

ELK RIVER WATERSHED VALLEY BOTTOM ASSESSMENT – REPORT TO RESIDENTS ON RIVER HEALTH, PHASE 1



FINAL REPORT

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PREPARED FOR
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Cover Photo

Flyover of the Elk River by David Thomas, Blairmore, AB

Errors and Omissions

The results of this study are intended to summarize the overall condition of the study area. Due to the nature of the analysis (which used orthophotos that were up to 3 years old, and relied upon office based land cover interpretation) there may be errors or omissions, which the authors nor the companies they are employed with are liable for. Discerning between unforested natural and unforested disturbed is one example where there may be some error as this delineation was based on sometimes small signs or evidence of past forest removal activities, such as straight edged lot lines, cultivation lines, or forest cover only lining streams. The data should be field reviewed if confirmation is required for any formal purposes. Best attempts were made to provide an accurate and complete representation using the available data.

Executive Summary

The Elk River Alliance (ERA) is an independent, non-profit community-based water group formed in 2010 that promotes a holistic approach to management in the Elk River watershed. In 2013, ERA formed a partnership with local aquatic scientists from Lotic Environmental Ltd. and experts from GrandDuke Geomatics Ltd. to complete the Elk River watershed valley bottom assessment for Reporting to Residents on River Health, Phase 1 (**R2R Phase 1**), the first step towards a broader vision of developing a full *Elk River State of the Watershed Report* (SWR). The SWR is used across Canada to characterize watersheds, identify pressures, develop strategies to meet watershed goals, and monitor change over time.

R2R Phase 1 assesses the current land cover of the Elk River valley bottom from Elkford to Elko. The valley bottom is a major ecosystem that provides habitat that is very important for fish, wildlife and watershed function. Land cover information identifies the current habitat available, including the extent of natural and disturbed areas. The information from this study is intended to provide valuable baseline data describing current conditions and to be a tool for decision makers in land use planning (e.g. to help maintain or improve conditions into the future). This study was designed to complement rather than overlap with other projects.

Elk Valley residents have stated their values and importance for watershed health through a variety of forums. Community input on Elk River watershed goals incorporated into **R2R Phase 1**, were gathered at a variety of public sessions hosted by the ERA between 2011 and 2013. At these sessions, several questions of importance were identified, some of which could be addressed through this study and others, which require future efforts. Upon completion of the *DRAFT* report, presentations were scheduled with municipal governments and involved stakeholders, where ERA gathered input and advice regarding the best ways to translate the results of **R2R Phase 1** into a useful tool for decision makers.

Teck Coal signed a data sharing agreement in July 2013 with ERA for the project team to utilize their 2011/2012 orthophotos and Lidar data to complete the study. Methods were used to manually delineate the valley bottom onto the digital map base using the historical floodplain of the Elk River. Ten primary natural and disturbed land cover features were then delineated using both manual and automated methods. The aerial extent of land cover features found within the 30 m regulated riparian buffer was calculated. As well, parks and conservation coverage were also incorporated into the dataset. A literature review was undertaken to describe the habitat, summarise sensitive species potential to the area, and identify applicable indicators and thresholds to use to prepare an overall report card for the project. The results were presented by jurisdiction zones, which included three areas of the Regional District of East Kootenay (RDEK), and the municipalities of Fernie, Sparwood, and Elkford. Municipal management tools to protect watershed health were also summarized.

Key results of the **R2R Phase 1** study is as follows:

- The project extended along 108 km of the Elk River mainstem and assessed an area of 8371 ha. The study area encompassed three biogeoclimatic (BEC) zones: Montane Spruce, Interior Cedar-Hemlock, and Interior Douglas Fir. In valley bottom habitats within these BEC zones in the Rocky Mountain Forest District, there were 17 sensitive ecological communities listed; and 66 red-listed and 108 blue-listed plant and animal species.
- Of the total study area, 64% was undeveloped. This was primarily comprised of forest (45%) and water (14%), with some unforested (yet still vegetated) cover area (6%). Developed areas were largely areas that had once been forested but were replaced with other vegetation (25%). Built-up, roads, railway, and industrial had low coverage (10% combined).
- Elkford had the highest proportion of natural habitat (81%), followed by the RDEK (65%), Sparwood (60%), and Fernie (36%).
- The 30 m riparian area comprised 1412 ha of the study area; 86% of which was natural cover (74% forest, 12% unforested, and 14% water). Unforested disturbed was the main development type (10%) in the riparian buffer area. When the riparian zone cover was reviewed by jurisdiction, all

zones were assessed to have maintained over 75% natural vegetative cover, which was primarily forest. Elkford had the highest amount of naturally vegetated riparian area (93%).

- A total of 1127 ha, or 13% of the valley bottom has been set aside for conservation, through four protected areas: 1) The Big Ranch – Grave Prairie (The Nature Trust); 2) Elk Valley Heritage Conservation Area (Nature Conservancy of Canada); 3) Mount Broadwood Heritage Conservation Area (Nature Conservancy of Canada); and 4) Elk Valley Provincial Park (Province of BC).
- A report card was prepared using indicators and thresholds developed for other watersheds in Canada. Indicators reviewed were: 1) total disturbed area, 2) vegetated cover (natural and disturbed), 3) forest cover, and 4) forested riparian. The report card identified that the Elk River valley bottom land coverage to be **Good** overall. The jurisdictions were also individually typically rated as **Good**. However, Fernie rated **Fair** for ‘total disturbance’, ‘vegetated cover’ and ‘forest cover’.
- The intent is that the Report to Residents on River Health report card will be expanded in the future to include other watershed health parameters (e.g., water quality and updated as more information becomes available through future studies. Reports and an online report card can be accessed at the ERA website www.elkriveralliance.ca.
- Management approaches in official community plans and bylaws indicate the recognition of maintaining valuable valley bottom habitats. Fernie, Sparwood, and the RDEK are currently going through processes of updating/developing their planning documents.

The digital mapping content will be available to government, industry and non-government organizations involved in watershed management, which have GIS capabilities. The intent is that the product may be integrated as a GIS layer into their digital base map system. A digital copy of the GIS files can be obtained by contacting the Elk River Alliance (lee-anne@elkriveralliance.ca). A short video of the GIS product is available at: <http://www.youtube.com/watch?v=3D24I7Y8hCU>.

Communications is an important aspect of the **R2R Phase 1** report. The ERA has presented the results of this report to several stakeholders including municipalities, the RDEK, the Ktunaxa Nation Council – Tobacco Plains Band, Teck Community of Interest initiative workshop and Elk Valley Cumulative Effects Management Framework winter workshop. Discussion feedback obtained after each presentation has been incorporated into this **R2R Phase 1** FINAL report, and opportunities have been acknowledged on how the ERA can provide further support to land use decision making in order to ensure watershed health. ERA will continue to communicate results of the **R2R Phase 1** and subsequent studies to the general public and stakeholders through: the ERA website, public launch/open house, ERA newsletter and public presentations with identified target groups. ERA will work with Lotic Environmental to apply for additional phases of the *State of the Elk River Watershed Report* in 2014.

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1. Background

The Elk River Alliance (ERA) is a community-based water group that promotes a holistic approach to management in the Elk River watershed. The ERA formed a partnership with local aquatic scientists from Lotic Environmental Ltd. (Lotic Environmental) and GranDuke Geomatics Ltd. (GranDuke) to complete the Elk River Watershed valley bottom assessment. This project has been funded by the Columbia Basin Trust (CBT) Environmental Initiatives Program and Teck Coal Ltd. (Teck).

The goal of the project was to assess land cover in the Elk River valley bottom from Elkford to Elko, thereby providing a tool to aid in land use planning. This assessment is particularly valuable during this period of increasing development pressures on water and land resources in the watershed.

The valley bottom assessment is the first phase of a planned approach to report to residents (**R2R Phase 1**) on the State of the Elk River Watershed. State of the watershed reporting (SWR) is common in Alberta as part of their 'Water for Life' Strategy¹. A SWR provides a report card of watershed condition, by reviewing indicators including: land use, fish and wildlife, forest health, water quantity and water quality (Alberta Environment 2008). The outputs provide a baseline and help with watershed planning to maintain or improve conditions into the future. This study provides one component of a complete SWR.

In 2011, Lotic Environmental submitted a proposal to conduct a full Elk River Watershed SWR. Full support was not obtained; therefore, ERA, Lotic Environmental, and GranDuke worked together to streamline the scope of the project. **R2R Phase 1** produces a practical first step toward a full SWR in the future.

1.1 Why a land cover valley bottom assessment?

The Elk River is located in the southeast corner of BC. It is a sixth order tributary to the Kootenay River. From its headwaters at Elk Lakes near the continental divide in the Rocky Mountains, the Elk River flows in a southwest direction towards its confluence with the Kootenay River at the Koocanusa Reservoir. The Elk River has numerous tributaries. The largest tributaries are the Fording River (5th order), Michel Creek (5th order), and Coal Creek (3rd order). The Elk River forms a long narrow valley that falls from an elevation of 1,700 m at its northern source to 800 m at its confluence with the Kootenay River, which is dammed by the Libby Dam in Montana forming Lake Koocanusa (Obedkoff 1985).

The Elk River watershed is known for its world-class recreational opportunities including hunting, fishing, skiing and hiking. It has five active metallurgical coal mines, forestry, resource exploration, as well as ski hills both in Fernie and Elkford. Although most of these activities occur in the mountainous areas, the valley bottom is where supporting development is concentrated, including urban centres, transportation corridors, agriculture, and hydro power generation. Other recreational activities such as golf-courses, river rafting, and canoeing take place in the valley or on the river. Valley bottom habitat, with its diverse wetted areas (e.g., wetlands, side-channels, oxbows), is also depended upon by a wide variety of plant and animal species. Valley bottom habitat almost always has higher diversity and productivity than upland habitat. Additionally, valley bottom habitat provides important watershed functions including: water storage and buffering of high flow events; sediment capture and retention; maintaining water quality by chemically or biologically filtering contaminants; erosion control; provision of nutrients to the river via leaf litter and decay of woody debris; shading which lowers stream temperatures and provides cover for fish, and fish; and wildlife corridors. Sustainably managing the land and water resources in the valley bottom is important for long term environmental health of the area, and for maintaining the values that draw people to the area to live, work, and play.

