



# Elk Valley Invasive Plant Management

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## Year 2 Final Report

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## Executive Summary

Invasive species are widely acknowledged as a significant threat to biodiversity and ecological integrity across British Columbia and globally. They can grow rapidly and reproduce quickly, out-compete native species, and have the potential to cause undesirable or detrimental impacts on entire ecosystems. Mitigating the impacts of invasive species requires a coordinated and landscape-level approach involving multiple stakeholders and long-term investments on the land base.

The Upper Elk Valley stands out in the East Kootenay as an area rich in biodiversity, that is relatively less impacted by invasive species than other areas in the region. However, with industrial activity and backcountry recreation becoming increasing pathways for the introduction and spread of invasive species, land managers and local user groups came together in 2019 to discuss the feasibility of developing a multi-stakeholder invasive plant management plan (IPMP) for the area. To maximize combined efforts to best maintain ecosystem health and function, inventory of invasive plants, treatment, monitoring, and education were deemed essentials to an IPMP. The goal of this project is to work collaboratively with stakeholder groups to prevent and contain invasive plants from occurring in high-value wildlife habitat areas, specifically bighorn sheep winter range, and support the retention of ecological function in the Upper Elk Valley.

Development and implementation of an IPMP for the Upper Elk Valley was achieved during Year 1 of the Elk Valley Invasive Plant Management Project, administered by the East Kootenay Invasive Species Council (EKISC). In Year 2, the project was supported monetarily by many organizations including: Habitat Conservation Trust Foundation (HCTF), the Fish & Wildlife Compensation Program (FWCP), Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD), Ministry of Transportation and Infrastructure (MOTI), Columbia Basin Trust (CBT), BC Hydro, Nature Trust of BC (NTBC), Wild Sheep Society of BC, BC Backcountry Hunters & Anglers, Elkhorn Rod & Gun Club, Sparwood Fish & Wildlife Society (SDFWA), Ministry of Environment (BC Parks), and the Grassland Rangeland Enhancement Program (GREP). Other regional stakeholders were engaged, including Ktunaxa Nation Council, Teck Resources Ltd., and Canfor Forest Products.

In Year 2, a total of 415 sites were treated covering 91.47 ha of Forest Service Roads, recreation trails, or roads scheduled for deactivation. Treatments included both mechanical and chemical methods. Monitoring occurred at 16% of treatment sites to evaluate efficacy and completion. Additional invasive plant inventories occurred in areas that were inaccessible in Year 1 due to active logging. Data was collected from 13 long-term vegetation monitoring plots to help determine long-term effectiveness of applied treatment methods. Photos were taken at 13 photo plot monitoring sites to demonstrate impact of treatments over time. Three small-scale grass seeding trials were established to evaluate the effectiveness of grass seeding in outcompeting yellow hawkweed. A virtual workshop was given to provide information about invasive species in the Elk Valley to the public and project stakeholders. Invasive plant education signs were designed and will be installed at various locations within the Elk Valley in the Spring of 2022.



Table of Contents

Executive Summary.....	2
List of Figures .....	4
List of Tables .....	4
Introduction .....	5
Project Objectives .....	6
Study Area.....	6
Project Planning .....	8
Methods.....	8
Invasive Plant Inventory.....	8
Invasive Plant Treatment .....	9
Grass Seeding .....	9
Invasive Plant Monitoring .....	10
Treatment Efficacy Monitoring .....	11
Long-Term Effectiveness Monitoring.....	11
Photo Plot Monitoring .....	12
Results and Outcomes .....	12
Invasive Plant Inventory Results .....	13
Invasive Plant Treatment Results.....	15
NTBC Big Ranch Conservation Property.....	19
Chauncey Todhunter Access Management Area.....	21
Elk River, Round Prairie, and other Forest Service Roads.....	23
Treatment Efficacy Monitoring Results .....	25
Grass Seeding Trial Results .....	25
Long-Term Effectiveness (Vegetation Plot) Monitoring Results.....	25
Photo Monitoring Plots.....	27
Outreach and Community Engagement .....	27
Discussion & Program Recommendations.....	28
Challenges and Lessons Learned.....	29
Acknowledgements.....	30
References .....	31
Appendix A: Elk Valley IPMP Priority Species 2021 .....	33



### List of Figures

Figure 1. Upper Elk Valley Invasive Plant Management Plan Project Area. Note: Elkford is located approximately 20 km north of the southern boundary.....	7
Figure 2. Grass seed trial layout installed at sites 1 and 4 in the Upper Elk Valley project area.....	10
Figure 3. Grass seed trial layout installed at site 3 in the Upper Elk Valley project area .....	10
Figure 4. Diagram of a vegetation Monitoring plot established at all monitoring locations in the Upper Elk Valley project area.....	12
Figure 5. Invasive plant inventory data collected in Year 2 in the Upper Elk Valley project area. ....	14
Figure 6. Chemical and Mechanical Treatment Sites in the Upper Elk Valley project completed in 2021. ....	16
Figure 7. Nature Trust of British Columbia Big Ranch Conservation Property Invasive Plant Treatments, 2021. ....	20
Figure 8. Successful spotted knapweed treatments at the Nature Trust of British Columbia Big Ranch Conservation Property. ....	21
Figure 9. Invasive plant inventory and treatments in Chauncey Todhunter Access Management Area, completed in 2021. ....	22
Figure 10. Large, dense, continuous Yellow hawkweed infestation (yellow flowers) in the Chauncey-Todhunter Access Management Area pre-treatment, in 2021. ....	23
Figure 11. Successful Yellow hawkweed treatment on a spur road in the Chauncey-Todhunter Access Management Area, in 2021. Note: brown, dead vegetation are successful treatments. ....	23
Figure 12. Treatment and inventory sites on Elk River, Round Prairie, Forsythe Creek and surrounding forest service roads and spur roads within the middle portion of the Upper Elk Valley project area completed in 2021. ....	24
Figure 13. Grass seed Trial 1 where grass seed was applied in 2020 post chemical treatment (left), and one year following grass seed application (right). ....	25
Figure 14. Permanent monitoring plots installed and photo monitoring locations within the Upper Elk Valley project area. ....	26
Figure 15. Photo monitoring plot on the Ewin Creek forest service road within the Todhunter Access Management Area before (left) and after (right) treatment, 2021.....	27

### List of Tables

Table 1. Breakdown of chemical and mechanical treatment sites, area, and number of treatment days completed in the Upper Elk Valley project area in 2021. ....	17
Table 2. Details of invasive plant treatments that occurred within the Upper Elk Valley project area in 2021. Note some sites had more than one species present/treated. ....	17



## Introduction

The Elk Valley is rich in biodiversity (Poole et al., 2018) and provides habitat for seven ungulate species and seven large carnivore species (Chow et al., 2018). Of the ungulate species, Rocky Mountain bighorn sheep (*Ovis canadensis*), a blue-listed species, hold a particular significance in this area due to their high harvest and cultural value (Poole et al., 2018). Several bighorn sheep herds occupy both sides (east and west) of the Upper Elk Valley. The area is known to provide high quality winter range habitat (Poole et al., 2013), including Ewin Ridge which has been considered the most important bighorn sheep winter range in British Columbia (Demarchi, 1968).

In addition to providing valuable habitat for wildlife, the Upper Elk Valley is also used for industrial mining and forestry, and for numerous recreational activities, including hunting, fishing, hiking, and biking. Although these activities play an important role in the Elk Valley culturally and economically, they can have impacts on the landscape. On the east side of the Upper Elk Valley, preferred winter range habitat declined by 30% between 1980 and 2000 because of industrial activity and habitat degradation (Poole et al., 2018). Wildlife biologists are concerned about the impacts on bighorn sheep and other wildlife species if further habitat is lost (I. Teske, personnel. Communication, Oct 15, 2019). Of concern recently is the introduction and spread of invasive plant species into areas of high habitat value.

Invasive species are widely known as a significant threat to biodiversity and ecological integrity across British Columbia and globally (IUCN, 2011, Invasive Species Council of British Columbia, 2014). They establish and spread quickly and can form large infestations of dense monocultures. Invasive species can alter the structure and composition of ecosystems, have significant environmental, economic, and societal impacts, and are spreading at a rapid rate (Government of Canada, 2004 & 2017; IUCN, 2020). Sensitive habitats, typically those that have been selected for protection and conservation, can be particularly vulnerable to the impacts of invasive species, displacing native wildlife and plants, and attributing to overall ecosystem alteration and habitat change (MFLNRORD, 2019). Invasive plants can reduce soil productivity, degrade range resources and wildlife habitat, alter natural fire regimes, reduce property values, introduce disease to ecosystems, and more (Invasive Species Council of BC, 2020). Mitigating the negative impacts of invasive species (e.g., through management costs or accounting for reduction in crop, range, or forestry productivity) costs the global economy millions of dollars annually, and the Global Invasive Species Program recognizes invasive species “as one of the greatest threats to the ecological and economic well-being of the planet” (Mooney, 1999).

The East Kootenay Invasive Species Council (EKISC) is a non-profit organization that strives to reduce the negative social, environmental, and economic impacts caused by invasive species across the region (EKIPC, 2013). EKISC has been delivering an effective partnership delivery program across multiple jurisdictions since the East Kootenay Invasive Plant Pilot Program began in 2005 (Liepa, 2013). To do this, EKISC coordinates invasive species management on public and private lands, delivers invasive species education and outreach, and fosters increased support for invasive species management in the region. EKISC is comprised of various stakeholders including Provincial ministries, regional governments, community associations, and environmental groups with the common goal of invasive species management.

