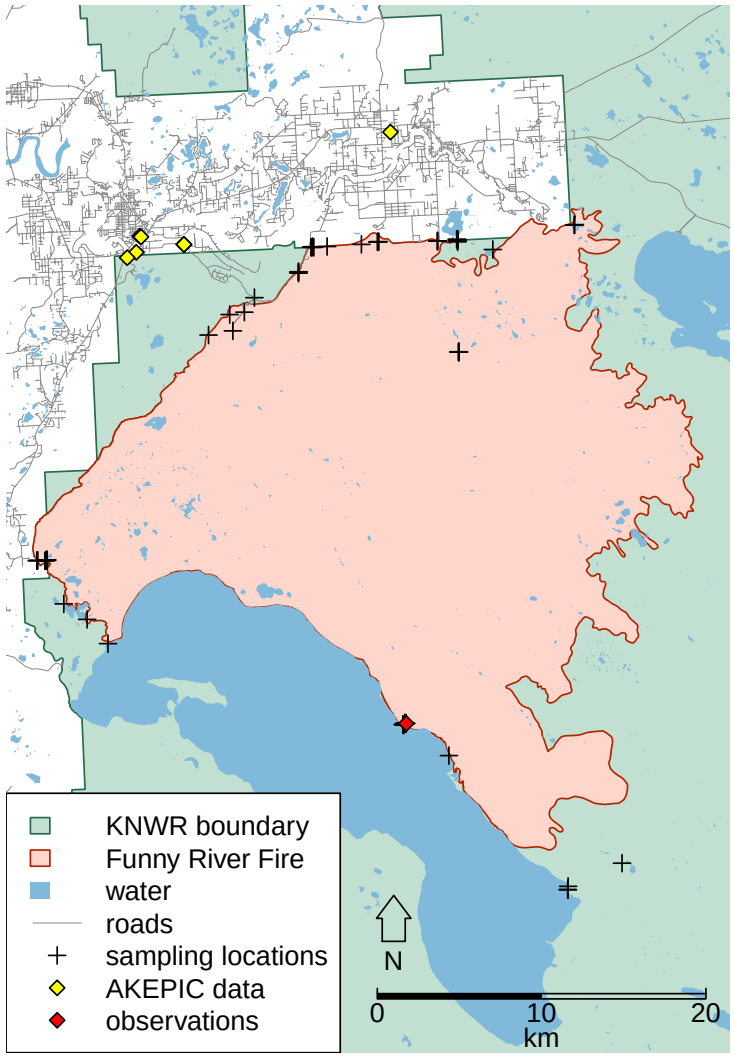

Figure 9: Map of observations of *Linaria vulgaris*. See legend definitions from Figure 6.

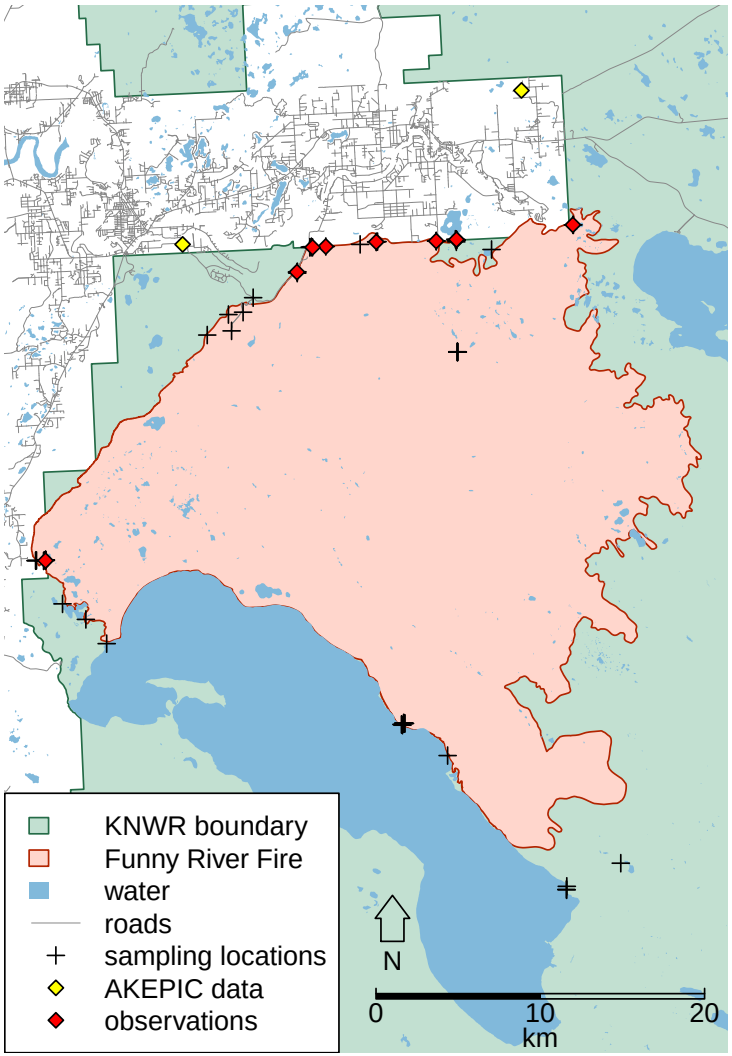

Figure 10: Map of observations of *Lupinus polyphyllus*. See legend definitions from Figure 6.

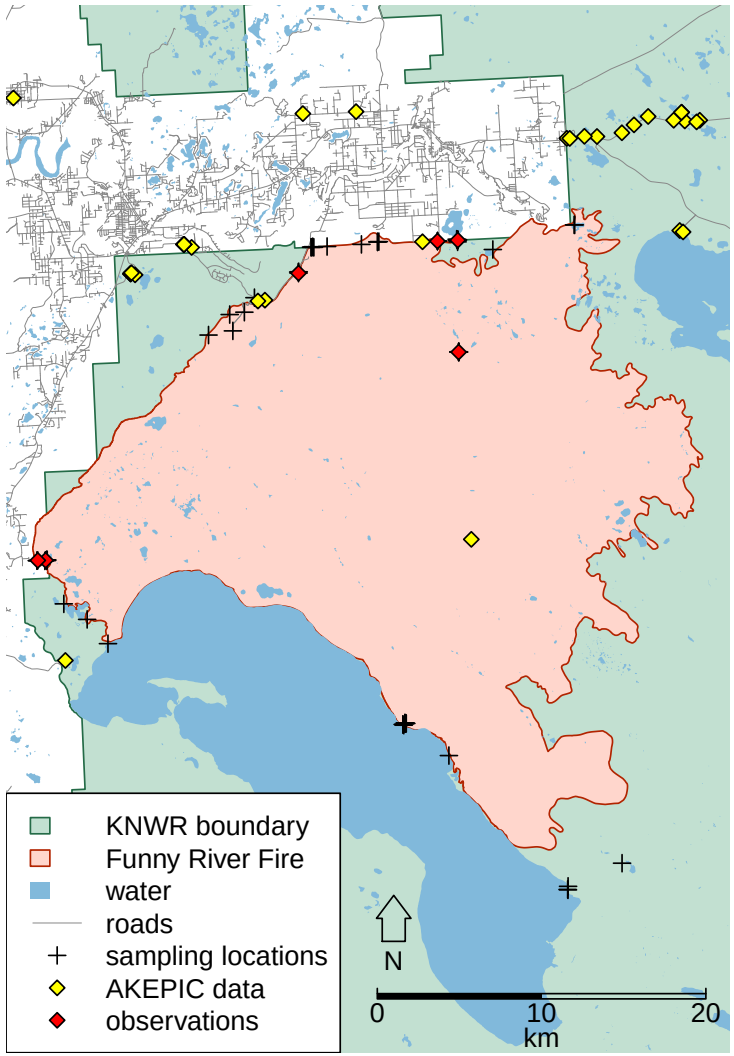

Figure 11: Map of observations of *Matricaria discoidea*. See legend definitions from Figure 6.