There are several reasons why understanding land coverage in the valley bottom is an important place to begin **R2R Phase 1**. Land cover identifies the present-day extent of natural and disturbed areas. It informs us about the characteristics of a major ecosystem that is very important for fish, wildlife, and watershed

¹ <http://www.waterforlife.alberta.ca/>

function. The valley bottom is expected to continue to experience growth and development pressure, reducing the amount of quality of habitat and effectiveness of watershed function. Land cover information can highlight where specific efforts are required to protect or restore these values. Additionally, an understanding of land cover status and trends can inform planners of areas where further development may occur without significant habitat losses versus areas where there may already be significant loss of habitat structure and function. This information is also important simply in providing a baseline, which will be a valued tool for long term monitoring of development.

The study area for this project extends from Elkford to Elko along the mainstem of the Elk River. This represents the area with the highest concentration of development in the watershed (e.g., urbanization, farming, and transportation corridors). The valley bottom is managed amongst: the City of Fernie (Fernie), District of Sparwood (Sparwood), the District of Elkford (Elkford), and the Regional District of East Kootenay (RDEK). Additionally, the provincial and federal governments have regulatory responsibilities throughout the area. The valley bottom assessment provides a planning and assessment tool for government, industry and community to work together on.

Riparian areas are found within the valley bottom. Riparian areas are the transitional areas between wetted and terrestrial upland along the banks of streams, lakes, and wetlands. They are very important, both as habitats, and as vital components of watershed function as explained above. Riparian habitat is protected by the federal Fisheries Act, the provincial Fish Protection Act (including the Riparian Areas Regulation (RAR)) and the Water Act, as well as municipal bylaws. Setbacks where development is restricted vary by jurisdiction throughout the province of BC. Through the RAR, many jurisdictions in BC (e.g., parts of Lower mainland, Vancouver Island, and the Okanagan) typically require 30 m setbacks from waterbodies (BC Ministry of Environment (BC MoE) 2005). The Official Community Plans for Fernie and Elkford also outline this setback distance (Fernie 2002, District of Elkford 2010). Quantifying the extent of natural and developed area in the 30 m riparian zone will provide a current understanding of conditions.

This study was designed to complement rather than overlap with other projects being completed in the Elk River watershed. Current projects underway during this assessment are as follows:

- The Elk Valley Water Quality Plan (prepared by Teck Coal²). The goal of this plan is to establish short, medium and long-term targets for constituents of concern - selenium, nitrates, sulphates, cadmium, as well as rates of calcite formation.
- The Elk Valley Cumulative Effects Management Framework (CEMF)³. The CEMF is a broadly-based, collaborative group of interested parties with the overall goal of providing a practical, workable framework that supports decisions related to the assessment, mitigation and management of cumulative effects in the Elk Valley. It is being led by Teck Coal, the province (via the Ministry of Forests, Lands and Resource Operations), the Ktunaxa Nation Council, municipalities within the valley, and the Elk River Alliance. The valley bottom assessment will form part of the retrospective assessment currently underway for the CEMF.
- Ecosystem values and restoration opportunities are being identified through the Kootenay-Koocanusa Watershed Action Plan⁴.
- The Official Community Plans (OCP) for the municipalities of Sparwood and Fernie are currently being updated.
- An Official Community Plan for the RDEK is under development.

² <http://www.teckelkvalley.com/>

³ www.elkvalleycemf.com

⁴ <http://www.bchydro.com/news/conservation/2013/fwcp-funding-columbia-region.html>

1.2 Community input

Community input regarding Elk River watershed values, priorities and goals for **R2R Phase 1** was gathered at a variety of sessions hosted by the ERA and as a Working Group member of CEMF:

1. *FLOW (Friends Living on Water) Conversations* held in Fernie/Sparwood/Elkford Winter 2011;
2. H2Oh! Workshop in Sparwood Spring 2011;
3. *Elk River Watershed Dialogue: Opportunity for Collaboration and Action Solutions* in Fernie Spring 2012; and
4. *Elk River Watershed Governance Workshop* in October 2012 and *Elk River Governance Task Force* meeting in Fernie November 2012, which resulted in a draft terms of reference.
5. The ERA gathered input into key questions regarding riparian areas that are important to municipal elected officials and staff at the Cumulative Effects Management Framework facilitated discussion in Sparwood October 22, 2013 attended by Elkford, Sparwood, Fernie and RDEK.

Through these sessions community identified several questions of importance. Some of these could be addressed through the valley bottom assessment, while others would require subsequent future efforts (Table 1).

Table 1. Questions identified by public, government and industry, and when they may be answered in the Reporting to Residents process.

Question Type	Question
Achievable through the Valley Bottom Assessment	What is the current extent and condition of valley bottom habitat along the Elk River mainstem from Elkford to Elko?
	What factors contribute to the current condition?
	If relevant studies for comparison exist, how does the state of our valley bottom compare to other areas in adjacent regions?
	How well is current watershed management working in the valley bottoms?
	What human actions support healthy landscape and hydrological interaction and function?
	How much riparian habitat exists and how is it distributed in the Elk Valley?
	What is the current condition of riparian habitat? Where has there been loss of habitat?
	What are the factors that contribute to the current condition of riparian habitat?
	What watershed management approaches are currently practiced in the valley bottom and how can we assess their effectiveness in protecting healthy riparian habitat along the Elk River?
	What human actions support healthy riparian habitat, hydrological interaction and function?
Requires subsequent assessment beyond the valley bottom assessment	What is the current extent and condition of this valley bottom habitat (e.g. age class of forests, wetland distribution, type of forest classification, deciduous/coniferous identifying early seral shrub communities)?
	What is the connectivity between stream and riparian (separation by diking, armoring, hardening)?
	What human actions protect the safety of citizens in the event of flooding?
	What are best management practices to protect riparian habitat and water quality with regards to: diking, width/development in riparian zone, stormwater runoff, new development, snow dumps?
	What are the best trade-offs for unavoidable impacts to riparian habitat (e.g. if have to armour banks)?

Representatives from the ERA appeared before council at all municipal governments, RDEK and Tobacco Plains Indian Band (Grasmere, BC) during January and February 2014 to inform them about the project results and to seek input and advice regarding the best way to translate the results of **R2R Phase 1** into a useful tool for decision makers. A plain language summary report card will be designed and posted on the ERA website and released via an ERA open house and newsletter by March 2014.

1.3 Objectives

The primary objective of this assessment is to provide a land cover overview for the Elk River valley bottom for the area extending from Elkford to Elko using Global Information Systems (GIS) analysis, supplemented by available literature. Select land use types will also be demarcated to allow for a comparison of major management areas (these include municipalities, the East Kootenay Regional District, and conservation areas). The results will show the current habitat availability, condition, pressures and issues. This information will help in the identification of priority areas for further study, protection, and restoration, in order to help ensure the long-term ecological health of the watershed.

2. Methods

The valley bottom assessment was completed largely using GIS mapping. Results were supplemented with findings available through the literature. Digital 2011 and 2012 orthophoto⁵ (0.5 m and 0.38 m spatial resolution respectively), Lidar⁶ point cloud, Lidar derived DEM⁷ (1 m spatial resolution), and DEM derived hillshade (1 m spatial resolution) data were obtained from Teck, through a data sharing agreement with ERA. All valley bottom features were delineated from these data using a combination of automated and manual methods.

2.1 Valley bottom delineation

The valley bottom was manually delineated, at a scale of 1:5000, with the aid of the hillshade surfaces derived from Lidar. The valley bottom was defined by the historical floodplain of the Elk River and represented the area confined between valley walls (Figure 1). This area was identified by fluvial patterns (i.e., land formed by flowing water showing historic channels and a general low gradient in cross-section) indicating that it was most recently shaped by the river as it migrated laterally. Overall, the valley bottom was delineated along the first main break in slope from the current river channel.

⁵ Orthophotos provide an aerial photograph that is geometrically corrected (or orthorectified) where the scale is uniform.

⁶ Light Detection and Ranging (Lidar) is a remote sensing technology that measures distance using a laser and by analyzing the reflected light.

⁷ Digital elevation model (DEM) is a digital model or 3D representation of a terrain's surface created from terrain elevation data.

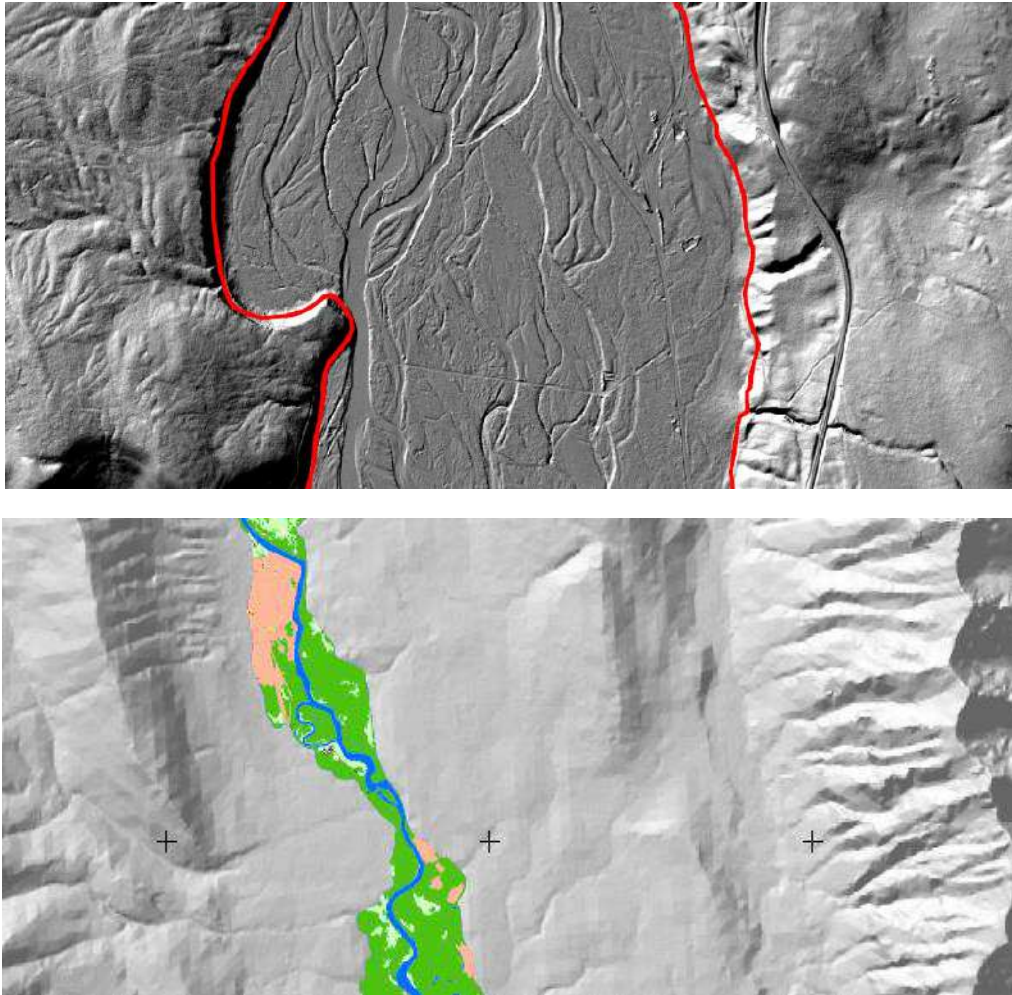


Figure 1. Examples of valley bottom delineation using hillshade surfaces derived from Lidar (valley bottom is the area between the red lines in the top photo, and the coloured area in the bottom photo).