Prior to 2020, EKISC completed annual inventory, treatment, and monitoring in the Upper Elk Valley only along mainline Forest Service Roads (FSRs) only due to limited funding resources for the area. With industrial activity and backcountry recreation becoming increasing pathways for the introduction and spread of invasive species, land managers and user groups came together in 2019 to discuss the feasibility of developing a multi-stakeholder Invasive Plant Management Plan (IPMP) for the area. To maximize



combined efforts to best maintain ecosystem health and function, inventory of invasive plants, treatment, monitoring, and education were deemed essentials to an IPMP.

Development and implementation of an IPMP was achieved during Year 1 (2020) and continued in Year 2 (2021) for the Upper Elk Valley Invasive Plant Management Project (hereafter referred to as “the project”). The project is administered by EKISC and supported monetarily by many organizations. The goal of the project is to work collaboratively to prevent and contain invasive plant species from occurring in high-value wildlife habitat areas, specifically bighorn sheep winter range, and support the retention of ecological function in the Upper Elk Valley (Phillips and Kaisner, 2019).

### Project Objectives

Objectives of Year 2 of the project include:

1. Update the comprehensive multi-stakeholder IPMP based on information acquired during Year 1 of the project, develop annual work plan with stakeholders, implement Year 2 of the IPMP.
2. To decrease the presence of invasive species and retain ecosystem health and biodiversity within priority areas through various treatment methods and education.
3. To prevent further spread and establishment of invasive plants in the upper Elk Valley.
4. To monitor effectiveness of treatment within the project area by revisiting permanent monitoring plots and completing treatment monitoring and evaluation.
5. To build community stewardship through connecting land managers and user groups with shared values.

The project and IPMP implementation is based in the Upper Elk Valley, with a focus on ungulate winter range (high-value wildlife areas) and utilizes an Ecosystem-Based Approach (FWCP, 2019). The project aims to protect conservation lands against the establishment and spread of invasive species, improve understanding of invasive species distribution, and enable early detection and rapid response to new invasive plant infestations. Priority habitats include fire-maintained ecosystems, ungulate winter range, grasslands and deciduous forests, existing conservation lands, and surrounding areas.

### Study Area

The project area is within the Regional District of East Kootenay (RDEK), extending from the Alberta border (northern and eastern boundaries) south past Elkford, BC to Airport Road (Figure 1). EKISC has divided the RDEK into five Invasive Plant Management Areas (IPMAs), and the Project area is located within EKISC’s IPMA 02: Elk Valley North. The project area is largely comprised of public land, including BC Parks, MFLNRORD (includes Access Management Areas and tenured areas by guide-outfitters and Canfor Forest Products), and MOTI rights-of-ways. There are tracks of private land within the project area, specifically Teck Resource Ltd., conservation properties, and CanWel Fibre.

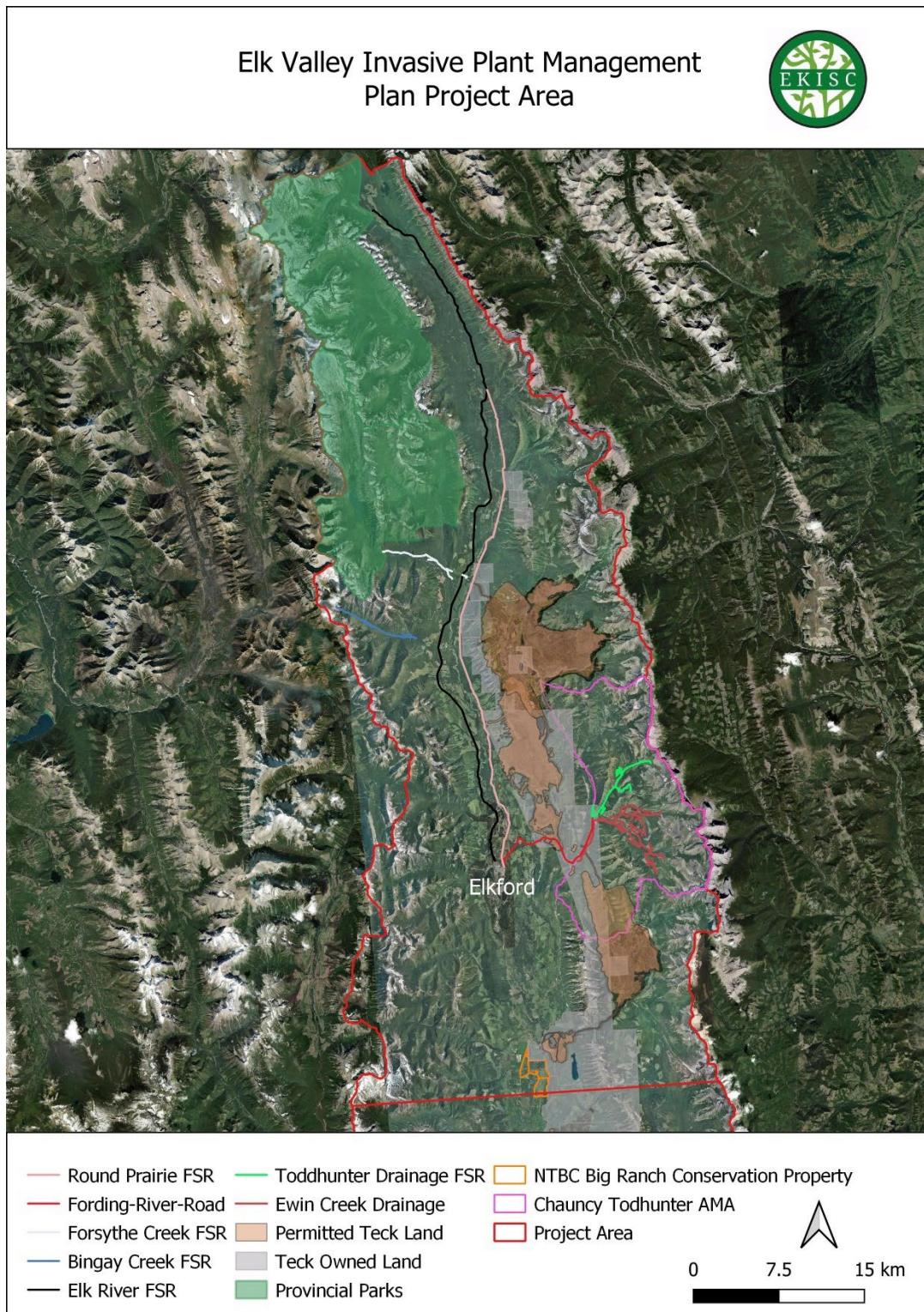


Figure 1. Upper Elk Valley Invasive Plant Management Plan Project Area. Note: Elkford is located approximately 20 km north of the southern boundary.



## Project Planning

EKISC worked closely with project stakeholders to update the Upper Elk Valley IPMP and initiate planning for the 2021 field season. EKISC finalized Year 2 project priorities through the following activities:

- All previously known invasive plant infestations were identified and downloaded from the Provincial Invasive Alien Plant Program (IAPP) database.
  - Data from the 2020 inventory was also accessible to ensure all priority infestations would be targeted for treatment during the 2021 field season.
- High-value wildlife areas (e.g., bighorn sheep habitat), areas with high recreational use, and other areas of particular interest within the project area were identified. These critical areas were decided through discussions with user groups and Provincial biologists.
  - During communications with Ktunaxa Nation Council, on May 14<sup>th</sup>, 2021, Cathy Conroy informed EKISC that “[Ktunaxa Nation Council] are taking some time to reflect internally and are pausing all external interactions until further notice. Please keep me informed of any developments or new information, and if I can respond I will do so”. EKISC included Cathy on all group communications throughout the field season.
- Inventory and monitoring protocols were reviewed to ensure all relevant information was collected during field work.
- EKISC worked with the Wild Sheep registry to identify more detailed data on sheep ranges due to publicly available data coarsely illustrating the entire Elk Valley as bighorn sheep habitat. Information shared by the Wild Sheep Registry along with the extensive information of invasive plant infestations on existing FSRs, spur roads, and trails in the project area that was collected in Year 1, allowed us to better prioritize treatment areas in Year 2.
- EKISC finalized the role of stakeholder groups and additional partners during this phase by hiring contractors, organizing educational workshops, and planning in-house field staff visits to the project area for data collection, treatment monitoring, grass seeding, and additional inventory field work.

## Methods

EKISC followed the methods outlined in the *Invasive Plant Management Plan for the Upper Elk Valley* (Kaisner and Phillips, 2019), which can be referenced for more detail. An overview of activities undertaken is provided in the following sections.

### Invasive Plant Inventory

EKISC staff and contractors surveyed and recorded invasive plant species, locations, infestation sizes, densities, distributions, and provided additional comments if necessary, using a standardized inventory record template in GIS Pro. Staff recorded information on invasive plant species that are provincially regulated by the BC Weed Control Act and Regulations or included in the *Priority Species for the Elk Valley IPMP* (Appendix A). Locations were entered when a new plant was inventoried, or when density and/or distribution of a species significantly changed. Polygon data was collected to document where infestations were continuous over large distances or very dense, and line segments were collected to demonstrate linear infestations. On linear segments (trails, spur roads, and FSRs) that were surrounded by dense trees, an observatory approach was utilized along either side of the segment until the tree canopy. The focus of the inventories were recreation trails, spur roads, and FSRs that were not inventoried in 2020. Once chemical treatment began, it was determined more efficient to conduct invasive plant treatments concurrently with inventory. Therefore, areas that were data deficient were surveyed and treated on the



same day. If the allocated treatment dollar amount did not cover the length of the FSR, only inventory data was collected.