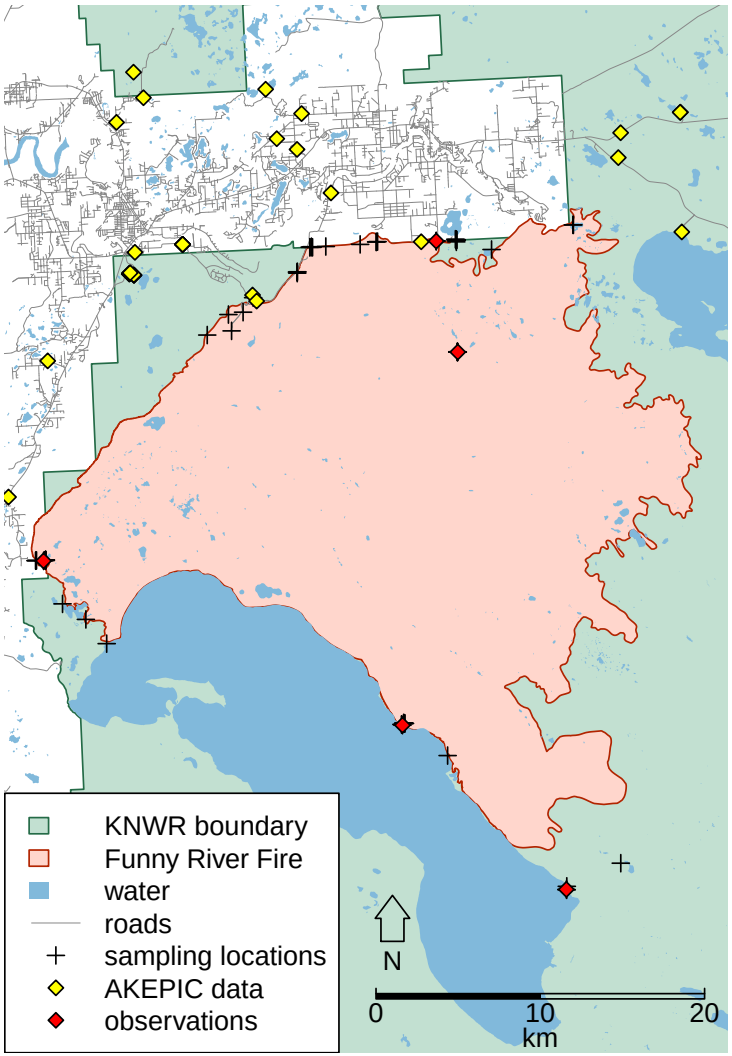

Figure 12: Map of observations of *Phleum pratense*. See legend definitions from Figure 6.

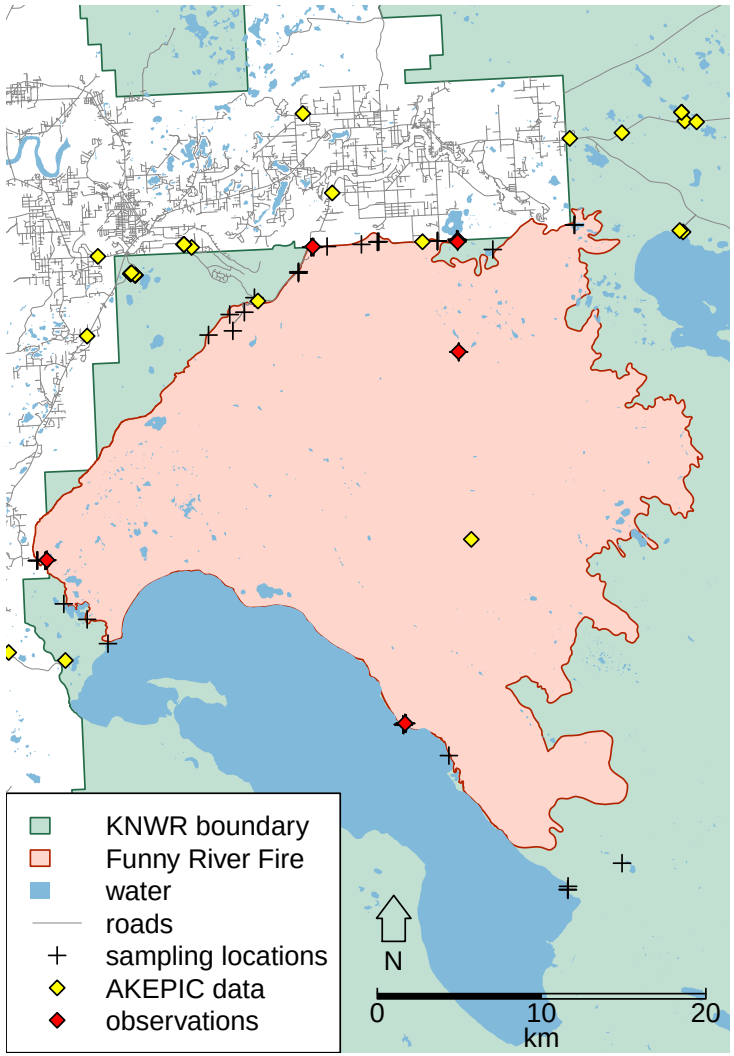

Figure 13: Map of observations of *Plantago major*. See legend definitions from Figure 6.

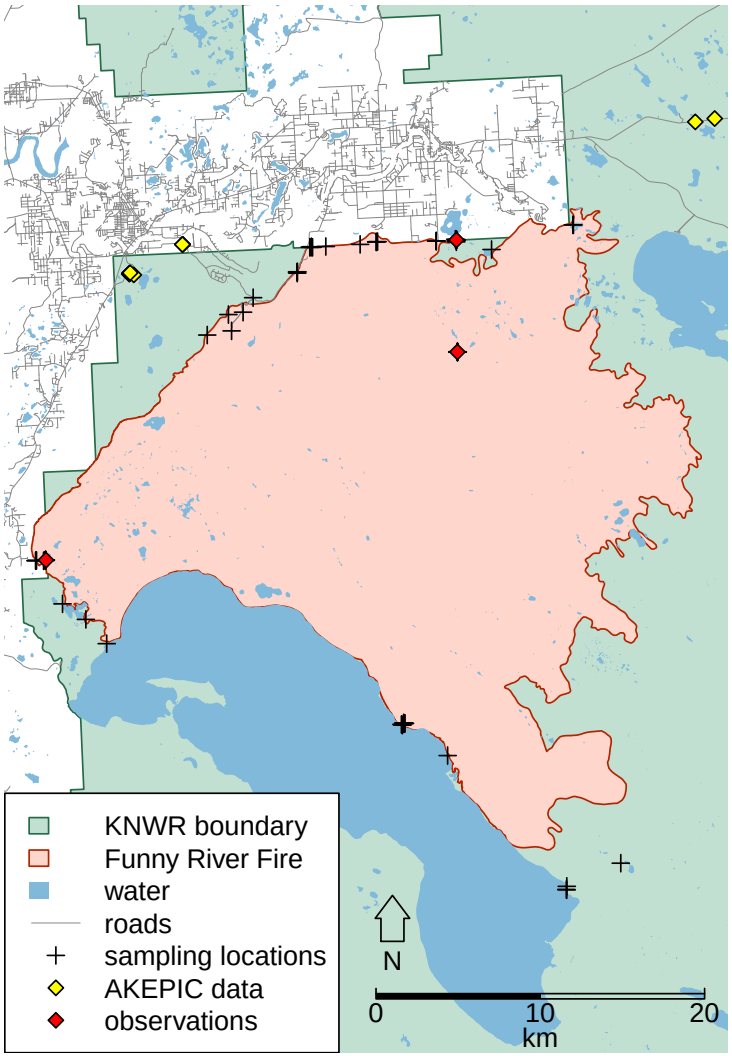

Figure 14: Map of observations of *Poa annua*. See legend definitions from Figure 6.