2.2 Land cover mapping

Primary natural and disturbed land cover features were based upon well-established Level I mapping methods (Anderson et al. 1976). Modifications to the standard land cover categories were adjusted to suit the goals for this project, such as the differentiation of disturbed vs. natural unforested areas (Table 2). Automated steps to classify features were based on the published works of Garcia-Gutierrez *et al.* (2010) which utilize data-fusion techniques and open source machine learning libraries (Hall *et al.* 2009).

The methods to generate the land cover dataset were as follows:

1. A manual process was used to initiate land cover mapping. This involved manually defining a few polygons for each land cover type, and defining the training data for the classification.

Table 2. Land cover assessed.

Type	Feature	Definition
Natural	Water	All water bodies, including: mainstem, tributaries, side channels, lakes, ponds and wetlands.
	Forested	Areas with deciduous or coniferous tree cover.
	Unforested natural	Vegetated undisturbed areas with no tree cover. Includes native grasslands, shrub areas (such as vegetated gravel bars), and wetlands. Includes polygons larger than 0.5 acres (0.2 hectares).
Developed	Unforested disturbed	Land that appears to have been cleared of natural forest cover and replaced with grass or other herbaceous cover (includes fields for crops or grazing, yards, and vegetated portions of road rights of way).
	Vegetated - recreation	Land that has been developed for recreation areas including golf courses and campgrounds, but still maintains vegetative cover such as forest or grass.
	Road	Roadways including highways and secondary roads
	Railway	Rail transportation lines
	Built-up	Building structures including houses, stores, barns and associated infrastructure.
Other	Industrial	Infrastructure such as wastewater treatment facilities, gravel pits, and mine spoil areas.
	Unvegetated	Area devoid of vegetation, having only exposed substrate, such as river banks, gravel bars, gravel parking lots and other clearings. Includes both natural and anthropogenic causes.

2. Then an automated process was developed to delineate the remaining area:
 - a. The orthophoto, DEM, and lidar data were lined up to derive various "feature" data (28 in total) from the manually delineated features (e.g., number of lidar returns in a pixel, maximum lidar intensity, terrain slope, ortho red band maximum, lidar within pixel object height).

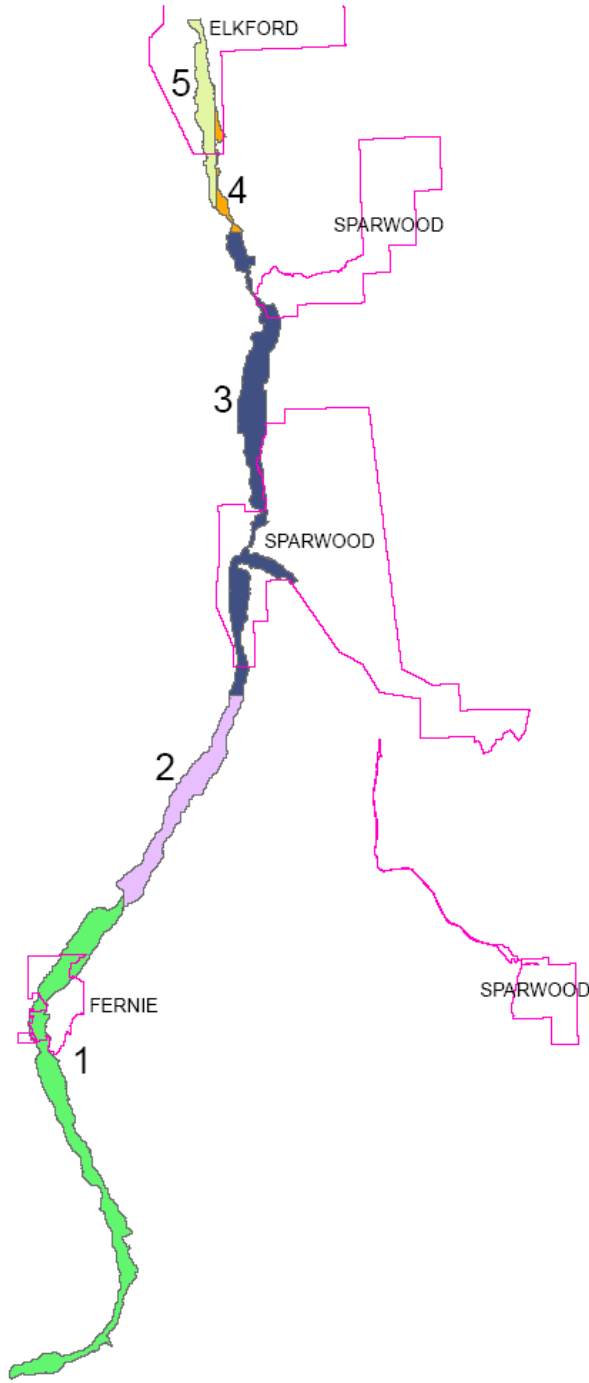


Figure 2. Five data zones showing areas of unique data combinations.

- b. A 'brain' / 'classifier' was created to create the decision tree structure used to determine what defined each of the features. This was done using the Random Forest machine learning algorithm.

Five training datasets and decision trees, were built for the analysis. The training zones were established to ensure the most current datasets were used for the analysis. For example, training zone 1 (located from Elko to an area just north of Fernie) relied on 2011 orthophotography and 2011 Lidar. Training zone 2, located between Fernie and Sparwood, used 2012 orthophotography and 2011 Lidar (Table 2, Figure 2). Each zone was comprised of the most current combination of orthophoto and Lidar data.

Table 2. Data zones used for land cover delineation

Zone	Year	
	Orthophoto	Lidar
1	2011	2011
2	2012	2011
3	2012	2012
4	2012	2011
5	2011	2011

- c. A second automated filter was used on Unforested Natural and Forest features so that only polygons of 0.5 acre or greater would be mapped. This was completed to remove error associated with open canopy forest being typed as Unforested Natural.
3. Lastly, shadows were removed through a manual process (Figure 3) in order to provide a clean product that can be more accurately interpreted.

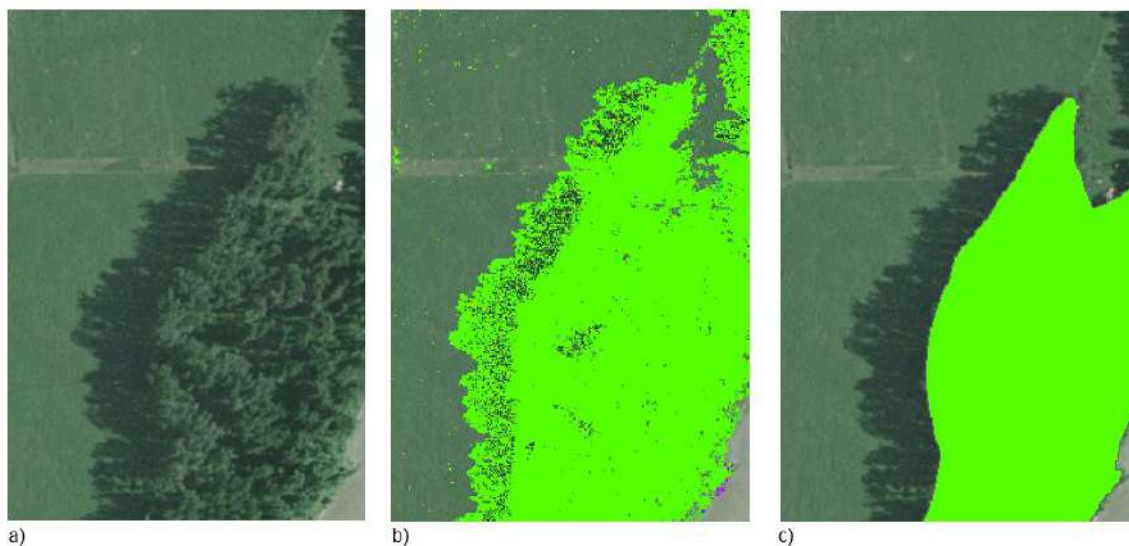


Figure 3. a) Area of shadows cast over agricultural field; b) automated classification before manual intervention; and, c) following manual intervention.

2.3 30 m riparian area buffer analysis

Land cover mapping was the first level of analysis and allowed for the valley bottom to be described based on proportions of the different cover types. A secondary assessment was then completed to describe the proportions of land cover types found within the 30 m regulated riparian buffer. To do this an automated program was developed to calculate the aerial extent of natural and disturbed features within 30 m of all large waterbodies (greater than 0.5 acres (0.2 ha)). Using this approach, the presence of small water bodies (less than 0.2 ha) within 30 m of the main water bodies were quantified along with the other land cover features.

2.4 Land use

Select land use data were incorporated into the map product to allow for a spatial description of findings. These were municipal boundaries (obtained from the RDEK), provincial parks (obtained from BC Parks), and other non-government organization conservation properties (obtained from The Nature Trust of BC and Ducks Unlimited Canada). The aerial coverage and type of habitat protected was calculated for the park and conservation areas.

2.5 Jurisdiction zones

The study area was divided into the regional and municipal regulatory jurisdiction zones using municipal maps provided by the RDEK. The aerial extent of the land cover features and the riparian analysis results were compared between these zones.

3. Results

3.1 Habitat overview

Habitat throughout the valley bottom was classified into three biogeoclimatic (BEC) zones: Montane Spruce, Interior Cedar-Hemlock, and Interior Douglas Fir (MFLNRO 2012; Figure 4). These BEC zones are summarized below as per Meidinger and Pojar (1991).