#### Invasive Plant Treatment

The IPMP identifies priority areas for invasive plant treatment in the Upper Elk Valley, largely informed by the extensive invasive plant inventories that took place in Year 1 of the project. In 2021, treatments focused on:

- High-value wildlife habitat and Access Management Areas
- FSR road segments scheduled for deactivation by MFLNRORD
- High-use recreation trails
- Conservation properties.

Invasive species targeted for treatment follow the *Priority Species for the Elk Valley* (Appendix A), updated annually within the Elk Valley IPMP using a variety of resources, including Provincial legislation, Provincial invasive species data, and regional stakeholder and user group knowledge. Species that have not been observed in this IPMA are ranked as Early Detection Rapid Response (EDRR) species. If found, the treatment goal is eradication. Species ranked as Priority 1, 2, or 3 are targeted for treatment, with varying goals of eradication or containment based on species distribution. Yellow hawkweed, classified as Priority 3, is widespread across the project area, but limited in extent north of km 143 on the Elk River FSR. A containment line was established for this species, with everything north of the 143 km mark being treated and particular attention to areas where the species has been found in high elevation grassland habitat.

Treatment methods included both mechanical (hand-pulling) and chemical (backpack, boomless nozzle, or handgun). Treatment methods utilized for each invasive plant site depended on the species, location, timing, and weather. All herbicide applicators had valid Pesticide Applicator Certificates and followed the requirements and guidelines provided in BC's Integrated Pest Management Regulation as well as the MFLNRORD Pest Management Plan for Southern Interior BC (MFLNRORD, 2019). Selective herbicides were primarily used to limit negative impacts on non-target species. Treatments focused on a backcountry-in approach, beginning at the most northern/high elevation portions of the project area, with the intent of containing species to the main valley and preventing further spread into the backcountry (Kaisner & Phillips, 2019).

#### Grass Seeding

To evaluate the effectiveness of grass seeding in outcompeting Yellow hawkweed, an aggressive invasive species that is present in varying densities throughout the Upper Elk Valley, three grass seeding trials were implemented in 2021, in addition to one small-scale trial established in 2020 (Forsythe Creek FSR). Sites were chosen due to known dense Yellow hawkweed infestations and accessibility for monitoring purposes. All sites were chemically treated throughout the summer, and grass seed was manually applied on October 14<sup>th</sup>, 2021. Site locations are:

**Trial 1:** Forsythe Creek FSR

**Trial 2:** Bingay Creek FSR

**Trial 3:** Spur road off Toddhunter drainage FSR

**Trial 4:** Toddhunter drainage FSR

At sites 1 and 4, a 30 x 15 m plot was marked and divided into two 15 x 15 m subplots. One area was seeded, and the other left unseeded (Figure 2). Nails were placed at 5 m intervals throughout the subplots (i.e., 0 m, 5 m, 10 m etc.), with images taken at each nail. At site 2, a 20 x 10m plot was marked and divided into two 10 x 10m subplots because the area was not large enough to install a 30 x 15m site. Lastly, site 3 contained two 15 x 15m subplots. These subplots were divided and placed on an angle to one another due to site location and the nature of the infestation, which follows a curving spur road (Figure 3). In subsequent years, all sites will be monitored to determine if grass seed application has been successful and could be utilized in other areas of dense Yellow hawkweed or other invasive species infestations.

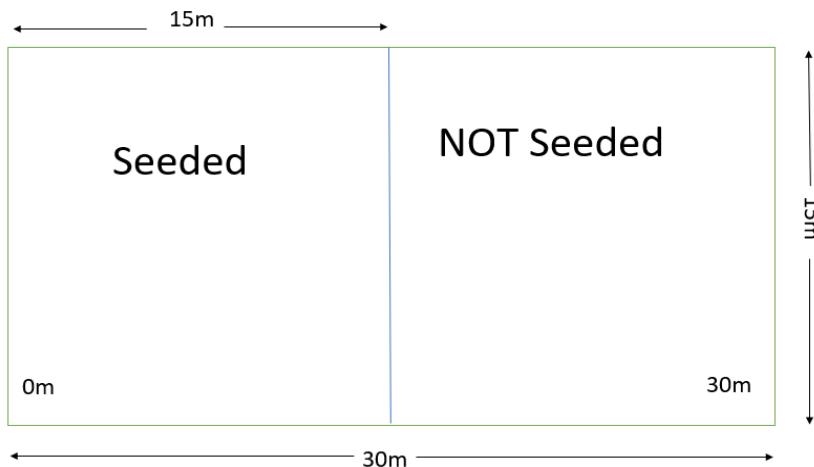


Figure 2. Grass seed trial layout installed at sites 1 and 4 in the Upper Elk Valley project area.

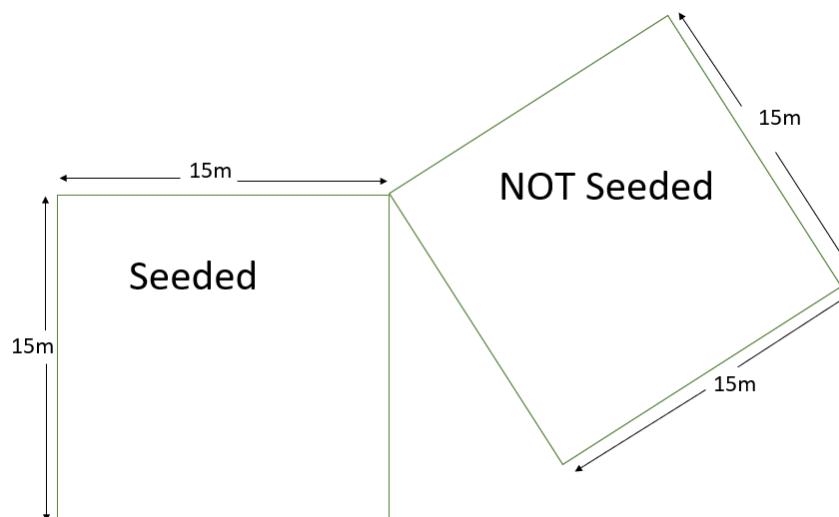


Figure 3. Grass seed trial layout installed at site 3 in the Upper Elk Valley project area

#### Invasive Plant Monitoring

Three types of monitoring are utilized in the project, including: treatment efficacy monitoring, long-term effectiveness monitoring, and photo plot monitoring. Treatment efficacy monitoring is used as an accountability measure to ensure treatments are effective on target species and that treatment sites are completed by contractors. Long-term effectiveness and photo plot monitoring are used to evaluate the



success of invasive plant management activities over time. Monitoring methods are described below and can be found in more detail in the Elk Valley IPMP (Kaisner and Phillips, 2019).

#### Treatment Efficacy Monitoring

A minimum of 10% of all treated sites (chemical and mechanical) are monitored for treatment efficacy and completion, 2-4 weeks post treatment. Efficacy monitoring is conducted to ensure compliance with all relevant policies and legislation, and to ensure protection of environmentally sensitive areas. Digital monitoring records congruent with Provincial templates are used to evaluate treatment efficacy and completion for each monitored site. Treatment sites selected for efficacy and completion monitoring use a targeted approach, as opposed to random selection, to ensure that different habitat types, species of concern, and various infestations were monitored.

#### Long-Term Effectiveness Monitoring

In Year 1 (2020) 10 permanent vegetation monitoring plots were established to enable evaluation of long-term treatment effectiveness at the site level. In 2021, an additional three plots were installed to include a wider variety of species and habitat types. Annual plot data collection will show how invasive plant treatments are impacting targeted weed species and desirable native species over time. Results will be used to inform future treatment prescriptions.

Plot establishment followed a modified version of MFLNRORD's Ecosystem Restoration Programs' Routine Monitoring Protocols for Understory Cover Sampling. Locations are selected non-randomly, within areas of dense infestations designated for treatment. Subjective site selection is used to capture areas with dense invasive plant infestations, a variety of habitat types, elevation levels, and invasive species. At each site, 5 subplots were established. The center subplot was marked with a stake, and 4 subplots were placed at each cardinal direction 5m from the center (Figure 4). Each subplot was permanently marked with a stake, and labelled with the plot number, cardinal direction, and date of establishment. Subplot locations were recorded, and a photograph taken.

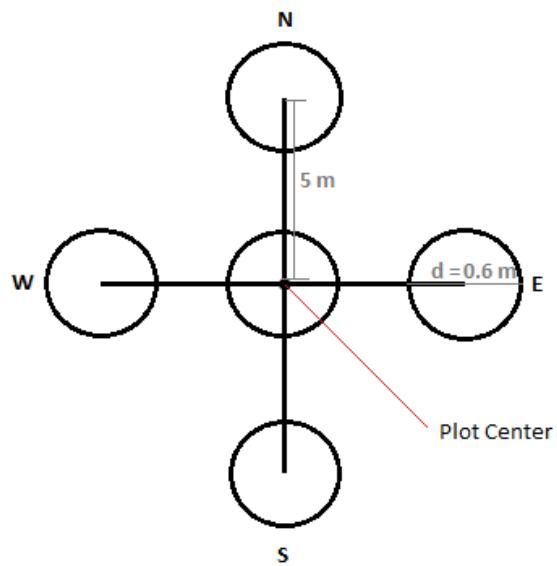


Figure 4. Diagram of a vegetation Monitoring plot established at all monitoring locations in the Upper Elk Valley project area.

Data was collected from each subplot by placing a circular quadrat (0.60m diameter) over the center stake and recording percent cover and frequency for every invasive species observed within the quadrat area. Percent cover of non-invasive forbs, shrubs, grass, and trees was recorded, and identified to genera or species when possible. If additional vegetation was observed but the species unknown, a percent cover was still recorded. Lastly, percent cover for bare ground, rock, woody debris, cryptogrammic crust, litter, and scat was also recorded.