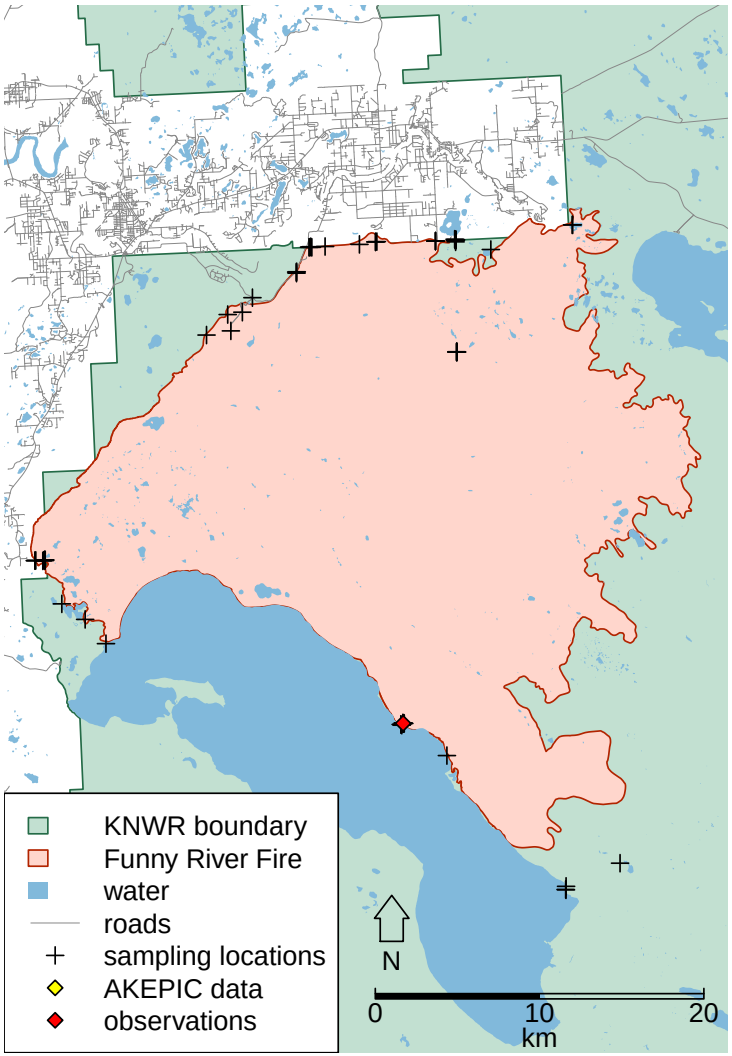

Figure 15: Map of observations of *Silene latifolia*. See legend definitions from Figure 6.

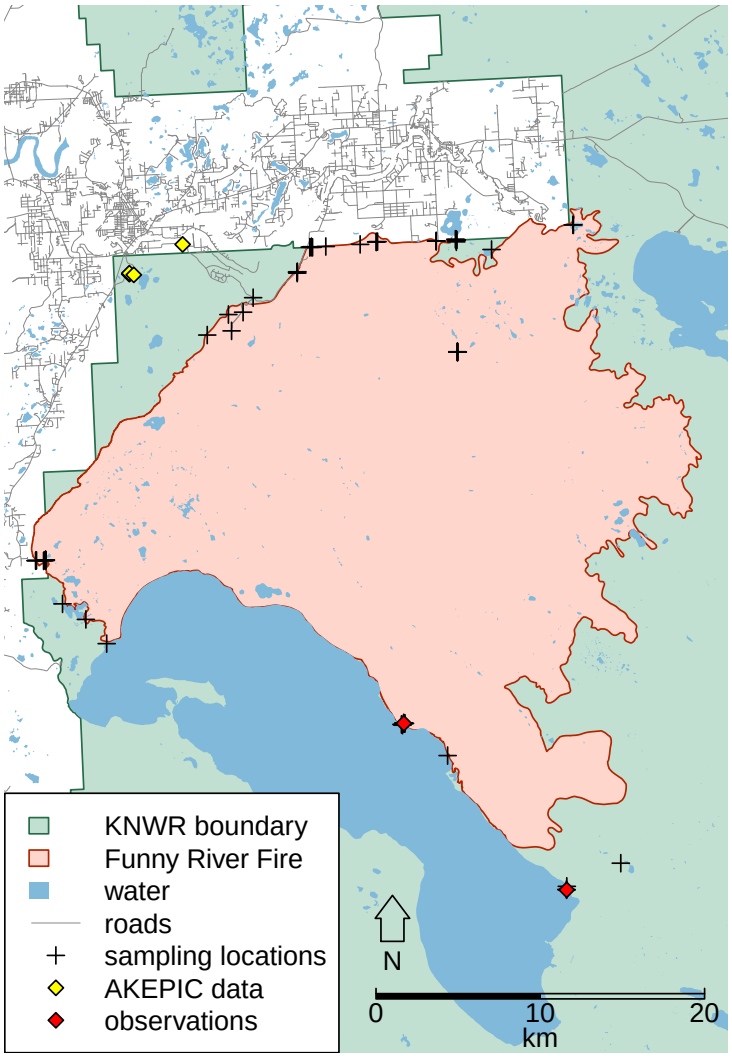

Figure 16: Map of observations of *Stellaria media*. See legend definitions from Figure 6.

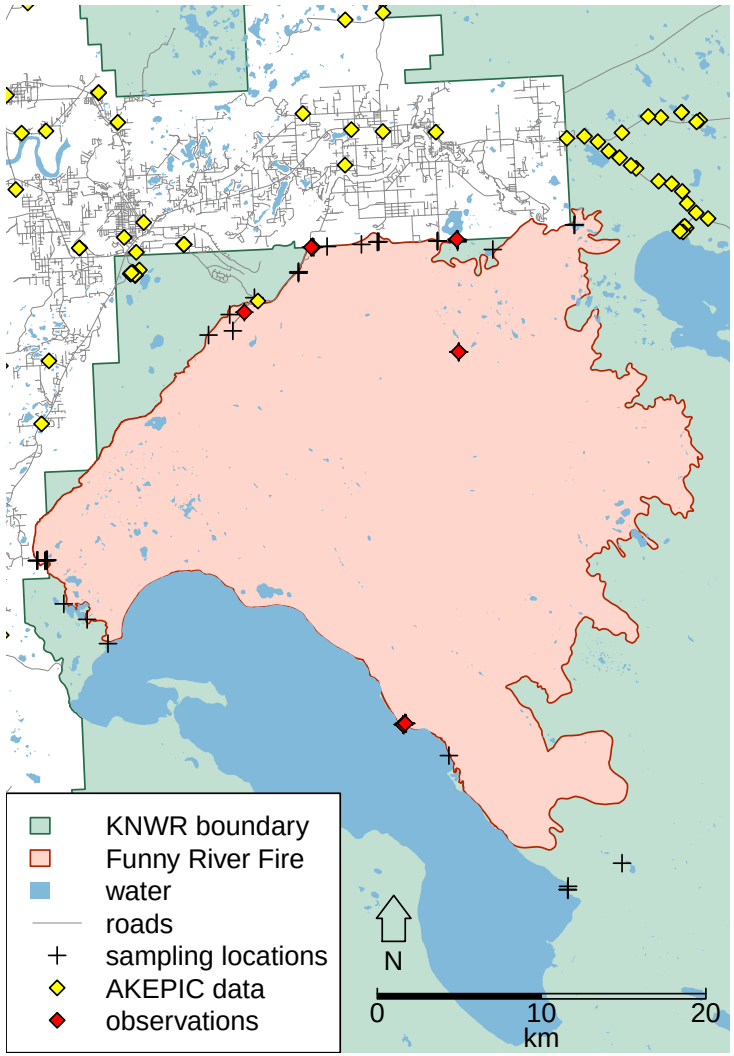

Figure 17: Map of observations of *Taraxacum officinale*. See legend definitions from Figure 6.