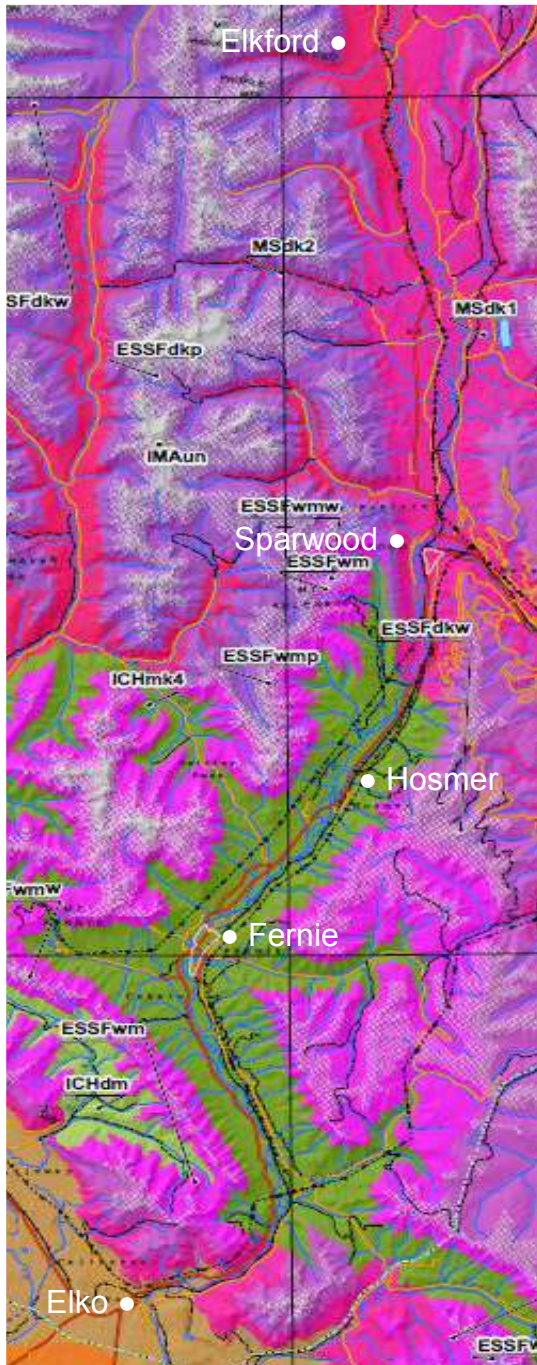


Figure 4. Biogeoclimatic (BGC) Zones along the Elk River (Source: MFLNRO 2012)

Montane Spruce (MS) zone

The MS zone is found from Elkford downstream past Sparwood 10 km, and for a 5 km section upstream of Elko. The MS zone has a cool climate characterized by cold winters and moderately short, warm summers. A distinctive feature is the extensive, young and maturing seral stands of lodgepole pine that have formed following wildfire. Grassland ecosystems occur only on south-facing upper slopes and ridges in the driest subzones. Where terrain allows, a common wetland type is the fen community of willows, sedges, and glow moss. Riparian areas and waterbodies are very important summer habitats for a variety of mammals, birds, and amphibians because they are wet islands in a matrix of fairly dry forest.

Interior Cedar – Hemlock (ICH) zone

The ICH zone covers the valley bottom downstream of Sparwood, past Fernie 20 km. The ICH climate is dominated by easterly moving air masses that produce cool wet winters and warm dry summers. This zone is one of the wettest and most productive forest in the interior of BC. Engelmann spruce, white spruce, various spruce hybrids, subalpine fir, and black cottonwood are often climax species in riparian areas. Lodgepole pine, trembling aspen, and paper birch are common seral species. Marshes are often associated with waterways.

Interior Douglas Fir (IDF) zone

IDF zone is situated in a short section of the study area, starting approximately 5 km upstream of Elko extending downstream past Elko dam. The IDF climate has warm, dry summers, a fairly long growing season, and cool winters. Open to closed, mature forests containing Douglas-fir cover much of the landscape. Ponderosa pine persists as a climax species on drier sites and the dry mild subzone present around Elko is distinguished by the presence of western larch. Grasslands occur in parts of the IDF. Wetlands are common and range from cattail and great bulrush marshes, to sedge fens, and saline meadows. Tall willow swamps often follow small streams and drainage channels.

3.2 Terrestrial species overview

The Elk River watershed provides habitat to a wide range of terrestrial species. Many animals are common throughout all three BEC zones found in the valley bottom and rely on the range of habitats available including forests, grasslands and riparian areas.

There are numerous sensitive plant and animal species known to inhabit the MS, ICH and IDF BEC zones in the Rocky Mountain Forest District. These listed species are primarily found in habitats present in the valley bottom including forest, riparian, wetland and grassland areas (Appendix A-1). In these areas, there are 66 red-listed and 108 blue-listed species⁸ (BC Conservation Data Centre (BC CDC) 2013). Of these, 30 species are listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)⁹. Many of the species are known to at least two and often all three of the BEC zones. Of the sensitive ecological plant communities, 1 is known to the ICH (Kootenay moist cool variant) and 16 are found in the IDF (Kootenay dry mild variant) (Appendix A-2).

Table 3. Sensitive species counts for valley bottom habitats in the IDF, MS and ICH BEC zones of the Rocky Mountain forest district (Source BC CDC 2013).

Species Type	BC listing		Federal COSEWIC listing			
	Red	Blue	Endangered	Threatened	Special Concern	Concern
Non vascular plant	2	9	-	1	1	-
Vascular plant	41	53	-	-	-	-
Invertebrate animal	10	22	7	-	2	3
Vertebrate animal	13	24	-	6	8	-
Ecological Communities	8	9	-	-	-	-

3.3 Aquatic species overview

A falls on the mainstem Elk River below Elko is a barrier to fish migrating upstream from the Kootenay River. Other than this, fish access is generally unrestricted throughout the mainstem Elk River upstream to Elkford. Fish distribution by species is as follows:

- westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) throughout;
- mountain whitefish (*Prosopium williamsoni*) and bull trout (*Salvelinus confluentus interior lineage*) are found primarily in the mainstem, with some tributary use for spawning and by juveniles;
- longnose dace (*Rhinichthys cataractae*) are most abundant in middle and lower portions of the watershed, in mainstem and off-channel habitat;
- longnose sucker (*Catostomus catostomus*) are found in off channel habitat; and,
- eastern brook trout (*Salvelinus fontinalis*), a non-native species to the area, are also quite wide spread, but more limited to the tributaries;

Two of these fish species are under conservation listings. Bull trout (interior lineage) and westslope cutthroat trout are recognized as a species of Special Concern in BC and by COSEWIC (BC CDC 2013). Additionally, westslope cutthroat trout are listed as a species of Special Concern throughout their range in British Columbia under the federal Species at Risk Act (SARA). The Elk River is known for its world-class fishing. In response to high fishing pressure, and in order to maintain the high quality of angling experience, the Elk River has been designated as Classified Waters by the BC Government, requiring special licencing provisions and angler targets.

⁸ BC Listing: Red listed species are candidates for, Extirpated, Endangered, or Threatened status; and blue-listed species are considered to be of Special Concern.

⁹ COSEWIC listing: Endangered species face imminent extirpation or extinction, Threatened is likely to become endangered if limiting factors are not reversed, and Special Concern are particularly sensitive to human activities or natural events.

3.4 Jurisdiction zones

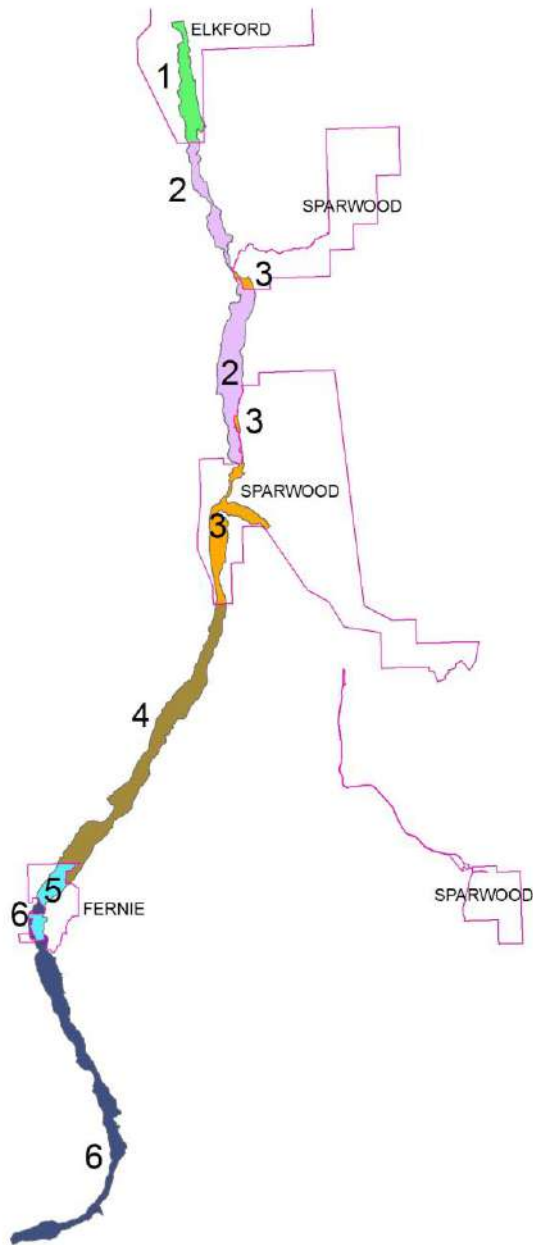


Figure 5. Jurisdiction zones reviewed through the valley bottom assessment

The Elk River is 220 km long and has a drainage basin of 4450 km² (City of Fernie 2002). The Valley Bottom Assessment reviewed land cover along 108 km of the mainstem, for a total area of 84.47 km² (8371 ha). The valley bottom ranged in width from 69 m to 1559 m, and had an average width of 843 m.

Most of the valley bottom (74%) is within the RDEK jurisdiction (Figure 5). The municipalities of Elkford, Sparwood and Fernie comprise 9%, 12% and 6% of the valley bottom respectively. Not all of the District of Elkford was reviewed in this study (Figure 6); the upstream extent of this assessment started at the northern extent of the town. The land to the north of this was non-urbanized. Maps depicting large scale results for each of these jurisdictions are located in Appendix B, and data tables are in Appendix C.