#### Photo Plot Monitoring

In Year 1 (2020), five photo plot monitoring sites were established. In Year 2 (2021) an additional eight were created, totaling 13 photo monitoring plots. Plots were established at infestations of note within the project area. Images were taken using the Theodolite application at the same height, angle, and cardinal direction as previous years (or previous visits). All sites were visited, either once, twice, or three times throughout the field season. In subsequent years, photos will be taken at all sites at least once per year to highlight impacts of treatment efforts. The permanent photo plots will enhance long-term monitoring for the project, by providing a qualitative means of evaluating treatment success over time.

#### Results and Outcomes

Data quality control was completed on treatment, inventory, and monitoring records. Inventory and treatment data was entered into the Provincial database (IAPP) prior to December 1<sup>st</sup>, 2021. Data was then used to provide summary statistics for the project. The following sections summarize results from Year 2 of the project.



### Invasive Plant Inventory Results

EKISC staff focused inventories on recreation trails that were not surveyed in 2020. Contractors collected inventory data prior to conducting treatments on spur roads and FSRs that were either inaccessible in 2020 or had not received previous treatment. In 2021, inventory data was collected in the following areas:

- Elk River FSR (160 km – 167 km)
- Crossing Creek Trail
- Weary Creek (143 km)
- Britt Creek to Greenhills peak trail
- Forsyth Creek Trail
- Gardener Creek Road
- Bingay Creek FSR
- Elk Lakes Provincial Park (select trails)

During the inventories, no species on the provincial watchlist of new invasive plants were observed. Therefore, an early detection rapid response (EDRR) was initiated. Further, no Priority 1<sup>1</sup> species as identified in the *Priority Species List for the Upper Elk Valley IPMP* list (Appendix A) were found. A total of 50 new inventory points were collected identifying five different species, including: Yellow hawkweed, Caraway, Scentless chamomile, Orange hawkweed, and Yellow toadflax. This list does not include infestations previously recorded in IAPP or during treatments in 2021. Figure 5 demonstrates where inventory data was collected in 2021.

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<sup>1</sup> Priority 1 species are known species with extremely limited distribution. Eradication is the objective with these species.

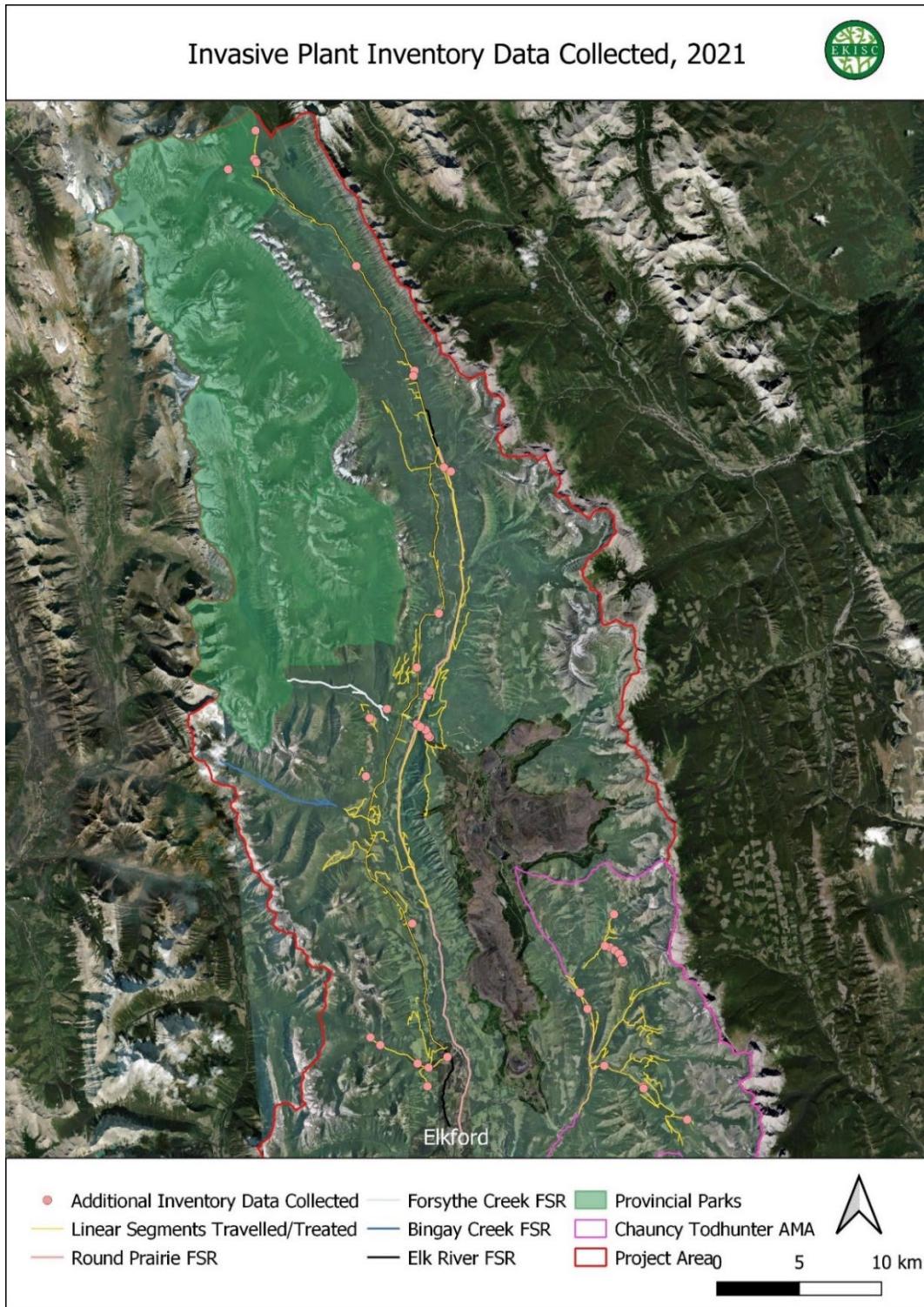


Figure 5. Invasive plant inventory data collected in Year 2 in the Upper Elk Valley project area.

EKISC staff were scheduled to conduct invasive plant inventories along the Boivin Creek Recreation Trail, Quarrie Creek Trail toward Height of the Rockies Provincial Park, and the Cardona Creek Trail. However, due to the heat dome and extreme fire risk in the backcountry the inventories could not be completed. Missed locations will be added to the workplan in 2022. Additional locations will be discussed with local



clubs, volunteers, and stakeholders to determine the need for these areas to be inventoried, and if increased collaboration efforts with local users can occur.

### Invasive Plant Treatment Results

Invasive plant treatments took place over 41 days between July 6<sup>th</sup> and September 26<sup>th</sup>, 2021. A total of 415 sites, containing one or more priority species were treated covering approximately 320 kms or 91.47 ha of FSRs, recreation trails, and roads scheduled for deactivation (Figure 6). A combined total of 19,709.6L of herbicide mix was used across the entire project area (note: herbicide mix refers to herbicide product mixed with water). A summary of mechanical and chemical treatments metrics is provided in Table 1. Species targeted for treatment include:

- Blueweed (*Echium vulgare*)
- Canada thistle (*Cirsium arvense*)
- Common tansy (*Tanacetum vulgare*)<sup>2</sup>
- Diffuse knapweed (*Centaurea diffusa*)
- Hounds tongue (*Cynoglossum officinale*)
- Orange hawkweed (*Hieracium aurantiacum*)
- Oxeye daisy (*Chrysanthemum leucanthemum*)<sup>3</sup>
- Scentless chamomile (*Tripleurospermum inodorum*)
- Spotted knapweed (*Centaurea stoebe*)
- St. John's wort (*Hypericum perforatum*)
- Sulphur cinquefoil (*Potentilla recta*)
- Wild caraway (*Carum carvi*)
- Wormwood (*Artemisia absinthium*)
- Yellow hawkweed (*Hieracium caespitosum*)
- Yellow/common toadflax (*Linaria vulgaris*)

<sup>2</sup> Canada thistle was only treated advantageously when other high priority species were being treated at the same time, because the plant is a low priority across the province.