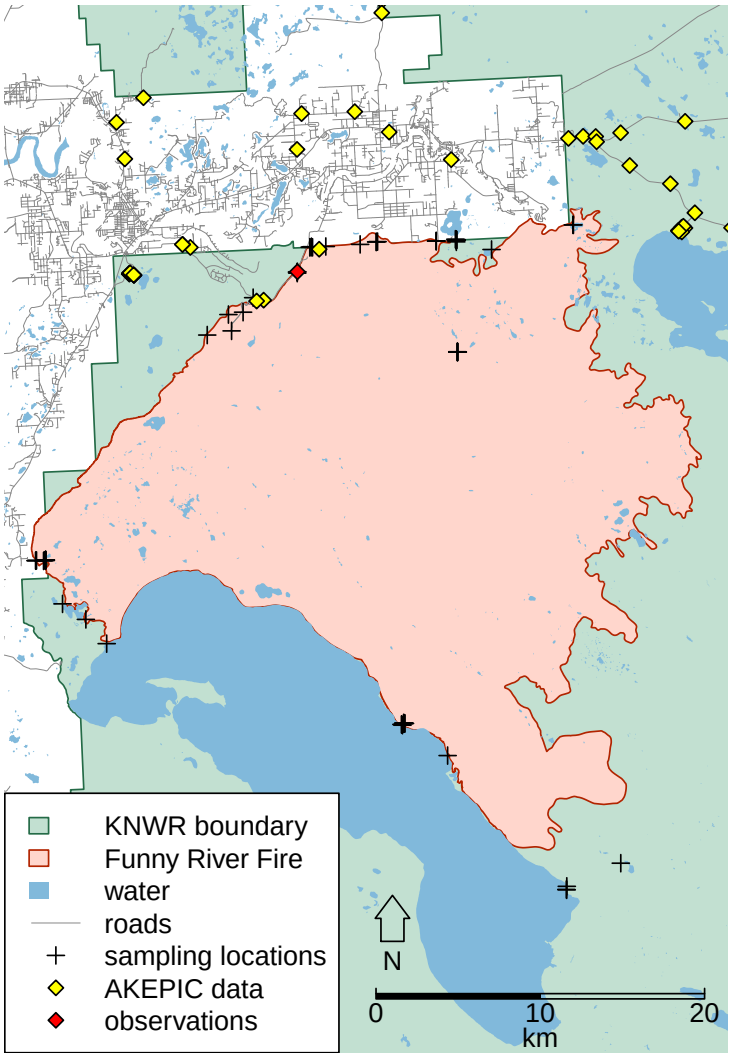

Figure 18: Map of observations of *Trifolium hybridum*. See legend definitions from Figure 6.

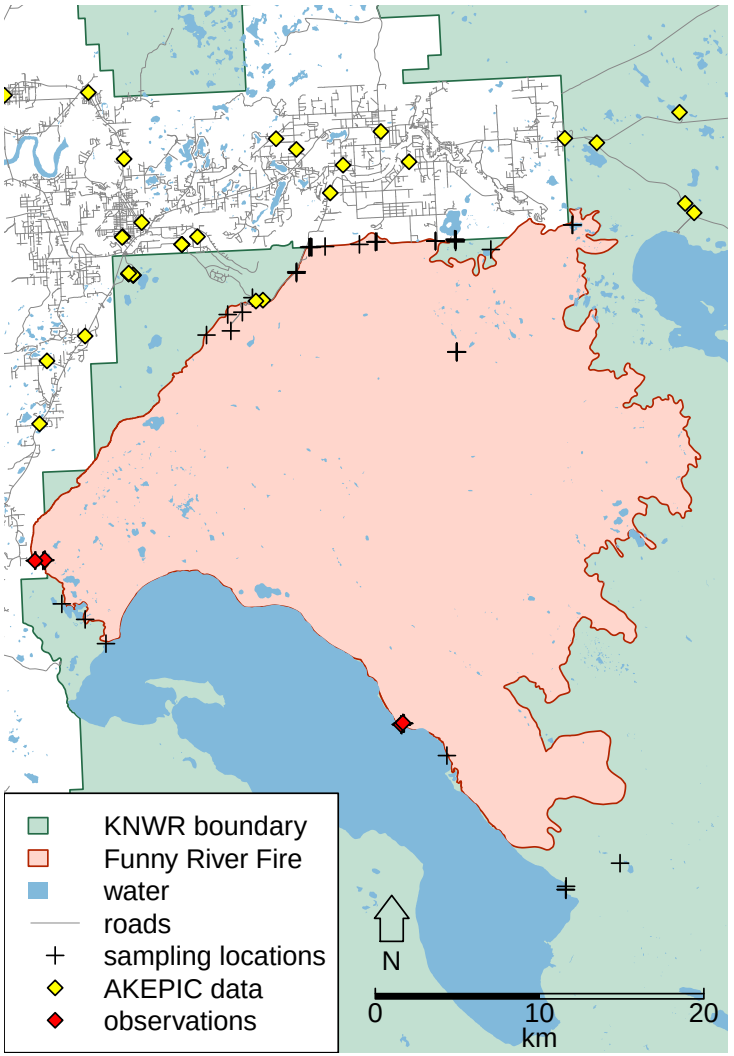

Figure 19: Map of observations of *Trifolium repens*. See legend definitions from Figure 6.

Discussion

Overall, it appeared that fire supression activities associated with the 2014 Funny River Fire have not yet substantiallly contributed to the spread of exotic weeds. None of the exotic plants that we found were new to the area or new to the Refuge. However, exposed soil along bulldozer lines and burned soils will remain vulnerable to invasion until they are revegetated with native plants.

Although *Ce. fontanum vulgare*, *Tr. repens*, and *M. discoidea* did disperse successfully along new bulldozer lines, all three of these species tend to be minimally invasive in natural settings on the Kenai and are expected to be replaced by native vegetation if the bulldozer lines are not disturbed further.

Lupinus polyphyllus and *Ta. officinale* were the most widespread exotic species we found, but these and most other exotics we encountered had been well-established before the Funny River Fire.

Crepis tectorum was the only species that appeared to be quickly expanding its range in this area, growing on burned ground and where mineral soil had been exposed by heavy equipment. This species has not yet been found in the remote areas of the Refuge, but it is quickly becoming ubiquitous along roadsides, gravel pits, and other disturbed sites on the Kenai Peninsula. *Crepis tectorum* has successfully invaded burned areas in Interior Alaska (Villano and Mulder, 2008) and may be able expand its range within the recent Funny River Fire and the 2015 Card Street Fire.

Charred soils within the fire perimeter and especially mineral soils exposed on bulldozer lines will continue to provide potential pathways of invasion until they are filled in by native plants. As of the time of our surveys, some revegatation had begun in the bulldozer lines and slash laid over the lines during rehabilitiation efforts had reduced the area of exposed mineral soils, but much bare soil remained. Multiple wind-dispersed exotic plants already present on the Kenai Peninsula including *Ta. officinale*, *Cr. tectorum*, *Leontodon autumnalis*, and *Hieracium* spp. have the potential to populate these areas.

Acknowledgments

Mallory Okuly and Ethan Bowser assisted with field work.

References

ANHP (2015) Non-Native Plant Species List. URL http://aknhp.uaa.alaska.edu/botany/akepic/non-native-plant-species-list/.

Carlson ML, Cortés-Burns H (2005) BAER accomplishment report — September 2005. Invasive plant monitoring following 2004 fires. USFWS National Wildlife Refuges — Alaska Region. Anchorage, Alaska: University of Alaska Anchorage, Alaska Natural Heritage Program, URL http://www.fws.gov/uploadedFiles/Sep_05_report_Kenai_NWR.pdf.

Grimes S (2006) Exotic plant survey, KNWR Hansen Horse Trail and adjacent camping areas, 08/14/06 – 8/17/06. Soldotna, Alaska: U.S. Fish & Wildlife Service, Kenai National Wildlife Refuge, URL http://www.fws.gov/uploadedFiles/Grimes_S_2006.pdf.

Helmes Z (2015) Funny River, fire code H4Q1. Fire report, U.S. Department of the Interior, Bureau of Land Management, National Interagency Fire Center, Boise, Idaho. Appendix A

Morton JM, Bowser M, Burke T, Eskelin T, Grimes S, et al. (2007) BAER accomplishment report, April 2007. Invasive plant treatment and monitoring following the 2004 Glacier Creek Fire, Kenai National Wildlife Refuge. Soldotna, Alaska: U.S. Fish and Wildlife Service, Kenai National Wildlife Refuge, URL http://www.fws.gov/uploadedFiles/BAER_2004%20Glacier%20Ck%20fire_KENWR_apr2007_with%20appendix.pdf.

Newbould D (2014) 140 Funny River Fire Suppression Repair Plan. Soldotna, Alaska: U.S. Fish & Wildlife Service, Kenai National Wildlife Refuge. Appendix B

Saperstein L, Fay B, O'Connor J, Reed B (2014) Use and Effectiveness of Fuel Treatments During the 2014 Funny River Fire, Alaska. Anchorage, Alaska: U.S. Fish and Wildlife Service, Branch of Fire Management, URL https://www.frames.gov/rcs/20000/20848.html.