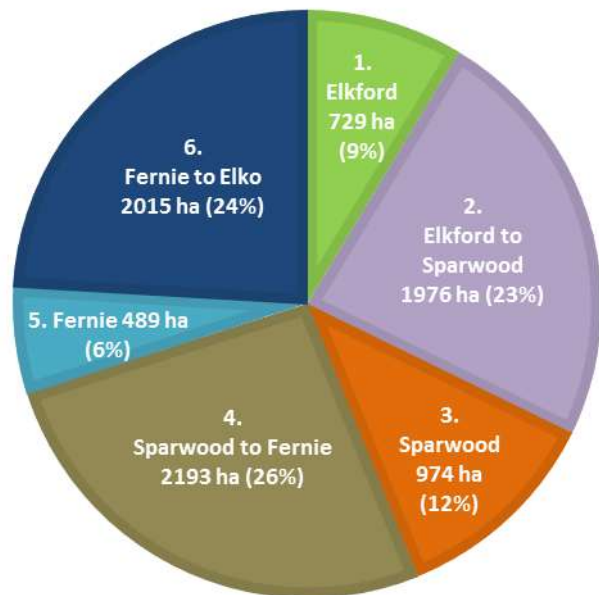


Figure 6. Valley bottom cover for the jurisdiction zones reviewed¹⁰

¹⁰ The total jurisdiction area has not been calculated (i.e., upland is excluded).

3.5 Natural versus disturbed

A total area of 5380 ha or 64% of the study area was undeveloped. The natural area was primarily comprised of forest (45%), and water (14%). There was also a small amount of natural unforested vegetated cover (6%; Figure 7). Development covered 2991 ha or 36% of the valley bottom and was largely the result of replacing forest cover with other vegetative cover (unforested disturbed = 25%). Vegetated recreation covered 1%. Development types which typically have the largest impact on the landscape such as built-up, roads, railway, and industrial had fairly low coverage throughout the study area (10% combined).

The unvegetated land cover was delineated but it was omitted from this analysis. This is because it included both natural areas devoid of vegetation (river banks, gravel bars), and developed areas (gravel parking lots and other clearings). Overall, unvegetated land cover comprised 76 ha or 1% of the valley bottom area.

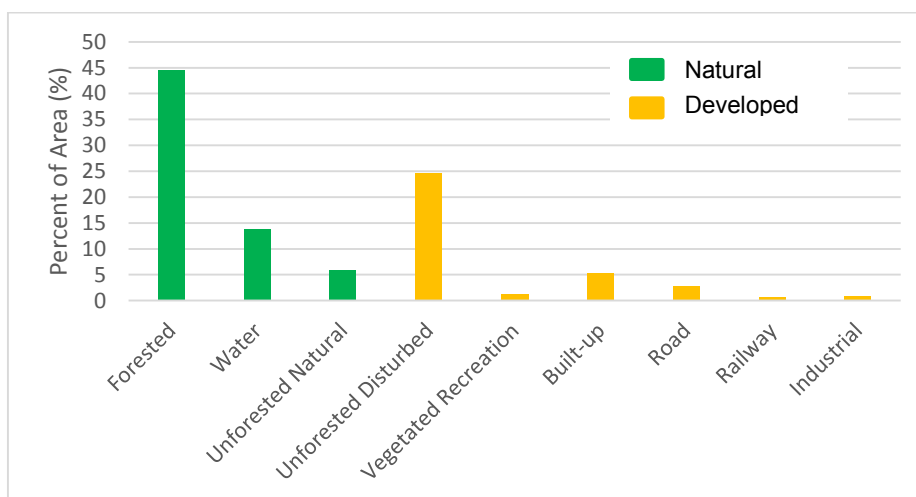


Figure 7. Natural and disturbed cover features throughout the Elk River valley bottom (%).

Elkford had the highest proportion of natural habitat (81% forested, unforested and water) (Figure 8). This was followed by the three RDEK zones combined (65%), Sparwood (59%), and then Fernie (36%).

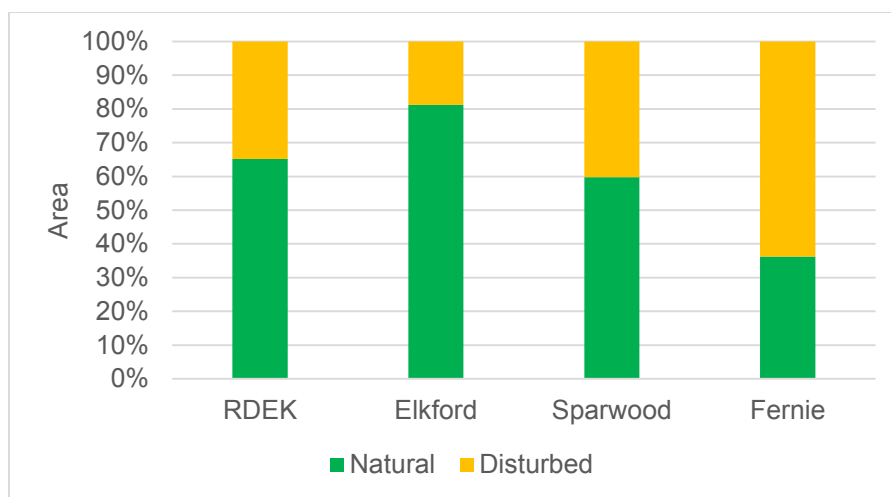


Figure 8. Natural (includes water) and disturbed habitat

3.6 Municipal land cover

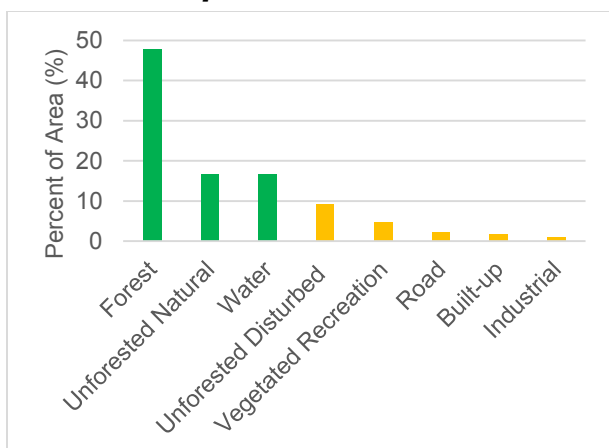


Figure 9. District of Elkford percent cover (total area = 724 ha).

Of the 81% of natural cover in Elkford, most was forested (48%) (Figure 9). The remaining natural cover was comprised of unforested natural and water cover, with each providing 17% area cover.

Developed areas were mainly represented by unforested disturbed and vegetated recreational cover. These habitats contain vegetative structure and together covered 14%. Roads, built-up, and industrial areas were the other developments, and together they comprised 5% of Elkford’s valley bottom cover.

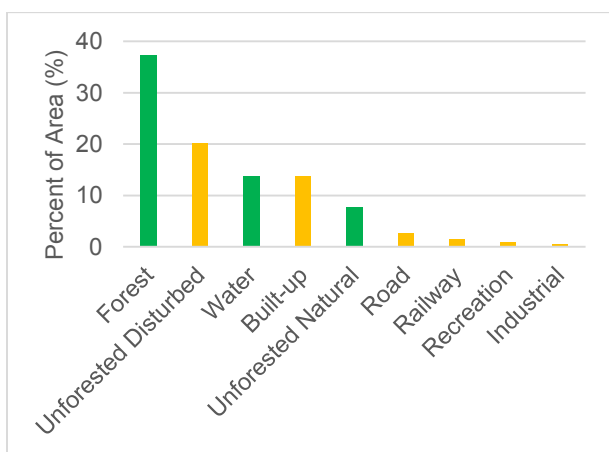


Figure 10. District of Sparwood percent cover (total area = 974 ha).

Sparwood had 60% natural cover in its valley bottom area (Figure 10). At 37%, forest cover accounted for a high proportion of this. Water and unforested natural areas provided 14% and 8% of additional natural cover, respectively.

Developments in Sparwood were mainly the result of conversion of forest to other vegetation types (21% unforested disturbed), and built-up (14%). Roads, railway, vegetated recreation and industrial disturbances were uncommon, and together covered 5% of Sparwood’s valley bottom landscape.

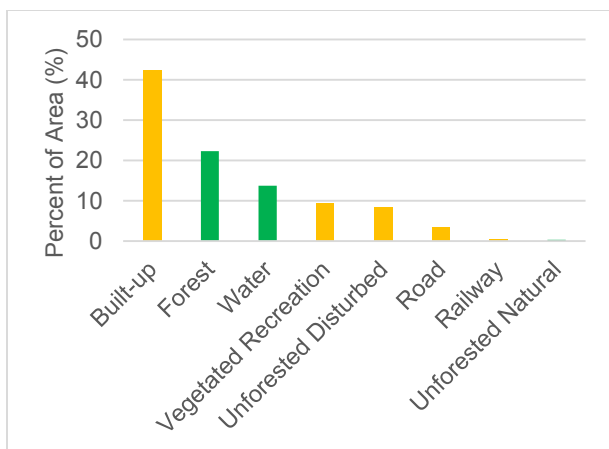


Figure 11. City of Fernie percent cover (total area = 489 ha).

Fernie had 36% natural valley bottom area at (Figure 11). 22% of this was forested and 14% was water cover.

Built-up areas were the prime disturbance type (42%). Recreation and unforested disturbed which both still provided vegetative cover, together accounted for 17%. When combined, the other disturbances evident, roads and railway, accounted for 4% of the Fernie valley bottom.

3.7 RDEK land cover

The valley bottom area for the three RDEK zones were comparable ranging from 1176 ha to 2193 ha (Table 4). Although cover types were generally similar, unforested disturbed decreased moving down the valley. This feature covered 40% at Elkford to Sparwood, 26% at Sparwood to Fernie, and 20% at Fernie to Elko¹¹. Land cover similarities were as follows:

- The greatest cover was forest, which ranged from 39% to 54%;
- Natural land cover (forested and unforested) was fairly high in all zones, and showed a gradual increase moving down the valley (i.e., comprised 45.6% at Elkford to Sparwood zone, 53% at Sparwood to Fernie zone, and 55% at Fernie to Elko zone).
- Water cover was similar, ranging from 12% to 16%;
- Road cover was low, ranging from 2% to 4% and
- Vegetated recreation, built-up, railway and industrial cover were all low, at less than 2% individually. Combined, these disturbance features were 5% or less for each RDEK zone.

Table 4. RDEK land cover results

Zone	Area (ha)	% Natural			% Developed					
		Water	Forest	Unforested Natural	Unforested Disturbed	Vegetated Recreation	Built-up	Railway	Industrial	Road
Elkford to Sparwood	1976	12.2	39.3	6.3	39.6	0.0	0.5	0.2	0.0	1.7
Sparwood to Fernie	2193	12.0	47.7	6.2	25.8	1.1	1.8	0.9	1.7	2.8
Fernie to Elko	2015	16.3	53.7	1.8	20.7	0.0	1.8	1.0	1.0	3.7

Because of these similarities, the RDEK results were combined (Figure 12). Overall, the RDEK valley bottom covered 6184 ha and 65% of this was natural land cover. This was primarily forest (47%), and also included water (13%), and natural unforested areas (5%). Unforested disturbed made up most of the developed area (29%, and includes historically forested areas that are now fields, yards, or vegetated portions of road rights of way). The other developed cover types (road, built-up, railway, industrial), when combined, occurred over 6% of the study area. Other than the near absence of built-up areas in the RDEK, developed areas were similar (low) when the RDEK area was compared to the three municipalities.