<sup>3</sup> Oxeye daisy was only treated advantageously

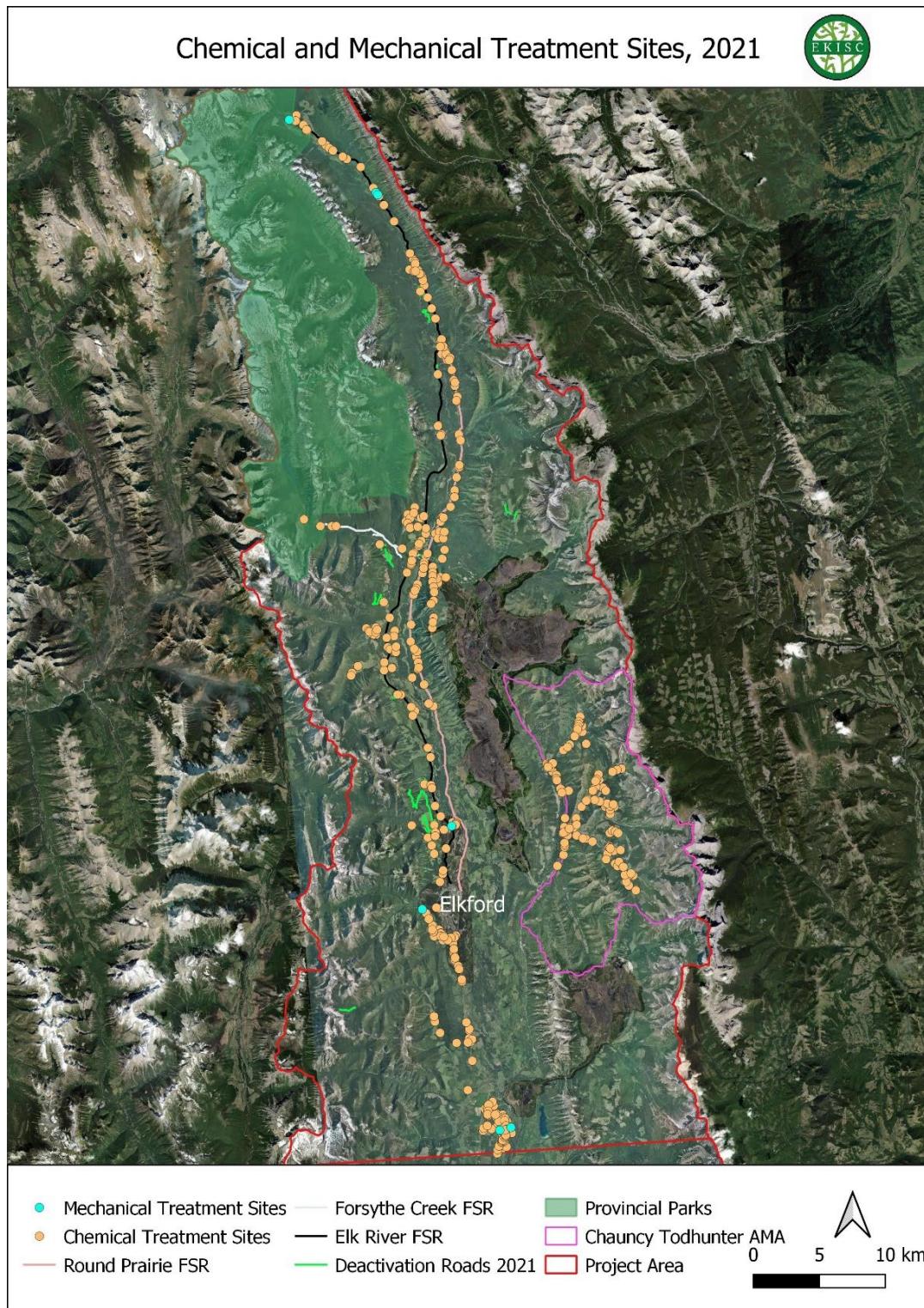


Figure 6. Chemical and Mechanical Treatment Sites in the Upper Elk Valley project completed in 2021.



Table 1. Breakdown of chemical and mechanical treatment sites, area, and number of treatment days completed in the Upper Elk Valley project area in 2021.

Treatment Method	Mechanical	Chemical
Number of sites	7	408
Area Treated	0.07 ha	91.4 ha
Number of days of treatment	5	36

In 2021, 34 Priority 1 species (identified in the *Elk Valley IPMP Priority Species*; Appendix A) were recorded and/or treated by contractors or EKISC field staff in the project area. These included:

- 15 Blueweed sites
  - Sites are largely concentrated south of Elkford, and are small, low-density infestations.
- 10 Common tansy sites
  - Sites are concentrated in the lower portion of the project area and are small, low-density infestations. One site is in the northern portion of the project, and one site in the Chauncey-Todhunter AMA.
- 1 Diffuse knapweed site
- 12 St. John's wort sites
  - Sites are scattered throughout the project area, and sites are mostly small and low-density infestations (except for one site on the Big Ranch Property).

These sites will be prioritized for treatment in 2022, and because most sites are small and low in density, we are optimistic that eradication is feasible at most infestations. Details of species treated and their priority within the *Priority Species List for the Upper Valley IPMP* (Appendix A), number of sites containing each species, area treated, and amount of herbicide used within the project area are provided in Table 2. Treatment summaries of select areas are provided in the following sections.

Table 2. Details of invasive plant treatments that occurred within the Upper Elk Valley project area in 2021. Note some sites had more than one species present/treated.

Invasive plant <sup>4</sup>	Priority Ranking (1-4)	Number of sites treated <sup>5</sup>	Herbicide used	Area treated (ha)	Amount of herbicide mix used (L)
Blueweed	1	15	Clearview	0.74	158.6
			Tordon 22K	0.58	126
Canada thistle	4	7	Aspect	1.67	357
			Milestone	0.46	99.5
			Tordon 22K	0.01	3
Caraway	2	28	Clearview	1.58	376.8
			Milestone	0.80	173.8
			Tordon 22K	0.18	38.9

<sup>4</sup> Oxeye daisy and Canada thistle were primarily recorded as a tertiary species within the project area due to the extremely low priority for treatment within the project area and RDEK. Therefore, accurate site numbers are not available.

<sup>5</sup> Total number of sites exceeds the 415 previously stated. This is because more than one species was treated at a site.



Common tansy	1	10	Clearview	0.18	38.4
			Milestone	0.03	6.2
Dalmatian toadflax <sup>6</sup>	3	N/A	N/A	N/A	N/A
Diffuse knapweed	1	1	Clearview	0.001	0.3
Hounds tongue	New observation in 2021	1	Aspect	0.02	3.5
Orange hawkweed	2	4	Clearview	0.02	5
			Milestone	0.22	47.25
Oxeye daisy	4	8	Aspect	0.40	85.5
			Clearview	0.73	159.5
			Milestone	1.90	409
			Tordon 22K	0.40	84
Scentless chamomile	2	97	Clearview	10.62	2284
			Milestone	4.32	929
			Tordon 22K	1.54	333.4
Spotted knapweed	2	89	Clearview	6.33	1361.3
			Milestone	4.65	998.9
			Tordon 22K	1.41	304.8
St. John's wort	1	12	Clearview	0.16	35.4
			Milestone	0.17	36.5
			Tordon 22K	0.0005	0.1
Sulphur cinquefoil	3	4	Aspect	0.02	3.5
			Clearview	0.10	21
			Tordon 22K	0.03	7
Wormwood	3	15	Clearview	0.20	42.6
			Milestone	0.03	6.25
Yellow hawkweed	3	192	Aspect	1.89	405.5
			Clearview	27.74	6082.1
			Milestone	38.41	8263.2
			Tordon 22K	10.70	2313.7
Yellow toadflax		24	Clearview	2.00	429.1
			Milestone	0.13	29
			Tordon 22K	1.40	304.1

<sup>6</sup> No Dalmatian toadflax plants were observed at the 2020 recorded site.



#### NTBC Big Ranch Conservation Property

The NTBC Big Ranch Conservation Property is located at the very southern portion of the project area, approximately 15 km north of Sparwood along Highway 43. The property is an easily accessible public recreation area, and the eastern boundary is adjacent to Teck Resources Ltd land. In 2019, Bear Track Environmental Services Ltd. conducted a range assessment for the property to assess the quality of grassland habitat, specifically to provide recommendations on improving winter forage for large ungulate species, primarily focusing on elk (*Cervus canadensis*; Bear Tracks Environmental Services 2019). Following this assessment, in 2020, NTBC and the Sparwood & District Fish and Wildlife Association (SDFWA) initiated the Big Ranch Ecosystem Enhancement Project (BREEP) to help mitigate the impacts of land-use changes on the property (SDFWA & NTBC, 2020). In 2021, as part of BREEP, and in collaboration and coordination with the Elk Valley IPMP (and primarily supported via funds from NTBC in 2021), large-scale invasive plant treatments were completed on the property (Figure 7).