Villano KL, Mulder CP (2008) Invasive plant spread in burned lands of Interior Alaska. Fairbanks, Alaska: University of Alaska Fairbanks, URL http://aknhp.uaa.alaska.edu/wp-content/uploads/2010/11/Villano_Mulder_2008.pdf.

Appentix A: Fire report - Funny River, fire code H4Q1

Fire Reporting - Fire Report

General Reporting Information

Status:	Complete	**Fire Name:**	Funny River
Bureau:	Bureau of Land Management	**Fire Code:**	H4Q1
State:	Alaska	**Fire Type - Protection Type:**	Action Fire - Other land protected by BLM under a cooperative agreement or contract (16)
Field Office:	Alaska Fire Service	**Cause Category:**	Human
Unit Identifier:	AKAFS	**Reimbursable:**	Yes
Calendar Year:	2014	**Burning Index:**	69
Fiscal Year:	2014		

Statistical Data

State, County	Owner	Vegetation	Burned/Treated Acres	Total Project Acres
AK	Private	Non-Commercial Forest	691.0	
AK	State	Non-Commercial Forest	108.0	
AK	BIA	Non-Commercial Forest	49.0	
AK	FWS	Non-Commercial Forest	195171.0	
AK	Tribal	Non-Commercial Forest	591.0	

Location Data (point of origin of the fire)

Resource Area: State Protection
Owner: FWS
Origin Accuracy: Location coordinates correspond to the known point of origin
Location Method: Corrected GPS coordinates or equivalent precision
Latitude: 60:26 (60.43) North *entered as: 60:26 North*
Longitude: 150:57 (150.95) West *entered as: 150:57 West*
UTM: Zone: 5 North Easting: 612,833 Northing: 6,701,428
Datum: NAD83

Fire Management Data

	Date	Time	Detection or Resource Type	Amount	Acres
Discovery/Start:	05/19/2014	16:03	Other Aircraft		2.0

Initial Attack:	05/19/2014	16:03	Airtanker (Type 2); Drops	6	2.0
			Engines (Type 3, 4, or 5); Each	1	
			Handcrew (Type 1); People	22	
Controlled/Completed:	08/31/2014	10:00			196,610.0
Declared Out:	12/08/2014				

Site Data

Topography:	Flat or rolling	**Weather Station:**	500927
Aspect:	Flat	**MSGC Model:**	Alaska black spruce (Q)
Slope:	0 - 25 %		
Elevation:	0 - 500 feet above sea level	**MSGC Slope:**	0 - 25 % (1)
		MSGC Grass:	Perennial (P)
FBPS Fuel Model:	Short Grass (1 foot)	**MSGC Climate:**	Sub-humid (rain deficient in summer) (2)
Wildland Urban Interface (WUI)?:	Yes		
Special Area Type:	No Special Area Type designation	**Structures Burned/Destroyed:**	6

Fire Ecology

Fire Regime Group	Pre-fire Condition Class	Acres
IV) Lodgepole pine and jack pine Fire Frequency: 35-100 years Severity: Stand replacement	1) For the most part, Fire Regimes in this Fire Condition Class are within historical ranges. Vegetation composition and structure are intact. The risk of losing key ecosystem components from the occurrence of fire is relatively low. Maintenance management such as prescribed fire and/or mechanical treatments is needed to prevent these lands from becoming degraded.	196610.0

Remarks

Signature Block

Data Provided By:	Howie Kent	**Title:**	FMO	**Date:**	04/06/2014
Authorized By:	Howie Kent	**Title:**	FMO	**Date:**	04/06/2014
Report Entered By:	Zachary Helmes	**Title:**	Forestry Technician	**Date:**	04/06/2015

Trespass Investigation

Fire Cause Code (General - Specific):	Miscellaneous - Other, unknown	**Amount Billed:**	$0.00
Other Cause:		**Date Billed:**	04/06/2015
Suspect Classification:	Unknown	**Amount Recovered:**	$0.00
Status:	Field manager decision pending	**Date Recovered:**	04/06/2015
Case Number:		**Amount Received by Organization:**	$0.00
Authorized By:		**Date Received by Organization:**	04/06/2015
Rationale:			

Remarks:

The Alaska Fire Service will bill the State of Alaska on 1 April 2015, per terms of their Annual Operating Agreement.

Fire Report Modification History

Date & time (ADT)	Status	Action	Form	User
04/06/2015 15:37	Complete	Created	Fire Report	Zachary Helmes

Fire report last modified: 04/06/2015 15:37 ADT

Wildland Fire Management Information
U.S. Department of Interior
Bureau of Land Management
National Interagency Fire Center

Funny River

403140

Division of Forestry
Alaska Department of Natural Resources

Fire Status:	F - Finalized				
Incident Number:	403140	DOI Fire Code:	H4Q1	USFS:	PNH4Q1
Incident Name:	Funny River	Type:	Fire - Wildland Fire	Mgt. Office:	Kenai-Kodiak
General Cause:	Human	Specific Cause:	Undetermined	Detail Cause:	Undetermined
Latitude:	60° 26.367	Longitude:	-150° 57.713		

T: 004N R: 010W S: 14 ¼¼: SWNE M: Seward

Land Status:

Land Status Type	Unit	Protection Level	Size	Primary
Private	Private Fee Simple		215.0	
State	AK - Other DNR Owned/Managed		108.0	
BIA	Native Allotments		49.0	
County	Kenai Peninsula Borough		476.0	
Tribal	Salamatof Native Association, Incorporated		7.0	
USFWS	Kenai National Wildlife Refuge	Full	195171.0	X
Tribal	Cook Inlet Region, Incorporated		584.0	
		Total Acres:	196610	

Fire Costs:

Total Reimbursable:	$11,452,981.00
Total State:	$46,751.00
Total Non-Reimbursable:	$0.00
Total Cost:	$11,499,732.00

Suppression Data:

Incident Status	Date	Size (ac)
Reported	05/19/2014 16:03	2.0
Contained	08/31/2014 10:00	195858.0
Controlled	08/31/2014 10:00	195858.0
Fire Out	12/08/2014 10:00	196610.0

Initial Resources Dispatched:

Resource Type	Callsign
Hot Shot Crew	CHENA IHC
Tanker	T-55
Type 2 IA Crew	Gannett Glacier
Type 7	K-73
Lead Plane	LP-5AK
P/U	K-14
Medium	212TH
Type 7	K-70
Type 6	K-67
Light	H-306MH

Values At Risk:

Value	Lost(Cumulative)
Allotments	0
Commercial Property	0
Out Buildings	2
Residences	4

Site Data at Ignition Point:

Topography: Flat
Aspect: S
Slope (°): 0-25
Elevation (ft): 0-500
Fuel Type: Black Spruce

Weather Data at Initial Attack:

Nearest Weather Station: Soldotna KKS - 500927

Temperature (°F):	60.0	RH (%):	21	Wind Speed (mph):	10	Wind Direction:	NNW
FFMC:	93.4	BUI:	68.8	ISI:	19.9	FWI:	41.3

Historical Narrative:

Report Day:	Narrative:
05/19/2014	At 1608 Helicopter 13AT reported a wildfire 3 miles south of Soldotna airport along the Funny River Horse trail, looking to be in a small stand of birch trees pushing forward. At 1612 212TH reported seeing the column from the air as 1 acre burning in hardwood and spruce. At 1618 212TH reported the fire to be 1.5 to 2 acres burning in logging slash and continuous black spruce, with winds out of the east 12-15 mph. At that point Chena IHC was mobilized as well as forestry engines, already en route. A/A and Tankers and dozers were ordered as well as crews and an additional helicopter. Gannett Glacier was mobilized from Mat-su. At 2003 A/A estimated the fire¿s size to be 200 acres, with winds estimated to be 25 miles per hour. At 2225 A/A reported the fire to be 4.5 miles from the Tustumena Lake, 6.9 miles long, about ¾ of a mile wide, 2500 acres with winds 25 miles per hour coming out of the north, ½ mile flame lengths at the head 200 feet tall. At 00:30 on 5/20 IC reported flame lengths of 125 feet and erratic fire behavior. The Alaska Type 2 Long team has been ordered for delivery 5/20.
05/20/2014	The Funny River Fire's size has increased to over 20,000 acres. Current IC's strategic objective is to establish line from the heel and monitor the line at the head of the fire. The incoming IC of the Alaska T2 Long Team's objectives are to contain the northeast side of the fire and the 2nd priority is to start construction and aerial drops of either water or retardent on the west flank of the fire down to Tustumena Lake. Current IC's critical resource needs are 5 hot shot crews; 8 dozers with operators, heavy equipment bosses and transports; 10 T2 crews with 5 Strike Team Leader Crews; and ducks are a must, as they can utilize the Tustumena Lake to dip from. Low RH's combined with high winds, and competing nearby fires stretching ground and aerial resources thin are making containment near impossible.
05/21/2014	Early on 5/21 the fire impacted the Funny River Road. The Alaska Type 2 IMT took command of the fire at 0400 and Forestry and CES engines along with crews were able to keep the fire from crossing the road to the north. The IMT was able to move into the new ICP. Crews continued to develop an anchor point on the north end of the fire.
05/22/2014	The fire continued to grow on the northeast, southeast, and southwest corners. Crews in Division A made good progress burning along Funny River Road and dozers began to work east across the northern edge of the fire. In Division X crews and dozers continued to secure the western flank. CL-415s worked to slow growth to the west and southwest. The fire made a late run to the southeast toward Bear Creek Subdivision, and a load of smokejumpers was inserted to initiate structure protection. Type 1 crews from the Lower-48 arrived at ICP and were briefed for the 5/23 operational shift.
05/23/2014	The fire continues to burn actively through the peak burn period as well as during the night. In Division A dozers continued to build direct line east from Funny River Road and prepared a contingency hoselay. In Division X dozers continued to work toward the southwest and a squad hiked in to Cole Lake

	began to work north toward the dozer line. In Division H engines assessed structures in the Pollard Loop area while smokejumpers and an IHC prepared to burn out along the Intertie powerlines. At Bear Creek smokejumpers and a Type 2 IA crew plumbed structures and prepared to burn out. CL-215s continued to support suppression efforts in Divisions A and H. The Borough issued an advisory for the Pollard Loop area warning that evacuation may become necessary.
05/24/2014	Strong winds produced active crown fire runs in spruce with single and group tree torching common around the perimeter. In Division A crews began burning from the fuel break west towards Funny River Road. In Division X dozers continued to work toward the southwest and a the squad spiked at Coal Creek Lake continued constructing handline north to tie in with the dozer line. In Division H the fire backed into the Intertie powerline right-of-way where and IHC and smokejumpers went direct to contain the fire's western edge. Riparian areas in the southwest corner were assessed for containment potential. CL-215s and helicopter buckets continued to support suppression efforts in Divisions A and H.
05/25/2014	Fire weather indices remain high, with extreme preseason availability of black spruce stands. Continued strong winds and continuous black spruce produced active crown fire runs late in the burn period. Spotting was observed up to 1/2 mile ahead of the fire, crossing the Kenai River. Active suppression on these spots limited fire establishment north of the river. Crews in Division A worked to contain a slop over the fuel break and aerial resources worked to slow the advance of a spot over the Kenai River. Residents in the Funny River area remain under an evacuation order. The squad at Coal Creek Lake continued to work north to tie into the dozerline in Division X. In Division H Smokejumpers and an IHC crew continued direct line north to the division break. Dozers and crews worked south from the powerline toward Tustumena Lake. At Bear Creek smokejumpers and a crew mopped up around the subdivision and prepared to burn out around the Pipe Creek cabin.
05/27/2014	Cooler conditions and light to moderate rain observed over the fire area has given a reprieve to fire fighters. Crews are progressing with direct suppression tactics around the north, west and south flanks tying in with natural barriers. Old burns scars are helping to check up fire progression northeast. Inaccessible terrain to the east is posing difficulty for access for fire fighters. Evacuation orders have been lifted in the Funny River communities. Structure protection efforts are underway for private and public structures east of the fire along the south shore of Skilak Lake, Killey River and the east shore of Tustumena Lake.
05/28/2014	Cooler conditions and light to moderate rain has continued to give a reprieve to fire fighter efforts. Crews are progressing with direct suppression tactics around the northeast and southwest flanks tying line in with natural barriers. Crews are making good progress mopping up contained fire lines on the north and west flanks. Structure protection efforts are underway for private and public structures east of the fire along the south shore of Skilak Lake, Killey River and the east shore of Tustumena Lake.
05/29/2014	Overcast skies and scattered rain showers throughout the fire area reduced fuels availability Thursday. Fuels under closed canopies continue to remain markedly dry. Ground moisture remains frozen 10 inches below surface feather moss in most Spruce stands. Crews are making good production with the weather reprieve while utilizing Palm IR devices to ensure areas of heat are found and suppressed.
05/30/2014	Fuels dried considerably on Friday with Chinook winds affecting the western edge of the fire area. Isolated pockets on the west side of the fire displayed very active backing due to 40 plus mph easterly winds and limited precipitation. West/southwest flow will return to the fire area on Saturday increasing the likelihood of fire spread to the east. Excess personnel and equipment are being released due to incident management objectives being met. WFDSS has been submitted and approved for increase in funds from $7.5 million to $10 million.
05/31/2014	Significant precipitation decreased available fuels over the entire fire area. Fine fuels are soaked deep into the fuel bed. Expected weather over the next three days remains the same, with slowly drying fuels becoming available towards the end of the week. The fire experienced significantly high winds throughout the day. Numerous snags and green trees reported falling due to the high winds.

	Crews are utilizing Palm IRs and data from the Alaska Center for Unmanned Aircraft Systems to identify areas of heat. Excess crews and equipment are being released as incident management objectives are being met. High winds and moderate rainfall decreased fire fighter productivity due to increased hazards of falling snags and green trees.
06/01/2014	Continued precipitation saturated available fuels in the fire area again today. Isolated pockets of sheltered fuels may continue to hold heat away from most areas of concern. Crews are utilizing Palm IRs to identify areas of heat. Excess crews and equipment are being released as incident management objectives are met. Dryer conditions and a warming trend is expected over the fire area through the next few days.
06/02/2014	A NIROPS IR flight has been ordered to fly fire perimeter and provide intelligence on areas of heat around the fire perimeter. Branch Directors have been demobed and divisions are being placed into monitor status as mop up standards are met. Crews, equipment and overhead are being released as incident management objectives are met. Dryer conditions and warming trend is expected over the fire area through 06/04/14.
06/03/2014	Isolated pockets of heat in very sheltered fuels continued to vigorously smolder throughout the burn period. At the end of the burn period, Division C had some isolated interior torching. A NIROPS IR flight has been ordered for 06.04.14 to help identify areas of concern. Divisions are being placed into monitor status as mop up standards are met. Crews, equipment and overhead are being released as incident management objectives are met. The Repair Group is starting to work on interior dozer line in Division A. Dry and warm conditions are expected Wednesday with a light marine layer moving into the area Thursday through Saturday with increased humidity¿s and dew points. Plans are being made to transition to a Type 3 team.
06/04/2014	Divisions are being placed into monitor status as mop up standards are met. Crews, equipment and overhead are being released as incident management objectives are met. The Repair Group is working on interior dozer lines in Division A. A light marine layer is moving into the area Thursday through Saturday with increased humidity¿s and dew points. Chance of isolate showers over the western edge of the fire. Plans are in place to transition to a Type 3 team.
06/05/2014	Divisions are being placed into monitor status as mop up standards are met. Crews, equipment and overhead are being released as incident management objectives are met. The Repair Group is working on repairing dozer lines. A light marine layer has moved into the area with increased humidity¿s and cloud cover. Isolate showers over the forecast area is expected. Plans are in place to transition to a Type 3 team on 06/06/14.
06/06/2014	Tim Soliday¿s Type 3 organization assumed incident command. Active group torching and steady backing fire was observed in Div G near Bear Creek drainage despite increasing cloud cover and higher humidity¿s. Fire resources continued to mop up and repair suppression impacts. Increasing cloud cover, humidity¿s and chances of precipitation are expected over the fire area.
06/07/2014	Type 3 Organization remains in command of incident. Fire resources continued to mop up and repair suppression impacts. Increasing cloud cover, humidity and chances of precipitation continue over the fire area. Fire growth was minimal, only smoldering fire behavior observed.
06/08/2014	Type 3 Organization remains in command of incident. Minimal fire behavior occurred today with areas of smoldering observed. Fire resources continued to mop up and repair suppression impacts. Increasing cloud cover, humidity and chances of precipitation continue over the fire area.
06/09/2014	Minimal fire behavior occurred today. Areas of smoldering observed on the Kenai River near Torpedo Lake and along the eastern flank of the fire. Fire resources continued to monitor, mop up and repair suppression impacts. Increasing cloud cover, humidity and precipitation continued over the fire area. Fire growth was minimal; only smoldering fire behavior observed.
06/10/2014	Fire resources continued to monitor, mop up and repair suppression impacts. Increasing cloud cover, humidity and precipitation continued over the fire area. Fire growth observed to be minimal through backing, smoldering and creeping near the Bear Creek drainage.