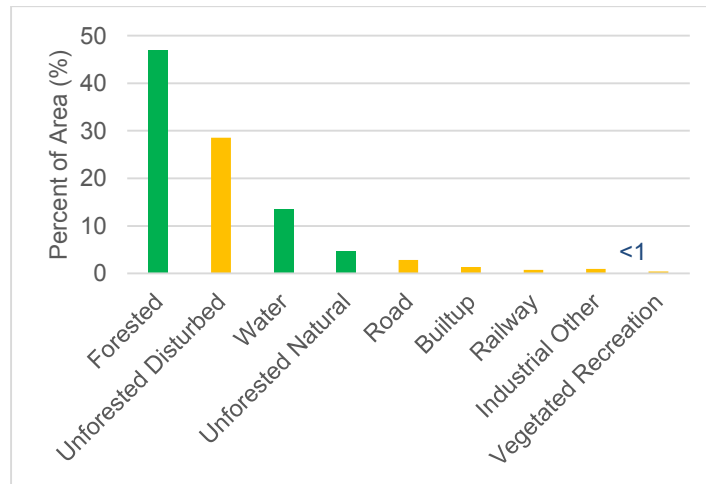


Figure 12. RDEK combined land cover (%)

¹¹ Figures in the text have been rounded to the nearest whole number from those in the table.

3.8 30 m riparian buffer area

The riparian area (i.e. area within 30 m of bodies of water sized greater than 0.2 ha) comprised a total of 1412 ha. Overall, 86% of the riparian area was naturally vegetated. This cover type was primarily forest (74%), and also included unforested natural (12%) and a small water area (0.4%). Unforested disturbed (10%) was the main development type. With a combined coverage of 4%, other developments such as roads, railway, built-up, recreational and industrial were not prevalent in the riparian area.

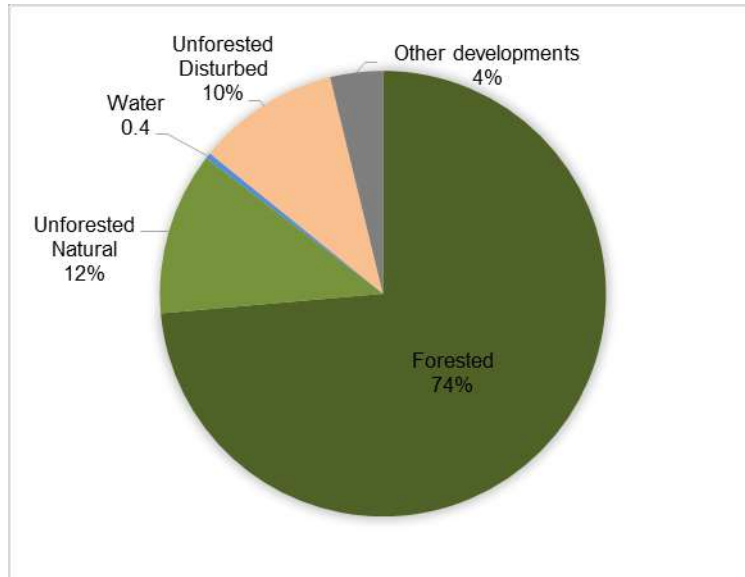


Figure 13. Natural and developed area within the 30 m riparian zone for the valley bottom study area.

When the riparian zone cover was reviewed by jurisdiction, a predominant finding was that all zones had maintained over 75% natural vegetative cover, which was primarily forest (Table 5). Elkford had the highest amount of natural riparian area (93%). The cover in the three RDEK zones were similar, and when combined, the RDEK had 85% natural in the riparian zone. Sparwood followed closely with 84%. Fernie had the greatest developed riparian area (21%). This was evident mainly as higher coverage with built-up (10%) and roads (5%), which the other jurisdictions maintained below 1% and 3% respectively (See the final figure in Appendix B).

Table 5. Cover within 30 m of water bodies (the riparian zone) by jurisdiction.

Jurisdiction	Total Area (ha)	% Natural			% Developed					
		Water	Forest	Unforest Natural	Unforest Disturb	Vegetated Recreation	Built-up	Road	Rail	Industrial
Elkford	189.8	<1	61	32	4	2	1	1	0	0
Sparwood	177.7	<1	69	15	13	0	<1	1	1	<1
Fernie	70.2	1	77	1	6.5	<1	10	5	<1	0
RDEK (all)		<1	77	8	12	<1	<1	2	1	<1
Elkford to Sparwood	322.8	<1	72	11	15	0	<1	1	1	0
Sparwood to Fernie	322.3	1	78	4	10	<1	1	1	1	<1
Fernie to Elko	329.5	1	80	6	10	0	<1	3	2	<1

3.9 Conservation areas

A total of 1127 ha or 13% of the valley bottom has been set aside between Elkford and Elko for conservation, through four protected areas (Table 6). These areas protect 8% of the valley bottom forest habitat (including both natural and recreation areas), 3% of unforested (both natural and previously disturbed), and water habitats (<1%) (Figure 14).

Table 6. Protected areas in the Elk River valley bottom study area.

Name (managed by)	Valley bottom area (ha)	Cover (% of valley bottom park area)
Big Ranch – Grave Prairie, Rankin Property (The Nature Trust)	236	Unforested disturbed (70%), Forested (25%), Water (3%), Unforested natural (2%).
Elk Valley Heritage Conservation Area (Nature Conservancy of Canada (NCC))	708	Forested (72%), Unforested natural (10%), Water (8%), Vegetated recreation (3%), Unforested disturbed (2%)
Mount Broadwood Heritage Conservation Area (NCC)	106	Forested (87%), Unforested disturbed (3%)
Elk Valley Provincial Park (Province of BC)	77	Forested (78%), Water (13%), Unforested natural (8%)
Total Area	1127	

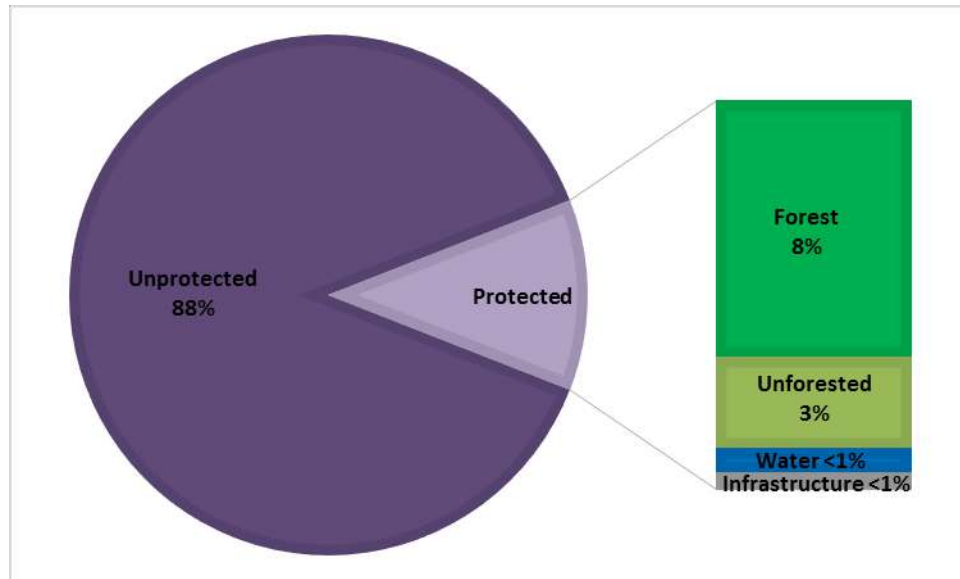


Figure 14. Habitat protected through conservation and park lands in the Elk River valley bottom between Elkford and Elko.

Elk Valley Provincial Park (Source: BC Ministry of Environment 2003).

The primary role of Elk Valley Provincial Park is to provide a scenic day use area along a major tourist route. The park provides walking access to sites along the Elk River. The secondary role of this park is to preserve stands of old growth cottonwood and retain a considerable tract of natural riverfront. Black cottonwoods on this site provide valuable wildlife habitat for secondary cavity nesters, and riparian cover and browse for ungulates and other mammals. This park covers a total area of 78 ha, 77 ha of which are in the valley bottom, providing primarily forest habitat (78%).

The Big Ranch Conservation Area & Grave Prairie (Source: The Nature Trust of BC 2003).

The Big Ranch/Musil & Rankin Conservation Area covers a total area of 472 hectares and was established to help buffer the area from adjacent agricultural operations. It conserves ungulate winter range and provides important habitat for small mammals, birds and red-listed American badgers. Seventy five percent of the property is open grassland containing a mix of native grassland habitat and remnant agronomic grass complex. The remaining area is comprised of riparian and mixed forest stands. This conservation area was assessed to cover 236 ha of the valley bottom, providing mainly unforested (e.g., grassland) habitat (72%).

In the fall of 2013, Teck purchased an additional 3,059 ha at Grave Prairie across the river from the Big Ranch, further protecting winter range for wildlife between Elkford and Sparwood (e-Know 2013). However, the legal boundary data were not yet available at the time of preparing this report, and were thus not included in the valley bottom summary.

Elk Valley Heritage Conservation Area and Mount Broadwood Heritage Conservation Area (Source Nature Conservancy of Canada (NCC) 2014, and N. Newhouse pers. comm.)

Covering an area of 8944 ha, the Mount Broadwood Conservation Area was the NCC's largest private land donation in Canadian history. Valley bottom habitat here comprises 106 ha, and is mainly forested (87%).

In 2004, NCC acquired the Elk Valley Heritage Conservation Area between Hosmer and Sparwood (made up of 1214 ha of fee simple land and 3000 ha of covenant lands). Only the fee simple GIS layer was available at the time of preparing this report. Using this data, 708 ha of this conservation area was determined to be in the valley bottom, and this was primarily forest habitat (78%). NCC's vision statement for the Elk Valley Heritage River Conservation Area is to contribute to safe, well-functioning corridors for cross-valley animal movement in the Elk River Valley.