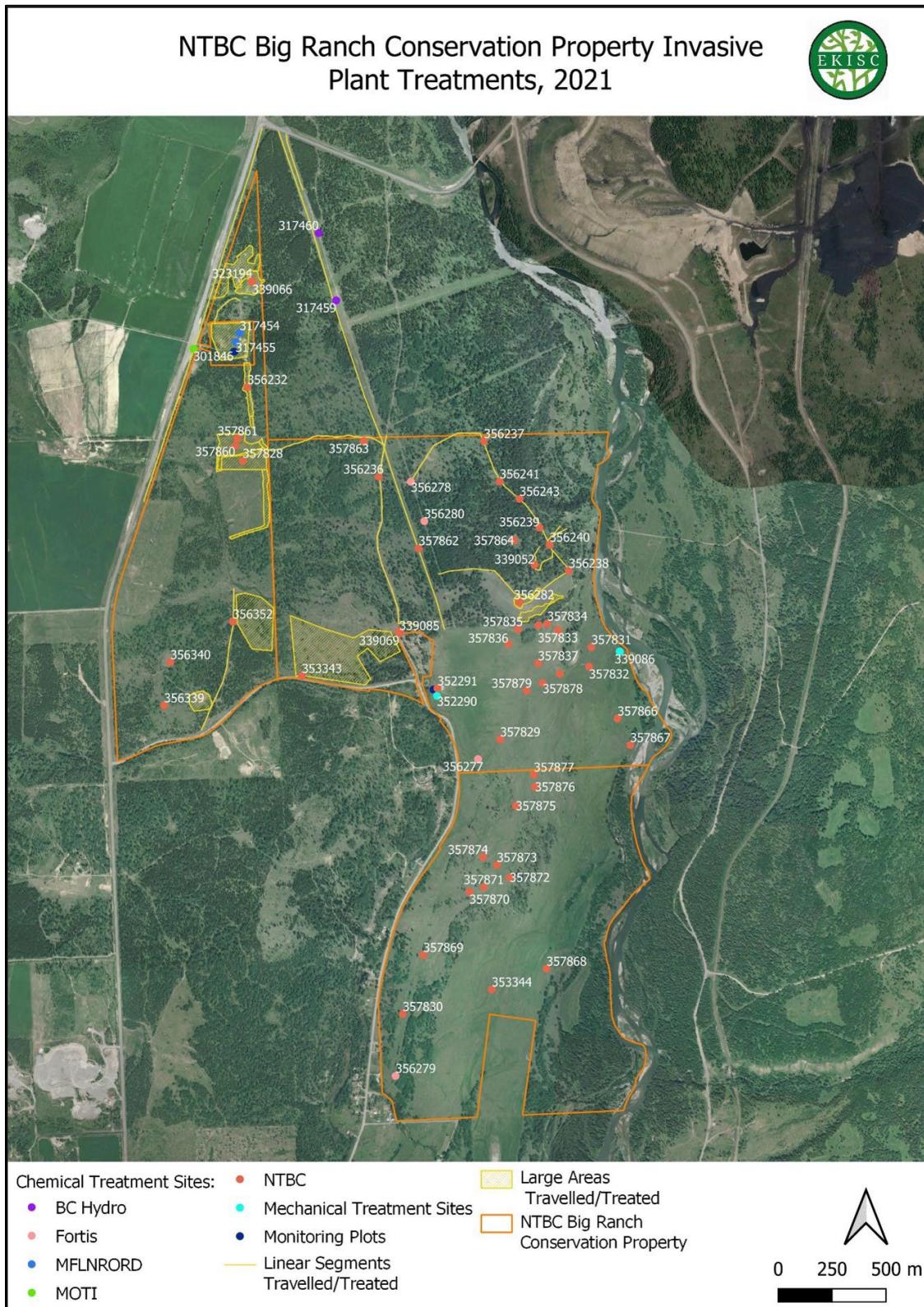


Figure 7. Nature Trust of British Columbia Big Ranch Conservation Property Invasive Plant Treatments, 2021.

Ten different invasive plant species were observed and treated within the conservation property, including three Bluerock sites, one Scentless chamomile site, and one St. John's wort site. Two mechanical treatment sites within pesticide free zones were targeted and completed by EKISC and NTBC staff. Mechanical treatment sites were visited twice throughout the growing season to enhance control efforts and limit seed production on the Spotted knapweed and Wild caraway infestations. Although there is a higher number of Spotted knapweed infestations across the property, infestations are relatively small (Figure 8). Larger Yellow hawkweed infestations were treated on the complex to begin containing the species and preventing further spread. Treatments were largely successful across the property, with only the St. John's wort sites having some challenges of treatment. This was due proximity of a Cottonwood tree stand limiting the use of herbicide. Moving forward, discussions between EKISC and NTBC staff in the spring of 2022 will help inform best management practices for this site.



Figure 8. Successful spotted knapweed treatments at the Nature Trust of British Columbia Big Ranch Conservation Property.

#### Chauncey Todhunter Access Management Area

In the Chauncey Todhunter Access Management Area (AMA), treatments were conducted on all main FSRs and accessible spur roads (Figure 9). Seven invasive species were observed and treated including one Common tansy, one Spotted knapweed, two Yellow toadflax, and three Wild caraway sites. Scentless chamomile and Yellow hawkweed are the dominant species within the Chauncey Todhunter AMA. Yellow hawkweed is dense on several landings, and spur roads that head towards cut blocks (Figure 10 & 11). All species were targeted for treatment. Large, dense, and continuous Yellow hawkweed infestations were treated only after all other areas were completed.

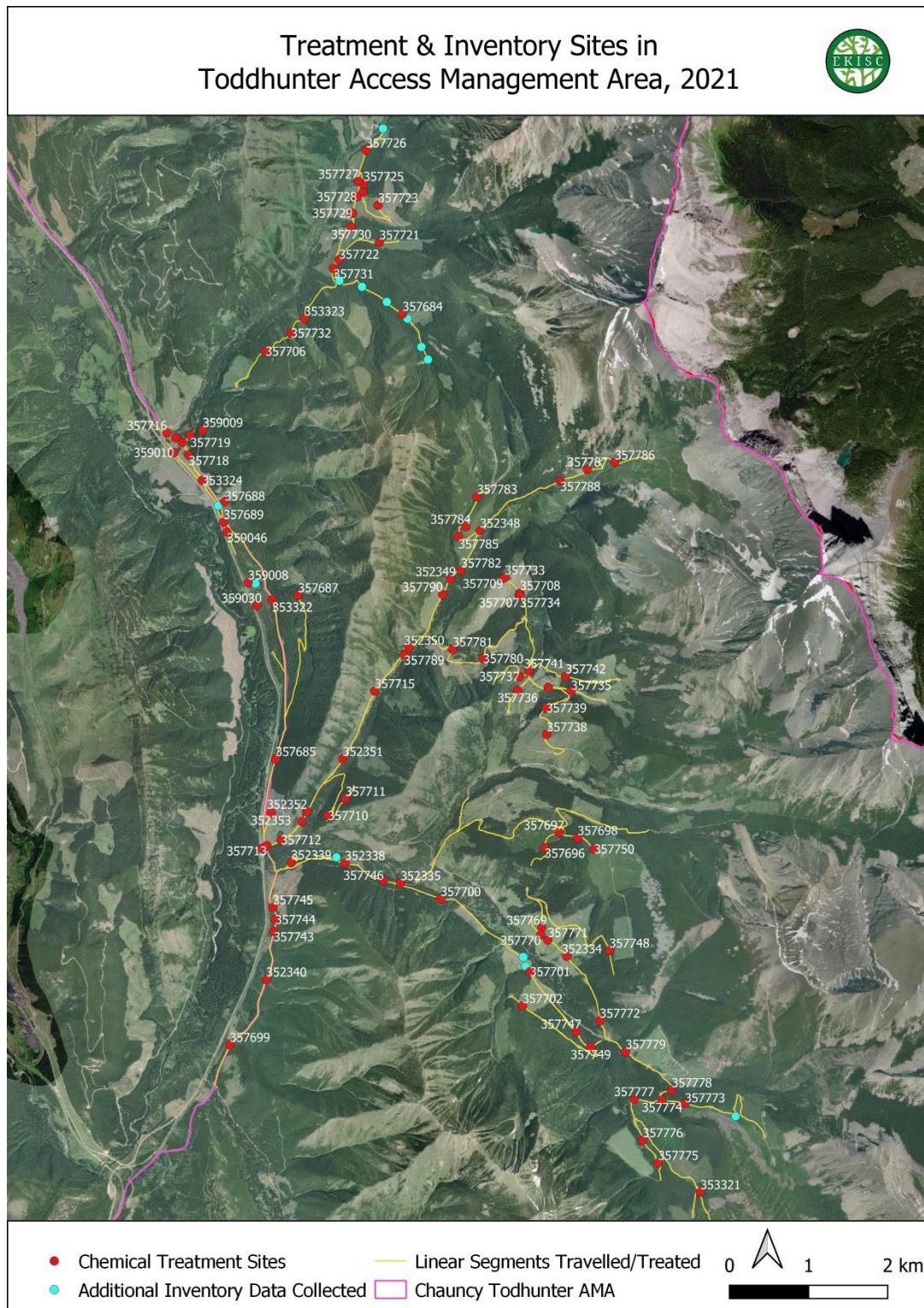


Figure 9. Invasive plant inventory and treatments in Chauncey Todhunter Access Management Area, completed in 2021.

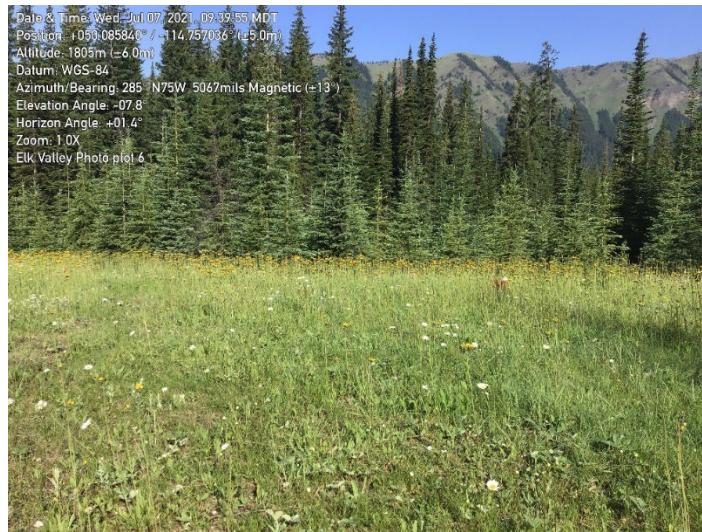


Figure 10. Large, dense, continuous Yellow hawkweed infestation (yellow flowers) in the Chauncey-Todhunter Access Management Area pre-treatment, in 2021.



Figure 11. Successful Yellow hawkweed treatment on a spur road in the Chauncey-Todhunter Access Management Area, in 2021. Note: brown, dead vegetation are successful treatments.

#### Elk River, Round Prairie, and other Forest Service Roads

The remainder of the project area has several Blueweed and St. John's wort sites, including Spotted knapweed, and Wild caraway infestations. Several small, isolated Yellow hawkweed infestations are in the northern portion of the project area, with infestation size and density growing towards the south. Yellow hawkweed is typically found on spur roads and open landings but does not densely populate the main Elk River FSR. After discussion with project partners, it was decided to treat Yellow hawkweed below the previously determined containment line in areas that were perceived manageable. These areas included smaller populations along spur roads leading to higher elevation habitat. Figure 12 shows treatment sites and routes traveled beyond the main Elk River FSR (west side of the river), and Round Prairie FSR (east side of the river). The map also highlights some of the treatments that occurred on roads slated for deactivation by MFLNRORD and within Height of the Rockies Provincial Park.