06/11/2014	Fire resources continued to monitor, mop up and repair suppression impacts. Sunny conditions were observed over the fire area with some perimeter growth in the Bear Creek drainage near Emma Lake. Fire growth observed to be minimal through backing, smoldering and creeping skirting to the north of the Emma Lake MAP and toward the headwaters of Bear Creek drainage.
06/12/2014	Backing, creeping and smoldering fire occurred in tundra fuels east of Bear Creek drainage. Areas of heat detected at the Torpedo Creek and Kenai River confluence. Fire resources continued to monitor and mop up fire perimeters and repair suppression impacts. Cloudy conditions were observed over the fire area with minimal perimeter growth in the Bear Creek drainage near Emma Lake. Fire growth observed to be minimal through backing, smoldering and creeping skirting to the north of the Emma Lake MAP and toward the headwaters of Bear Creek drainage. Acreage adjustment due to updated mapping.
06/13/2014	RAWS records indicate a rain shadow across the fire area with moisture recording at .10 inches (Soldotna) to .01inches (Skilak Guard Station) over the last 24 hours. Backing, creeping and smoldering occurred in tundra fuels east of Bear Creek drainage. Backing, creeping and smoldering fire occurred in tundra fuels east of Bear Creek drainage. Fire resources continued to monitor and mop up fire perimeters and repair suppression impacts. Cloudy conditions were observed over the fire area with minimal perimeter growth in the Bear Creek drainage near Emma Lake. Fire growth observed to be minimal backing, smoldering and creeping skirting to the north of the Emma Lake MAP and toward the headwaters of Bear Creek drainage.
06/14/2014	No visible smokes along the perimeter were identified in an afternoon aerial recon. Fire resources focused efforts on the repair of suppression impacts on the Western flank. Partly to mostly cloudy conditions were observed over the fire area with no perimeter growth in the Bear Creek drainage near Emma Lake or elsewhere on the Eastern flank.
06/15/2014	Fire resources focused efforts on the repair of suppression impacts on the Western flank. Mostly cloudy conditions and scattered precipitation were observed over the fire area with no visible fire activity.
06/17/2014	Fire resources focused efforts on the repair of suppression impacts on the Western flank. Partly cloudy conditions early in the day were followed by mostly cloudy/scattered thunderstorms in the afternoon. No visible smokes were identified in an afternoon, aerial recon.
06/18/2014	Fire resources progressed with suppression repair on the Northwestern portion of the fire and removal of excess equipment throughout the fire area. Partly cloudy conditions early in the day were followed by mostly cloudy/scattered showers in the afternoon. Interior visible smokes were identified in an afternoon, aerial recon in the Southeast corner.
06/19/2014	Fire resources progressed with suppression repair on the Northwestern portion of the fire and removal of excess equipment elsewhere. Fire area weather consisted of mostly sunny skies and temperatures in the high sixties with light and variable. The Type 3 organization will transition the fire over to the Local Area on 6/20/14 at 0700 Hrs.
06/20/2014	Transfer from Type 3 to Type 4 IC took place. RAWS records indicate no measureable precipitation in the area over the last 24 hours. Temperatures reached the high sixties while lows were near forty degrees. One interior smoke observed in the rough vicinity of Moose Creek, about 1,000 feet from Tustemena Lake. A quarter-acre hot spot has developed along the fire perimeter, within the Glacier Creek fire scar. Fire activity there is Rank 2, with little growth potential. The Repair Group continued to progress through Div X repairing control line.
06/21/2014	Fire received precipitation throughout the day. The Repair Group completed rehab in Div X, and remaining equipment was demobed. Rehab is now complete fire-wide. No recon flights were taken due to poor weather conditions. The fire

	will continue to be monitored.
06/22/2014	Fire received precipitation throughout the day. Personnel completed a recon mission of the fire and saw 3 interior smokes. The crew continued work on a shaded fuel brake. Fire will continue to be monitored.
06/23/2014	Fire received sporadic precipitation throughout the day. The crew continued work on shaded fuel brake. Fire will continue to be monitored.
06/24/2014	A recon flight was flown by the IC and IC trainee, no fire activity was observed. And Yukon T2IA Crew was demobbed.
06/25/2014	All overhead personnel were released at the end of shift, as was helicopter 304MH. The fire was transferred back to the area, and placed in monitor status.
07/03/2014	Helicopter 212TH flew the fire late morning/early afternoon. No heat or smoke was discovered. Fire remains in monitor status.
07/09/2014	Helicopter 212TH performed a recon flight in preparation for back haul of pumps and hose, and saw no heat or smoke.
07/17/2014	212TH began backhauling hose and pumps, and retrieved portable weather station. No fire activity was observed.
07/18/2014	Resolving cost error.
07/22/2014	Alaska State Troopers relayed 911 caller seeing smoke in the area of the Funny River fire, south of Torpedo Lake. 212TH did a recon of the area, seeing nothing returned to base.
08/31/2014	The fire was called contained and controlled at 1000.
12/08/2014	Howie Kent called and said to call the Funny River Fire out at 1000 today 12/8/14.

Appentix B: 140 Funny River Fire Suppression Repair Plan

140 Funny River Fire Suppression Repair Plan

Prepared by: _____
Doug Newbould, Fire Management Officer, Kenai National Wildlife Refuge

Reviewed by: _____
Steve Miller, Deputy Refuge Manager, Kenai National Wildlife Refuge

Reviewed by: _____
Rob Allen, Incident Commander, Alaska Type 2 IMT

Approved by: _____
Hans Rinke, Kenai Area Forester, Alaska DNR

_____
Andy Loranger, Refuge Manager, Kenai National Wildlife Refuge

_____
Dara Glass, Land Manager Cook Inlet Region, Inc.

_____
Marcus Mueller, Land Manager, Kenai Peninsula Borough

_____
Ray Hart, Regional Fire Management Officer, Bureau of Indian Affairs

The following guidelines were developed to help fire managers repair areas damaged or disturbed during fire suppression operations on the Funny River Fire (AK-KKS-403140). These guidelines are for Wildfire Suppression Activity Damage Repair on areas damaged during the incident and to be financed (charged to the fire incident). Suppression damage repairs are usually completed by fire suppression crews and equipment as directed by the Incident Management Team (IMT) following containment of the wildfire. These guidelines are not for a BAER (Burned Area Emergency Rehabilitation) Plan.

Suppression repair is the responsibility of the IMT assigned to the fire. Repairs to external control lines should start as soon as the damaged areas are "released" by the Operations Section Chief. Repairs to control lines that are no longer external to the fire perimeter, safety zones that are no longer needed, and spike camps that are no longer in use, should be repaired as soon as appropriate equipment and personnel are available to accomplish the repair. The Planning Section staff should provide an inventory of ground disturbance from fire suppression activities including: dozer lines, brush lines, hand lines, constructed safety zones, helispots, water source sites, etc.

The Funny River Fire burned area currently includes Kenai National Wildlife Refuge, State of Alaska, Kenai Peninsula Borough, Cook Inlet Region, Inc. (CIRI), Salamatof Native Association, Inc., Native Allotments and Private lands. The goal of suppression repair is to prevent the long term environmental degradation of the land and its natural resources, and to encourage recovery.