Both properties are managed to support functioning ecosystems within a working landscape in order to meet the following conservation goals:

- To maintain and enhance cross-valley animal movement corridors;
- To create and implement reclamation and restoration plans for all present commercial activities;
- To provide access to old-growth Black Cottonwood forests in order to help raise riparian values awareness in residents;
- To maintain and enhance the viability of native fish populations;
- To control problematic invasive species;
- To ensure ongoing forestry practices do not decrease key conservation values;
- To help support local economic initiatives on portions of NCC lands; and
- To support compatible recreational access where appropriate.

4. Discussion

4.1 Valley bottom habitat

A considerable percentage (64%) of the Elk River valley bottom from Elkford to Elko was undeveloped. Comprised largely of forest, water, and other naturally vegetated areas (including grasslands, wetlands, shrub areas), these areas would be expected to provide high value habitat, supporting fish and wildlife biodiversity. These areas would also be important contributors to healthy watershed function, through processes such as:

- Providing space to allow natural stream channel processes – a benefit of maintaining this is to mitigate the potential impacts of flood events without the costly requirement for bank protection infrastructure and associated maintenance;
- Retaining or slowing down flood waters entering the mainstem as it moves across the landscape, potentially minimizing large scale effects on habitat and infrastructure downstream;
- Filtering silt and other contaminants before they reach the mainstem; and,
- Providing migration corridors for wildlife.

This study also found that while 36% of the valley bottom was classified as “developed”, 25% of this still remained vegetated. This cover type was mainly open fields, although there was also some contribution from golf courses, campground areas, and other deforested areas (such as vegetated sections along roadsides). While unnatural, this style of development maintains more habitat value than more intensive development such as built-up areas. The larger contiguous sections of this land cover type potentially provide valuable habitat (e.g., wildlife forage) and ecosystem function, particularly where they adjoin with natural areas, allowing for unrestricted migration for wildlife. Through undeveloped or minimally developed sections of land (preferably along the mainstem and tributaries), the upper watershed can be linked to the lower valley bottom. Maintaining a contiguous natural riparian area is also important to biodiversity and watershed function (see below).

The more intensely developed areas, including urban, road, railway and industrial covered a relatively small area within the valley bottom as a whole (10%). The jurisdiction review revealed that Fernie had the greatest overall amount of valley bottom development (58% of the total area in Fernie city limits). The proportional extent of development in the other jurisdictions was: 19% in Elkford, 40% in Sparwood, and 35% in the RDEK (this includes areas such as Hosmer and West Fernie). The main difference between Fernie and the other jurisdictions was that the city itself was situated in the valley bottom (42% built-up), due to the historic development of the town since 1898. Being newer towns developed after the 1960s, the built up areas in Elkford and Sparwood were mostly up out of the valley bottom, leaving natural vegetation as the leading cover type in the valley bottom.

Fernie’s position in the valley bottom has led to the building of dike structures along much of the river to protect the city from flood events. An assessment of dike impacts on natural habitat features was not completed for this project. However, there is typically a reduction in the diversity and abundance of fish assemblages along dikes, since complex habitat features are eliminated. For example, undercut banks, large woody debris, overhanging riparian vegetation, and side channel habitat are typically absent in areas with dikes. Construction of dikes will generally lead to the implementation of mitigation works, such as plantings or habitat features, in order to offset disturbance of existing habitats or vegetation (Province of BC 2003).

With increasing population and urbanization, environmental stress increases. Stresses may result from direct habitat removal or other impacts such as increases in impervious, or hardened surfaces. Hardened surfaces restrict water from infiltrating into the ground, and can lead to increases in pollutants entering streams, increased stream temperatures, and flood risk. Limiting further urbanization within the valley bottom would be favourable to biodiversity, ecosystem health, and watershed function.

4.2 Riparian

The riparian area is an important transition area between water and upland habitat. The frequent, seasonal inundation that occurs in the riparian zone supports plant species that are distinct from species on adjacent upland sites. Natural vegetative cover in the 30 m riparian setback zone was 86% throughout the study area. An additional positive finding was that a large extent (74%) of the riparian area was forested. Forest cover in the riparian area not only provides many biodiversity attributes but also is an important contributor to healthy watershed function, including for example:

- Deep/dense root structure which stabilizes stream banks to prevent erosion;
- contributions of organic matter and food (e.g. terrestrial insects that fall into the water) to the aquatic environment;
- shade which helps moderate the temperature of the waterbody;
- habitat structure for terrestrial species;
- habitat structure for aquatic species via woody debris;
- filtering of contaminants via chemical and biological processes in riparian soils from surface runoff pollution; and,
- retention of storm water runoff by providing area for absorption of water during high flow periods.

Unforested disturbed areas were more prevalent (10%) than the more intensively developed areas (4%), which include roads, railway, built-up, recreational and industrial. This is beneficial, since the unforested disturbed areas still have vegetation that provides habitat and watershed function.

4.3 Current watershed management

4.3.1 Conservation areas

The valley bottom in the study area had 13% of its habitat protected through provincial parks or conservation lands. These areas protect valuable forest and other vegetated features in the valley bottom and are a management measure contributing to the health of the watershed. This analysis did not account for municipal green spaces, NCC covenant lands in the Elk Valley Heritage Conservation Area, and recent additions by Teck to the Grave Prairie Conservation Area. However, these green spaces would be captured in the extent undeveloped through this study.

4.3.2 OCP and bylaws

Developmental pressures within the valley bottom are expected to become more prevalent as populations grow. The three municipalities have an estimated population of nearly 11,000 and have been gradually growing (Table 7). The City of Fernie has the largest population, with approximately 4,800 full time residents (based on 2011 census), and a population growth rate of 4.1% for the period of 2006 to 2011 (Statistics Canada 2013). Zoning bylaws and official community plans (OCPs) provide mechanisms to protect environmentally sensitive areas, while balancing the communities' needs to meet their development goals. Relevant bylaws intended to protect sensitive habitats such as riparian areas, and wetlands are listed by jurisdiction in Appendix D.

Table 7. Population (2011) and growth rate over a 5 year period from (2006 to 2011). Source Statistics Canada 2013.

Municipality	Population	Growth rate (% over a 5 year period)
Fernie	4,800	4.1
Sparwood	3,667	1.4
Elkford	2,518	3.1

In their OCPs, Fernie (2002) and Elkford (2010) protect the riparian area through development permit areas; whereby, generally no development is to take place within a 30 m area from a stream or wetland. These riparian policies are consistent with the BC RAR (BC MoE 2005), required in other parts of the province.

Sparwood's current OCP does not have any specified environmental development permit areas; however, Sparwood is currently in the process of preparing a new OCP that is scheduled to be finalized in March 2014.

In the RDEK, the Elk Valley Zoning bylaw outlines that live tree cover is to be maintained within 60 m of the high water mark of a lake and within 25m of a stream or watercourse. This RDEK policy applies to the Watershed Protection (WP-1) zoned land (RDEK 2013). Land use planning in the Elk Valley was identified as a priority for the RDEK in 2013 and the process is underway for a first-ever long term, strategic planning document that will provide direction and guide decision making with respect to land use preservation and change. Final RDEK Elk Valley OCP adoption is anticipated by October 2014.

The OCPs also include policies to protect other environmental land cover. For example, Elkford's Objective 5.2.1 is to *create a compact community that uses land efficiently, avoids urban sprawl, reduces GHG emissions and preserves forest, recreational and environmentally significant lands* (District of Elkford 2010). Elkford's Land Use Plan supports this by designating the area outside of the District Growth Boundary as primarily for recreation and maintenance of wilderness (District of Elkford 2010).

Fernie's OCP has several policies aimed at wildlife preservation. Most notable to this project is Section 12.4 (a): *Working with local environmental groups, the Regional District of East Kootenay and relevant provincial and federal government ministries to establish a Wildlife Corridor Identification and Protection Strategy for the area* (City of Fernie 2002). Fernie's Natural Open Space Policy (Section 14.12) also could help maintain natural or developed but still vegetated lands: *As a result of topography and the presence of watercourses in the community, considerable natural open space areas exist in the City of Fernie. These undeveloped open space areas contribute significantly to the natural setting. Further, in many cases, these areas serve as locations for active and passive recreation. The OCP supports the preservation of these areas in their natural form for informal recreation uses.* Fernie is also in the process of updating their Official Community Plan (OCP) and a draft plan it is currently at the public review stage. There are several proposed updates to the plan relating to the environment.

Overall, management approaches indicate the recognition of maintaining valuable valley bottom habitats. A review of OCPs from other areas in the Kootenays, BC or Alberta may prove valuable. For example:

- The Lake Windermere OCP addresses wildlife habitat (such as winter range areas) and corridors, with key areas mapped as Environmentally Sensitive Areas having specified Development Permit requirements (RDEK 2008).
- The City of Kelowna has conducted extensive ecosystem inventories to identify environmentally sensitive habitats including watercourses (creeks, streams, rivers, ponds, lakes, wetlands and springs), riparian areas, and terrestrial ecosystems (such as old coniferous forests, coniferous woodlands, grasslands and sparsely vegetated ecosystems) (City of Kelowna 2011). These areas have been identified as Development Permit Areas in the City's OCP to ensure that negative impacts areas are minimized.

A desired goal is to achieve a consistent approach to the maintenance of long-term sustainability of the natural landscape.

4.4 Report card

A report card was prepared summarizing the overall status of land cover throughout the study area. Watershed reports from outside jurisdictions were reviewed to determine health indicator and thresholds applicable to this project. Key sources used were from Ontario (Conservation Ontario 2013; Grey Sauble 2008), and Alberta (Oldman Watershed Council; AMEC 2010). Note, the indicators and thresholds were obtained from watershed level studies; they may be refined and made to best fit with municipal/regional objectives as more information becomes available. Applicable British Columbia indicators/thresholds were not available at the time of preparing this document.

Through the report card, the Elk River valley bottom land coverage was determined to be **Good** overall (Table 8). The jurisdictions were also individually typically rated as **Good**. Fernie rated **Fair** for 'total disturbance', 'vegetated cover' and 'forest cover'. The 'fair' category was generally broad ranging, with Fernie's values being nearer to the 'good' than 'poor' category. These results provide guidance that may be useful for setting management objectives towards maintaining and/or restoring environmental values into the future. Limiting development in the valley bottom, retaining natural vegetation cover, and maintaining natural river morphology should continue to be promoted.