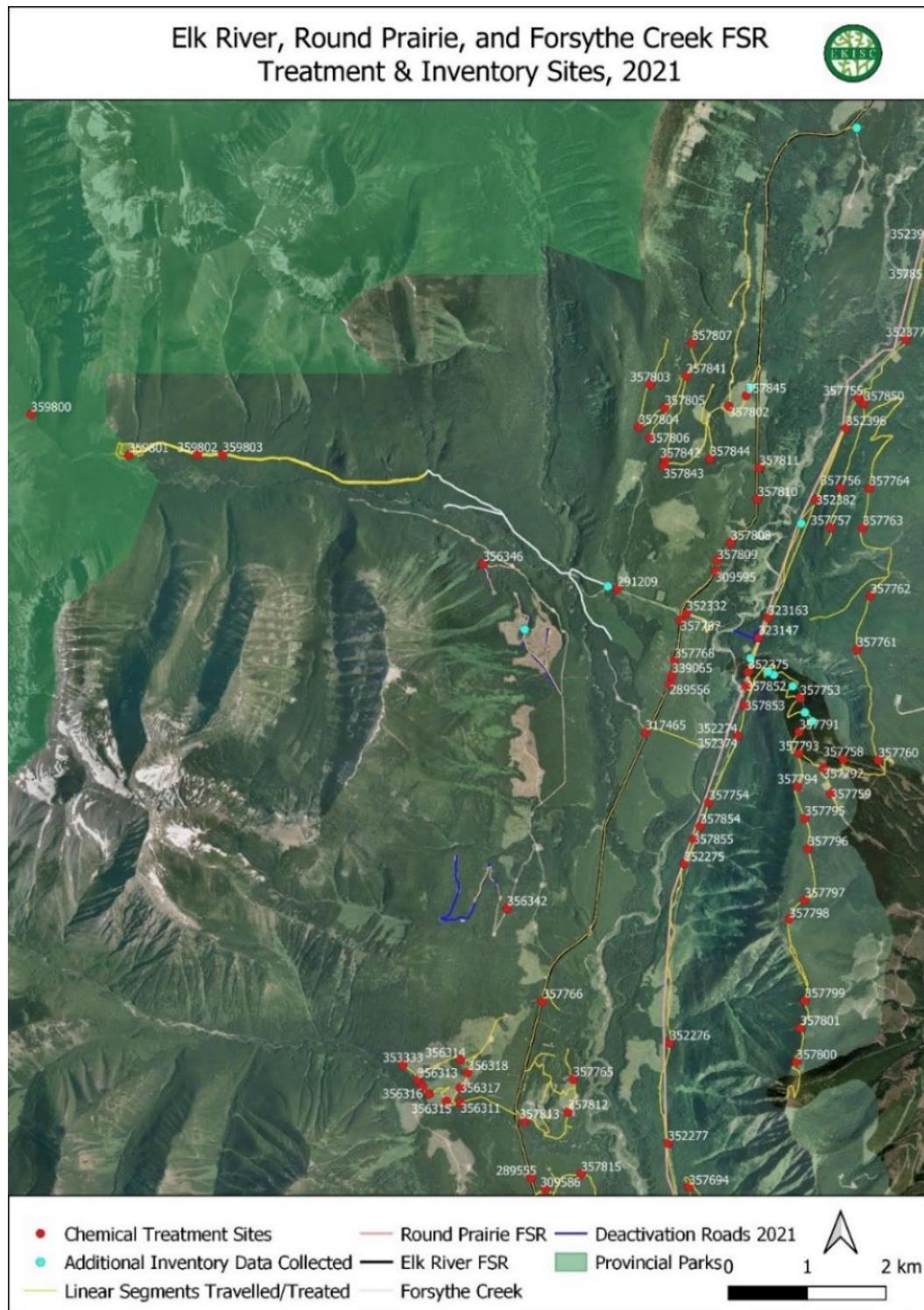


Figure 12. Treatment and inventory sites on Elk River, Round Prairie, Forsythe Creek and surrounding forest service roads and spur roads within the middle portion of the Upper Elk Valley project area completed in 2021.

### Treatment Efficacy Monitoring Results

EKISC conducted post-treatment monitoring of invasive plant control at approximately 16% of all treated sites (chemical and mechanical). Treatments were largely very successful, the majority having high efficacy and thorough site completion. Some challenges were encountered, specifically with St. John's wort treatment. At the Big Ranch Conservation Property, it was observed that some St. John's wort sites were not effectively treated. Re-treatments did not take place due to the concern of herbicide impact on nearby deciduous tree stands. Discussions between EKISC and NTBC staff in the spring of 2022 will help inform best management practices for this site.

### Grass Seeding Trial Results

EKISC staff monitored the one grass seeding trial that was implemented in Year 1 (2020) of the project. When initially monitored in early summer of Year 2 (2021), results did not suggest successful germination from the applied grass seed. However, when monitored again in the fall of 2021, grass species density was much higher than the previous year (Figure 13). Successful results prompted the implementation of three additional small-scale grass seeding trials at other sites, including different habitat types and Yellow hawkweed infestation levels within the project area. In subsequent years all grass seeding sites will be monitored to enhance the understanding of restoration efforts through chemical treatment and follow-up grass seed applications.



Figure 13. Grass seed Trial 1 where grass seed was applied in 2020 post chemical treatment (left), and one year following grass seed application (right).

### Long-Term Effectiveness (Vegetation Plot) Monitoring Results

The ten permanent vegetation monitoring plots that were installed in Year 1 (2020) were re-visited, along with the installation of additional three plots (Figure 14). Data was collected before treatment occurred, when plants and vegetation cover were easily identifiable at twelve plots between July 6<sup>th</sup> and 8<sup>th</sup>, 2021. One plot was not visited until September 15<sup>th</sup> (post treatment) because access was restricted at the time of previous data collection. In subsequent years, data on invasive and native species percent cover and frequency will be collected annually to determine long-term effectiveness of applied treatment methods in the project area. Statistical analysis has not been completed as data is still preliminary on trends in invasive plant infestations.

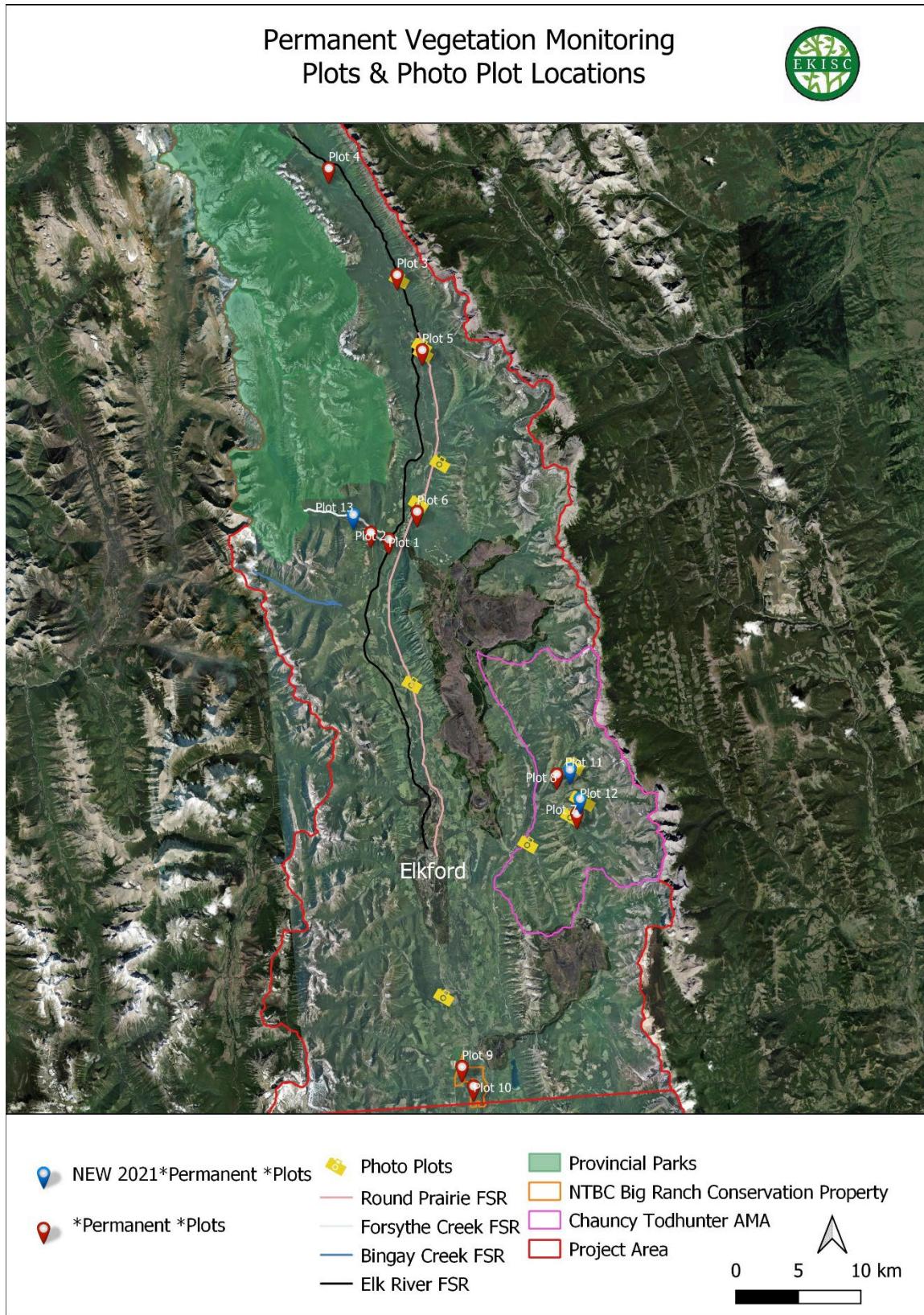


Figure 14. Permanent monitoring plots installed and photo monitoring locations within the Upper Elk Valley project area.