Land Ownership	Acres
Native Allotments	49
Kenai Peninsula Borough	476
Private	215
State of Alaska	108
CIRI	586
Salamatof Native Association	7
Kenai National Wildlife Refuge	191,390
TOTAL	**192,831**

Table 1: Funny River Fire Ownership

Land Ownership	Jurisdictional Agency	Line Type	Feet	Miles
Native Allotments	BIA	Uncontrolled Fire Edge	3566.634	0.675
Kenai Peninsula Borough	Alaska DNR	Completed Dozer Line	5062.025	0.959
Kenai Peninsula Borough	Alaska DNR	Heavy Equipment Track	2861.335	0.542
Kenai Peninsula Borough	Alaska DNR	Cold-trailed edge and Walking Trail	5780.489	1.095
Private	Alaska DNR	Completed Dozer Line	2535.62	0.480
Private	Alaska DNR	Cold-trailed edge and Walking Trail	7736.155	1.465
State of Alaska	Alaska DNR	Cold-trailed edge and Walking Trail	6744.457	1.277
CIRI	AFS/Regional	Completed Dozer Line	6951.161	1.317
CIRI	AFS/Regional	Heavy Equipment Track	5520.229	1.045
CIRI	AFS/Regional	Cold-trailed edge and Walking Trail	20629.97	3.907
Salamatof Native Association	AFS/Village	Completed Dozer Line	544.97	0.103
Salamatof Native Association	AFS/Village	Cold-trailed edge and Walking Trail	2336.858	0.443
Kenai National Wildlife Refuge	USFWS	Completed Dozer Line	51905.53	9.831
Kenai National Wildlife Refuge	USFWS	Heavy Equipment Track	3603.642	0.683
Kenai National Wildlife Refuge	USFWS	Cold-trailed edge and Walking Trail	279449.8	52.926
Kenai National Wildlife Refuge	USFWS	Uncontrolled Fire Edge	304248.4	57.623
Total	**All**	**All**	**74,421**	**140.949**

Table 2: Funny River Control Line by Ownership and Type

Note: **Total Dozer Line = 12.7 miles**

Repair Objectives:

1) Reduce or eliminate erosion and sedimentation that could result from fire suppression activities such as constructed fire lines and safety zones, and localized disturbed areas such as spike camps, staging areas, drop points, and helispots.

2) Protect sensitive wetland or riparian areas from further disturbance and cover with woody debris, vegetation or other suitable organic material to hold soils in place and encourage the regeneration of natural vegetation.

3) Prevent future accessibility of fire lines from unauthorized/unwanted ORV use.

4) Remove all equipment, supplies, flagging and trash from fire lines, spike camps, helispots, and water source sites.

General Fireline Repair:

All trash should be removed from fireline, drop points, and helispots and back-hauled to the ICP for proper disposal. Check all firelines and travel routes for litter.

Where heavy equipment will be used for repairs or where all-terrain vehicles are used for access, repairs should begin at the furthest point on the line from the access point and proceed out.

Where mineral soil has been exposed, provide adequate drainage by constructing water bars. Recommended waterbar spacing is indicated below depending on the fire line slope. On relatively flat areas, waterbars should alternate directional flow (in a herring bone configuration).

Spread the extra soil to the downhill side of the water bar to help hold it in place. Extend the uphill portion of the water bar well beyond the edge of the fire line so that runoff does not sneak around the top of the water bar. Do not place water bars perpendicular to the fireline. Excavate the soil at the bottom end of the bar to allow water to drain away from the fireline.

Where trees have been felled, flush-cut stumps where practicable, or cut stumps to within 12 inches of the ground on the high side. Cut any hazardous sharp stumps or staubs parallel to the ground.

Where indicated, block access to fireline by constructing berms.

Dozer Lines

General dozer line rehab includes leveling berm piles and spreading material within the blade line to both mitigate erosion potential and expedite revegetation. Water bar construction is also common in sloped areas where runoff can lead to significant problems.

Slope	Spacing
0-5%	400 ft
6-10%	300 ft
11-20%	200 ft
21-40%	100 ft
41-50%	50 ft
>50%	25 ft

Table 3: Dozerline Waterbar Spacing

- Actual location of waterbars should take advantage of natural slope breaks, and to minimize drainage on downslope burned areas.
- Use natural rolls and dips wherever possible.
- Waterbars should be skewed approximately 30-45 degrees from horizontal and away from the fire if possible. Waterbars should be opened on the downhill side to allow water to flow freely off the dozerline.

- Reinforce waterbars on cup trenches that run near parallel to the slope. Material used for reinforcing will be anchored into both edges of the fireline.
- On wet and dry sections of the dozer line, to prevent soil movement and to help prevent unauthorized or unwanted off-road vehicle access, use an excavator with thumb to pull trees, logs, brush and other organic material into the fire line (where adequate debris exists) to achieve at least 65% ground cover. Use bucket teeth to rough up any compacted soils.

Safety Zones

Re-spread all berms as evenly as possible to promote reestablishment of native vegetaion and minimize erosion.

Cold-trailed Edge with Walking Trail

Unless mineral soil has been exposed along the fireline, repair consists of removal of all equipment, supplies, flagging and trash from the fireline.

In specific locations where handline has been constructed to mineral soil, waterbar spacing should be approximately:

Fire Line Slope	Water Bar Spacing
0-10%	Every 200 feet
10-30%	Every 100-150 ft.
30-40%	Every 75-100 ft.
40-60%	Every 50 ft.
>60%	Every 25 ft.

Table 4: Hand line Waterbar Spacing (if mineral soil is exposed)

- Actual location of water bars should take advantage of natural slope breaks, and to minimize drainage on down slope burned areas.
- Use natural rolls and dips wherever possible.
- Water bars should be skewed horizontally approximately 30-45 degrees from horizontal and drained away from the fire if possible. Water should drain onto stable or vegetated sites.
- Scatter branches, wood, rock or other material to naturalize the fire line and further retard soil movement at locations identified by the Resource Advisor. Scattered material should be randomly placed at least every 5 ft. along the hand line. Strive to achieve at least a 65% ground cover on areas treated with scattered material to prevent soil movement. In grassy areas or where no material is available, replace soil, water bar, and scatter a few rocks on the line to naturalize.
- Reinforce waterbars on cup trenches that run near parallel to the slope. Material used for reinforcing will be anchored into both edges of the fireline.

Spike Camps

- Remove all equipment, supplies, and trash from camps and back-haul to ICP.
- Where trees have been felled, flush-cut stumps where practicable, or cut stumps to within 12 inches of the ground on the high side. Cut any hazardous sharp stumps or staubs parallel to the ground.

Helispots, Staging Area, and Drop Points

- Pull all flagging, trash, signs, oil etc.
- Repair of helispots will be done on a case by case basis as directed by the Resource Advisor.

Fueling Sites

- Spilled fuels or other toxic substances should be removed. Contaminated soils may need to be removed. Remove hazardous material containment pads and dispose of - properly.

Water Sources (Drafting or Pump Sites)

- Remove sumps, dams or dikes constructed during fire suppression, and return sites as closely as possible to surrounding terrain condition. Make sure all hose is collected and removed.

Appendix A: Branch I Repair Needs by Division

Branch I:

DIV-G

- No dozers were used in Division G.
- Helispots H-20, H-95, H-96, H-100
- Spike camps at Bear Creek, Harvey Lake, Pipe Creek
- Structure Prep at Bear Creek, Harvey Lake, Killey Fish Weir, Moose Creek Cabin, Pipe Creek.

DIV-H

- Intermittent dozerline/equipment trail southeast from powerline to Star Lake
    - Note: dozer line repair east of N60.30602, W-151.19232 requires additional guidance from Kenai NWR managers to determine timing and method of the repairs
- Helispots H-25, H-26, H-27, H-28, H-30, H-35
- DP-15

DIV-M

- No dozerline or helispots in Division M.

Appendix B: Branch II Repair Needs by Division

Branch II:

DIV-X

- Dozerline from Origin southwest to approximately one mile north of Coal Creek Lake.
- Helispots H-60, H-70, H-75, and H-80
- Safety Zone at H-70

DIV-A

- Burned-over dozerline off of Funny River Road in Sections 5 and 8
- Dozer improvement of existing Fuel Break
- Dozerline around slop-over north of Fuel Break
- Helispots H-81, H-82, H-83
- DP-6, DP-7

DIV-B

- Dozerline north of Moose Ridge Avenue
- H-84, H-85, H-90
- DP-3, DP-4

DIV-C

- No Dozerline in Division C
- Helispot H-91
- West C Spike
- East C Spike

Appendix C: Repair Maps