Funny River Fire invasive plant survey

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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 rehabilitated 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 facilitating invasions of exotic plant species into relatively weed-free portions of the Kenai National Wildlife Refuge. Movement of vehicles, aircraft, and heavy equipment 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.ualaska.edu/botany/akepic/).
Figure 1: Map of sampling locations.
<table>
<thead>
<tr>
<th>site label</th>
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<th>longitude</th>
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<tbody>
<tr>
<td>Caribou Island</td>
<td>Cabin</td>
<td>60.23842164</td>
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<tr>
<td>H-100</td>
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<td>H-20</td>
<td>Cabin</td>
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<td>Lake Emma Cabin</td>
<td>Cabin</td>
<td>60.12403057</td>
<td>-150.5585829</td>
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<td>no landing site</td>
</tr>
<tr>
<td>Nurses Cabin</td>
<td>Cabin</td>
<td>60.30052453</td>
<td>-151.0295338</td>
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<td>time constraints</td>
</tr>
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<td>Pipe Creek Cabin</td>
<td>Cabin</td>
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<td>-150.7531959</td>
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<td>H-27</td>
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<td>H-28</td>
<td>Helispot</td>
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<td>too wet to walk; low invasion potential</td>
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<td>H-30</td>
<td>Helispot</td>
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<tr>
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<td>------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PICNIC</td>
<td>horse trail</td>
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<td>-150.72031</td>
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<tr>
<td>Camp III</td>
<td>horse trail camp</td>
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<td>FRCAMP2</td>
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<td>time constraints</td>
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<tr>
<td>East C Spike</td>
<td>spike camp supply drop site</td>
<td>60.46973333</td>
<td>-150.5440833</td>
<td>from air</td>
<td>tight landing; burned in Card Street Fire, completely black at present</td>
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<tr>
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<td>spike camp supply drop site</td>
<td>60.48158334</td>
<td>-150.5675166</td>
<td>from air</td>
<td>the site was wet with low invasion potential</td>
</tr>
</tbody>
</table>
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>
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<tr>
<th>botanical name (ANHP)</th>
<th>botanical name (inaturalist)</th>
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<tr>
<td>Cerastium fontanum</td>
<td>Cerastium fontanum vulgare</td>
<td>common mouse-ear</td>
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<tr>
<td>ssp. vulgare</td>
<td>(Hartman) Greuter &amp; Burdet</td>
<td>chickweed</td>
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<td>Chenopodium album L.</td>
<td>Chenopodium album</td>
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<td>var. album</td>
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<td>narrowleaf hawksbeard</td>
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<td>common toadflax</td>
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<td>Mill.</td>
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<tr>
<td>Lupinus polyphyllus</td>
<td>Lupinus polyphyllus</td>
<td>bigleaf lupine</td>
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<tr>
<td>Lindl. ssp. polyphyllus</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Matricaria discoidea</td>
<td>Matricaria discoidea</td>
<td>pineappleweed</td>
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<td>DC.</td>
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<td></td>
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<tr>
<td>Phleum pratense L.</td>
<td>Phleum pratense</td>
<td>cultivated timothy</td>
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<tr>
<td>Plantago major L.</td>
<td>Plantago major</td>
<td>common plantain</td>
<td>44</td>
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<tr>
<td>Poa annua L.</td>
<td>Poa annua</td>
<td>annual bluegrass</td>
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<tr>
<td>Silene latifolia Poir.</td>
<td>Silene latifolia</td>
<td>white campion</td>
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<tr>
<td>Stellaria media (L.)</td>
<td>Stellaria media</td>
<td>common chickweed</td>
<td>42</td>
</tr>
<tr>
<td>Vill.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Taraxacum officinale</td>
<td>Taraxacum officinale</td>
<td>common dandelion</td>
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<tr>
<td>F.H. Wigg.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Trifolium hybridum L.</td>
<td>Trifolium hybridum</td>
<td>alsike clover</td>
<td>57</td>
</tr>
<tr>
<td>Trifolium repens L.</td>
<td>Trifolium repens</td>
<td>white clover</td>
<td>59</td>
</tr>
</tbody>
</table>

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](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.
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 m²) 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).

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.
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.

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<th>longitude</th>
<th>date</th>
<th>botanical name (inaturalist)</th>
<th>id (inaturalist)</th>
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</thead>
<tbody>
<tr>
<td>Tustumena Lake, Andrew Berg cabin (H-100)</td>
<td></td>
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<tr>
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<td>Tustumena Lake Wilderness Lodge at Bear Creek (H-20)</td>
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continued on next page...
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Kasilof, Pollard Horse Trail west of refuge boundary

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Hanson Horse Trail

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Funny River Road, woodcut road

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Funny River Road, bulldozer line across from Campfire Drive

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

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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 suppression activities associated with the 2014 Funny River Fire have not yet substantially 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 revegetation had begun in the bulldozer lines and slash laid over the lines during rehabilitation 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**


Appendix A: Fire report - Funny River, fire code H4Q1
Fire Reporting - Fire Report