### Photo Monitoring Plots

Photo monitoring plots were visited by EKISC staff either once, twice, or three times throughout the season. Figure 15 shows a photo monitoring plot established in 2021 on Ewin creek FSR. The photo on the left is a Yellow hawkweed infestation pre-treatment, and the photo on the right is post-treatment. Images captured at all photo plot locations will be used for comparison following another year of treatment and monitoring. The permanent photo plots will enhance long-term monitoring for the project by providing a qualitative means of evaluating treatment success over time.



Figure 15. Photo monitoring plot on the Ewin Creek forest service road within the Toddhunter Access Management Area before (left) and after (right) treatment, 2021.

### Outreach and Community Engagement

Education has been identified as a cost-effective method for the prevention of invasive species infestations (Invasive Species Council of BC, 2018) and was determined to be an integral part of the Elk Valley IPMP (Kaisner and Phillips, 2019). EKISC delivered the following outreach and community engagement activities for the project in 2021:

- 1) EKISC delivered one Elk Valley invasive plant identification and project workshop. It was presented virtually to various local clubs of the Elk Valley on September 21<sup>st</sup>, 2021. The workshop provided a background on the project, as well as an update of field work completed. EKISC discussed how club members can become more involved in the project, provided a basic summary of invasive species and a brief overview of identification for species currently present, and/or threatening the valley. An introduction of how to use the 'Report Invasives' App was also provided. A recording of the webinar was posted to EKISC's YouTube channel as well sent to all stakeholders, clubs, and land managers that are working within the project area.
- 2) Regular updates and information were emailed to all local clubs, guide outfitters, and stakeholders providing a summary of work completed and next steps of the project. This provided an opportunity for new ideas and input to be delivered for the project.
- 3) A project spotlight was included in EKISC's fall e-newsletter, and features on social media were used to increase awareness and highlight the collaborative nature of the project.



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- 4) Invasive species education signs were designed and will be installed at the Elk Lakes Provincial Park parking lot, NTBC's Big Ranch Conservation Complex entrance, and other high use areas in the Spring of 2022.

EKISC recognized various project partners in all communications and community engagement activities, including acknowledgement of support in EKISC's e-newsletter, on EKISC's website, during our annual general meeting in the fall of 2021, and during project presentations to local clubs.

## Discussion & Program Recommendations

During Year 2 of the project, EKISC worked with community groups and project stakeholders to implement the Upper Elk Valley IPMP with a particular focus on areas of high wildlife value. Following a comprehensive invasive plant inventory in Year 1 (2020), large-scale invasive plant treatments took place in Year 2 (2021) throughout the project area. Invasive plant infestations were treated to decrease their presence on the landscape and promote the growth of native forage species, resulting in improved ecosystem function and health. Based on results and outcomes from Year 2 of the Project and IPMP implementation, recommendations for subsequent project years include:

- **Remove the containment line that was created over the winter of 2020/2021.** Yellow hawkweed is widespread in the project area, with varying levels of infestation sizes and densities. In 2021 chemical treatments were very efficient, thus allowing increased treatment efforts of yellow hawkweed across the project area. Continued discussions between EKISC, contractors, and stakeholders allowed us to make informed decisions to treat Yellow hawkweed in select areas below the pre-determined containment line. Year 2 made significant progress of yellow hawkweed treatment, and we are confident that continued large-scale treatments will allow us to continue reducing this species presence on the landscape.
- **Continue utilizing a backcountry-in approach.** Using this approach prioritizes high-value wildlife habitat in the higher elevation areas of the Elk Valley. Continuing with this method will reduce the spread into these areas and contain the invasive species to the valley bottom.
- **Update the Upper Elk Valley IPMP and priority species list annually.** EKISC will review all data collected during Year 1 and 2 of the project and update the Upper Elk Valley IPMP and adjust species priorities if necessary.
- **Continue invasive plant surveys in locations not visited in 2021.** EKISC will identify areas that did not receive any invasive plant inventory or treatment during Year 1 and 2 of project implementation. Currently, this includes popular hiking trails that were not inventoried in Year 2.
- **Inventory high elevation areas.** Yellow hawkweed was not observed in areas where native plants and grasses are well established, such as avalanche slide paths, meadows, and other open areas. In 2020 and 2021, there was not an opportunity to inventory upper elevation areas due to limited access. Observations to date have concluded that unless a disturbance has occurred, Yellow hawkweed is unlikely to inhabit higher elevations. However, Yellow hawkweed does establish in cut blocks, therefore it is recommended to assess higher elevation areas where logging operations have occurred, or are planned, to prevent Yellow hawkweed establishment.
- **High priority species should receive annual treatment.** It is recommended to treat all high priority species annually. All species except Yellow hawkweed, Canada thistle, and Oxeye daisy will receive annual treatments.



- **Annual data collection from permanent monitoring plots and photo plots.** As part of project monitoring, it is recommended to collect data and images at all plots (permanent vegetation and photo plots) within the project area. Data collection should occur pre-treatment to understand residual herbicide effectiveness of sites treated in 2020 and 2021.
- **Monitor the four seeding trials implemented in Year 1 and Year 2 of the project.** The four seeding trials should be monitored in 2022 to evaluate effectiveness of grass seed at outcompeting Yellow hawkweed after chemical treatments have occurred. If the trials are considered successful, it is recommended to allocate more project funding towards restoration using grass seed in conjunction with chemical treatment. Grass seeding should also be expanded in areas of bare ground, or recently disturbed areas, to complement treatment efforts and to assist with native cover establishment.

### Challenges and Lessons Learned

During Year 2, most challenges were encountered during operational delivery. Challenges and suggestions for improvement include:

- Due to the pandemic, EKISC was unable to host an in-person education event which may have deterred some people from attending the online education platform that was presented. EKISC is optimistic we will be able to provide in person events in 2022.
- Due to early road deactivation, a few road segments were not treated because they became inaccessible before contractors could conduct treatment. EKISC will ensure enhanced communication takes place in 2022 to align all operational activities.
- Many pesticide free zones (PFZs) were identified during treatments in the Chauncey-Todhunter AMA. This impacted treatments by leaving small segments of some FSRs untreated. This will be addressed with stakeholders during the 2022 planning phase of project start-up. EKISC is hopeful that increased mechanical treatments in select areas, and alternate herbicides will help in PFZs. Additionally, already present narrow roads and heavy vegetation have the potential to prevent increased spread of invasive plants.
- During chemical treatment monitoring, it was observed that some St. John's wort sites were not effectively treated. Re-treatments did not take place due to the concern of herbicide impact on nearby deciduous tree stands. Field site visits, and additional monitoring will take place throughout the 2022 field season to ensure that treatments are more successful.
- Some of the project area is in high elevation areas, nestled within mountainous terrain. Due to the unpredictability of the weather, early snowfall may inhibit extended treatment times into the Fall of each year compared to areas in the valley bottom that may have longer treatment windows. Treatment plans will take this into account to ensure all designated areas receive treatment.
- On the Round Prairie FSR, section 100-114.5km (immediately north of Elkford) is private property. The property owner allows public traffic to drive on this section of road because it is the only road on the east side of the Elk River that heads north. Treatments have not taken place on this section of the road because EKISC has been unsuccessful at contacting the private landowner. Visual inventories have been noted but no information has been entered into IAPP because it is private property. EKISC will continue communication efforts with the landowner to improve collaboration for invasive plant management.



## Acknowledgements

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## Appendix A: Elk Valley IPMP Priority Species 2021

<b>EDRR Watchlist: Not currently found within the Elk Valley Project Area but determined to have some likelihood of introduction. If observed, should initiate an EDRR response and inventory and treat immediately.</b>		
Baby's breath Bighead knapweed Black knapweed Common bugloss Field Scabious Hoary alyssum	Hoary Cress Knotweed spp. Flat peavine Leafy Spurge Meadow knapweed Policeman's helmet	Plumeless thistle Rush Skeletonweed Russian thistle Teasel Wood sage Yellow starthistle
<b>Priority 1. Eradication: Currently found within the Project Area in very low numbers. Management objective is eradication. All existing sites should be treated a minimum of 1x per treatment year and 2x per year if resources are available. Any new occurrences to be inventoried and treated.</b>		
Blueweed Diffuse knapweed	Common tansy	St. John's wort
<b>Priority 2. Annual Control: Found within the Project Area but in low enough numbers to feasible treat all sites 1x per treatment year. Management objective is to reduce further spread of these species within the Project Area.</b>		
Caraway Orange Hawkweed	Scentless chamomile	Spotted knapweed
<b>Priority 3. Containment: Species is established in parts of the Project Area but is limited in other parts. Management objective is to contain these areas and prevent them from establishing further. All species will be treated north of Elkford, except Yellow hawkweed, which will be treated north of km 143 of the Elk River FSR and in the Forsythe Creek area.</b>		
Dalmatian toadflax (biocontrol) Sulphur cinquefoil	Wormwood Yellow/common toadflax	Yellow hawkweed (north of km 143 on Elk River FSR)
<b>Priority 4. Established: Species is established within the Project Area and will not be targeted for treatment. Species may be treated advantageously while treating higher priority species or have successful biocontrol agents.</b>		
Burdock Canada thistle	Hound's tongue (biocontrol)	Oxeye daisy