General Reporting Information

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Statistical Data

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https://www.nifc.blm.gov/cgi/FireReporting.cgi/Page/FireView/677568/FireEdit 4/6/2015
| Initial Attack: | 05/19/2014 16:03 | Airtanker (Type 2); Drops Engines (Type 3, 4, or 5); Each Handcrew (Type 1); People |
| Controlled/Completed: | 08/31/2014 10:00 | 6 2.0 |
| Declared Out: | 12/08/2014 | 196,610.0 |

### Site Data

| Topography: | Flat or rolling | Weather Station: | 500927 |
| Aspect: | Flat | MSGC Model: | Alaska black spruce (Q) |
| Slope: | 0 - 25 % | MSGC Slope: | 0 - 25 % (1) |
| Elevation: | 0 - 500 feet above sea level | 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 | Structures Burned/Destroyed: | 6 |
| Special Area Type: | No Special Area Type designation |

### Fire Ecology

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### 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: 04/06/2014 |

### Trespass Investigation

https://www.nifc.blm.gov/cgi/FireReporting.cgi/Page/FireView/677568/FireEdit 4/6/2015
The Alaska Fire Service will bill the State of Alaska on 1 April 2015, per terms of their Annual Operating Agreement.
Funny River
403140

Fire Status: F - Finalized
Incident Number: 403140
Incident Name: Funny River
General Cause: Human
Latitude: 60° 26.367

DOI Fire Code: H4Q1
Type: Fire - Wildland Fire
Specific Cause: Undetermined
Longitude: -150° 57.713

USFS: PNH4Q1
Mgt. Office: Kenai-Kodiak
Detail Cause: Undetermined


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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

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Printed Date: 04/09/2016 11:06 AKDT Incident Number: 403140
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Weather Data at Initial Attack:

Nearest Weather Station: Soldotna KKS - 500827

<table>
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<tr>
<th>Temperature (°F)</th>
<th>RH (%)</th>
<th>Wind Speed (mph)</th>
<th>Wind Direction</th>
<th>FFMC</th>
<th>BUI</th>
<th>ISI</th>
<th>FWI</th>
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<td>93.4</td>
<td>68.8</td>
<td>19.9</td>
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Historical Narrative:

Report Day: 09/19/2014

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 ¼ of a mile wide. 2500 acres with winds 25 miles per hour coming out of the north, ¼ mile flame lengths at the head 200 feet tall. At 0030 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 retardant 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 RFS combined with high winds, and competing nearby fires stretching ground and aerial resources thin are making containment near impossible.

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 hoseay. 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 Intermittent powerline. 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.

05/25/14

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 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 Intermittent 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.

05/27/14

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 slope 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.

05/28/14

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 lying in with natural barriers. Old burns scars are helping to check up fire progression northeast. Inaccessable 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.

05/29/14

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.

05/30/14

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 demobilized 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, 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 and dew points. Chance of isolates 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 and cloud cover. Isolates 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 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. Fire resources continued to mop up and repair suppression impacts. Increasing cloud cover, humidity 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 though 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 01 inches (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 measurable 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 Tustumena 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 demobil. Rehab is now complete fire-wide. No recon flights were taken due to poor weather conditions. The 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 T21A 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.
Appendix 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.

<table>
<thead>
<tr>
<th>Land Ownership</th>
<th>Acres</th>
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<td>476</td>
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<tr>
<td>Private</td>
<td>215</td>
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<td>State of Alaska</td>
<td>108</td>
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<tr>
<td>CIRI</td>
<td>586</td>
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<td>Kenai National Wildlife Refuge</td>
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<td>TOTAL</td>
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Table 1: Funny River Fire Ownership
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<th>Land Ownership</th>
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<th>Miles</th>
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<td><strong>All</strong></td>
<td><strong>74,421</strong></td>
<td><strong>140.949</strong></td>
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</table>

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.

<table>
<thead>
<tr>
<th>Slope</th>
<th>Spacing</th>
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<tbody>
<tr>
<td>0-5%</td>
<td>400 ft</td>
</tr>
<tr>
<td>6-10%</td>
<td>300 ft</td>
</tr>
<tr>
<td>11-20%</td>
<td>200 ft</td>
</tr>
<tr>
<td>21-40%</td>
<td>100 ft</td>
</tr>
<tr>
<td>41-50%</td>
<td>50 ft</td>
</tr>
<tr>
<td>&gt;50%</td>
<td>25 ft</td>
</tr>
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</table>

*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 vegetation 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:

<table>
<thead>
<tr>
<th>Fire Line Slope</th>
<th>Water Bar Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10%</td>
<td>Every 200 feet</td>
</tr>
<tr>
<td>10-30%</td>
<td>Every 100-150 ft.</td>
</tr>
<tr>
<td>30-40%</td>
<td>Every 75-100 ft.</td>
</tr>
<tr>
<td>40-60%</td>
<td>Every 50 ft.</td>
</tr>
<tr>
<td>&gt;60%</td>
<td>Every 25 ft.</td>
</tr>
</tbody>
</table>

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 stumps 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
- 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