Table 8. Elk River Valley Bottom Assessment Report Card

Indicators	Thresholds (%)*			Valley Bottom Results				
	Good	Fair	Poor	Overall	RDEK	Elkford	Sparwood	Fernie
Total Disturbance	<50	50-90	>90	36%	35%	19%	40%	64%
Total Vegetated Cover	>50	25-50	<25	77%	81%	79%	66%	39%
Total Forest Cover	>35	15-25	5-15	45%	47%	48%	37%	22%
Forested Riparian	>50	25-50	<25	74%	77%	61%	69%	77%
Total Water				14%	13%	17%	8%	14%

*The indicators and thresholds were obtained from watershed level studies; these may be refined and made to best fit with objectives as more information becomes available.

This report card is a general summary and it is expected that it would be refined to describe ecosystem health indicators as more information becomes available. For instance, with forest cover characterization, tree and shrub coverage in the riparian zone could be compared to the thresholds used in the Multiple Resource Value Assessment (MRVA) protocol for riparian habitat (Tripp *et al.* 2009). The MRVA provides indicators such as adequate root network, large woody debris supply, sufficient shading of the stream channel, and percentage of noxious and/or invasive plant species

The valley bottom is expected to continue to experience growth and development pressure. An understanding of land cover status and trends can inform planners of areas where further development may occur without significant habitat losses versus areas where there may already be significant loss of habitat structure and function. This information is also important simply in providing a baseline, which will be a valued tool for long term monitoring of human activity and development.

5. Stakeholder Input Process

The ERA developed a communication plan to share the R2R Phase 1 process and report with specific target audiences. Upon completion of the *DRAFT* "Elk River Watershed Valley Bottom Assessment – Report to Residents on River Health, Phase 1" (Report), ERA Executive Director Lee-Anne Walker prepared a 10-minute power point presentation highlighting the key points from the Report. Her presentation was followed by a facilitated discussion to gather feedback and input from local decision makers, partners, stakeholders and community. The presentation and discussion were facilitated at:

- City of Fernie – Committee of the Whole (Mayor, Council and Staff) on January 27, 2014;
- District of Elkford - Committee of the Whole (Mayor, Council and Staff) on February 11, 2014;
- District of Sparwood - Committee of the Whole (Mayor, Council and Staff) on February 7, 2014;
- Teck Community of Interest Initiative Workshop on January 29, 2014;
- Elk Valley Cumulative Effects Management Framework (CEMF) Workshop Group on February 12, 2014;
- Ktunaxa Nation Council – Tobacco Plains Band (Chief, Councilors and Band Administration Staff) on February 17, 2014; and,
- In-depth telephone discussions with Nelson Wight, District of Sparwood Planner (February 6, 2014) and Matt Gunn, Regional District of East Kootenay Planner/Lead for Area A OCP development (February 11, 2014).

A recorder noted the feedback from three questions. Questions, comments, corrections, and additions were incorporated to increase the relevance and usefulness of this Report. Key questions and clarifications emerged from the feedback during the presentations are provided in Appendix E.

6. Recommendations

This report provides a baseline or “snapshot” of land cover in the Elk River watershed valley bottom. The digital mapping content will be available to government, industry and non-government organizations involved in watershed management, which have GIS capabilities. The intent is that the product may be integrated as a GIS layer into their digital base map system. A digital copy of the GIS files can be obtained by contacting the Elk River Alliance (See Closing Section for contact information). A short video of the GIS product is located at: <http://www.youtube.com/watch?v=3D24I7Y8hCU>.

The recommended next steps to build on and further enhance the applicability of this study are:

1. Use a combination of orthophoto and field verification to complete an assessment of secondary habitat attributes in the valley bottom. This should include identification of specific high value habitats including: watercourses (creeks, streams, rivers, ponds, lakes, wetlands and springs), riparian areas, and terrestrial ecosystems (such as old coniferous and deciduous forests, wildlife trees, native grasslands, wildlife migration corridors, and winter range).

These projects are to be planned with a suitably qualified professional and/or a habitat biologist from the MFLNRO to review the project objectives, extent of study area, and to confirm applicable assessment methods. Assessment methods utilized by other jurisdictions should be considered such as those used for the development of recent OCPs in Kelowna (City of Kelowna 2011) and Invermere (RDEK 2008). All assessments are to be conducted by individuals suitable experienced and trained. Results are to be incorporated into a GIS database so they may be utilized incorporated into regional and municipal planning tools. Some examples of assessment methods are listed below:

- Use Foreshore inventory and mapping protocols to conduct an assessment of fish and wildlife habitat values, identify extent and type of development. Using this information, shoreline management guidelines to protect habitat are established (See <ftp://ftp.rdek.bc.ca/pdf/planning%20files/ekilimp/>)
 - Conduct a riparian field assessment following the Protocol for Evaluating the Condition of Streams and Riparian Management Areas (Riparian Management Routine Effectiveness Evaluation) (Tripp *et. al.* 2009.). Compare the results against the indicators and established benchmarks for properly functioning condition of the riparian zone. This would have the added advantage of being consistent with the methods being considered for adoption by the Elk Valley Cumulative Effects Management Framework. Also consider adopting an ecological definition of the riparian zone (rather than an arbitrary 30 m based on regulation).
 - Assess and map sensitive fish habitats (overwintering areas, spawning areas, rearing areas) using procedures such as Fish Habitat Assessment Procedures (http://www.for.gov.bc.ca/hfd/library/ffip/Johnston_NT1996.pdf)
 - Assess wetlands using Wetlands Inventory and Mapping (<http://www.kelowna.ca/CM/page2140.aspx>), or Wetlandkeeper methods (<http://bcwf.net/index.php/wetlands-sub-1>).
 - Conduct a wildlife tree assessment (See <http://www.for.gov.bc.ca/ftp/hfp/external!/publish/web/wlt/training/Parks-handbook.pdf>).
2. Bio inventories may also be conducted in association with these assessments, including surveys of breeding bird, amphibians, bats, spawning fish, and/or other sensitive species potential to the area of interest. As above, these projects are to be overseen/undertaken by a suitably qualified professional.
 3. Environmentally Sensitive Areas should be identified and protected from development. Environmentally sensitive areas should be included in OCPs, bylaws and policy documents as Development Permit Areas. Numerous possibilities exist for areas identified as sensitive, including

No Build / No Disturb Covenants, creation of Natural Areas Zoning bylaws, or by other mechanisms (donation to trust, etc.).

4. Review the human-caused riparian area modifications and management practices for priority areas (e.g., urban areas), such as rip rap armouring, diking, stormwater drainage, and snow dumping. For these activities, identify level of impact, opportunities for improvement, and best management practices to balance protection of riparian habitat and water quality with other important human requirements (e.g., protection of land base and safety).
5. Have the mapping product available online to the public as a digital watershed access tool for future monitoring activities.
6. Complete a land cover study for the upper portions of the watershed. This could provide an understanding of available habitat for sensitive species, extent of large intact forested areas, etc. This information would be beneficial in contributing to the overall watershed report card.
7. Use results of other studies completed in the Elk River watershed to help direct future activity. This may include the ecosystem restoration and fish and wildlife enhancement results anticipated in the Kootenay-Koocanusa Watershed Action Plan, expected in March 2014.
8. Report these findings to local governments and municipal staff, as well as community residents and identified target audiences (e.g., Fernie Nature Club, Wildsight Elk Valley Branch, Fernie Rod and Gun Club), in an easy to understand report card designed to track the impact of human actions in the watershed over time.
9. Repeat the study in five years to compare changes over time.
10. Continue to report on additional watershed indicators over time (e.g. water quality, benthic invertebrates, etc.).
11. As Phase 2, complete the Valley Bottom assessment north of Elkford; as well review significant tributaries such as Michel Creek.
12. Use Best Management Practices during development (See <http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second>). Some available guidelines that may be applicable include:
 - Develop with Care 2012: Environmental Guidelines for Urban and Rural Land Development in British Columbia (<http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2012/index.html>);
 - Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia (http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf)
 - Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (2013) (http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf)
 - Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia July, 2009 (http://www.env.gov.bc.ca/wld/documents/bmp/wetlandways2009/wetlandways_docintro.html)

Where a best management practice is not available, develop the guideline with consultation from a qualified professional, regulatory agency, and affected stakeholders.

Closing

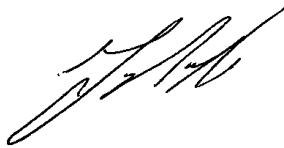
On behalf of the project team, we appreciate the opportunity to complete this valuable assessment, which contributes to sustainable development within the East Kootenay Region.



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Personal Communications

- Nancy Newhouse, March 6, 2014. BC regional office (Invermere), Canadian Rocky Mountains, Nature Conservancy of Canada.

Appendix A. Sensitive species

Rank codes for sensitive species

S = Sub-national (provincial/state) rank:

- 1 Critically Imperiled - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
- 2 Imperiled - At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors;
- 3 Vulnerable - At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors;
- 4 Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors;
- 5 Secure - Common; widespread and abundant;

NR = not ranked; B= breeding; N = non breeding; Z= moving, diffuse populations.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada):

Endangered (E): A species facing imminent extirpation or extinction.

Threatened (T): A species that is likely to become endangered if limiting factors are not reversed.

Special Concern (SC): A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.

CANDIDATE (C): A species that is on the short-list for upcoming assessment.

NAR = Not at Risk

SARA (Canadian *Species at Risk Act*):

Schedule 1 = Species recognized under the Act

Schedules 2 and 3 = COSEWIC Species under review

British Columbia Conservation Data Centre (provincial element ranking organization):

Red-listed species and ecological communities are considered to be extirpated, endangered or threatened (at risk of becoming endangered) in British Columbia.

Blue-listed species and ecological communities are considered “particularly sensitive to human activities or natural events”.

Identified Wildlife (under the British Columbia *Forest and Range Practices Act*)

Wildlife which require special management attention to address the impacts of forest and range activities on Crown land. Identified Wildlife are managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures (GWMs), or through other management practices specified in strategic or landscape level plans.

Appendix B. Land cover maps by jurisdiction zone

ELK RIVER VALLEY BOTTOM ASSESSMENT

AREA ID: ZONE 1

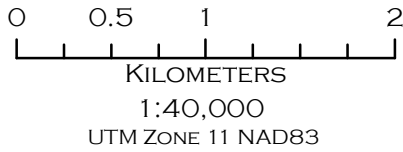
AREA: DISTRICT OF ELKFORD

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:

HILLSHADE
- GEOBASE CDED

MUNICIPAL BOUNDARIES
- REGIONAL DISTRICT OF EAST KOOTENAY

PARKS
- BC PARKS

NGO CONSERVATION AREAS
- THE NATURE TRUST OF BC
- DUCKS UNLIMITED CANADA

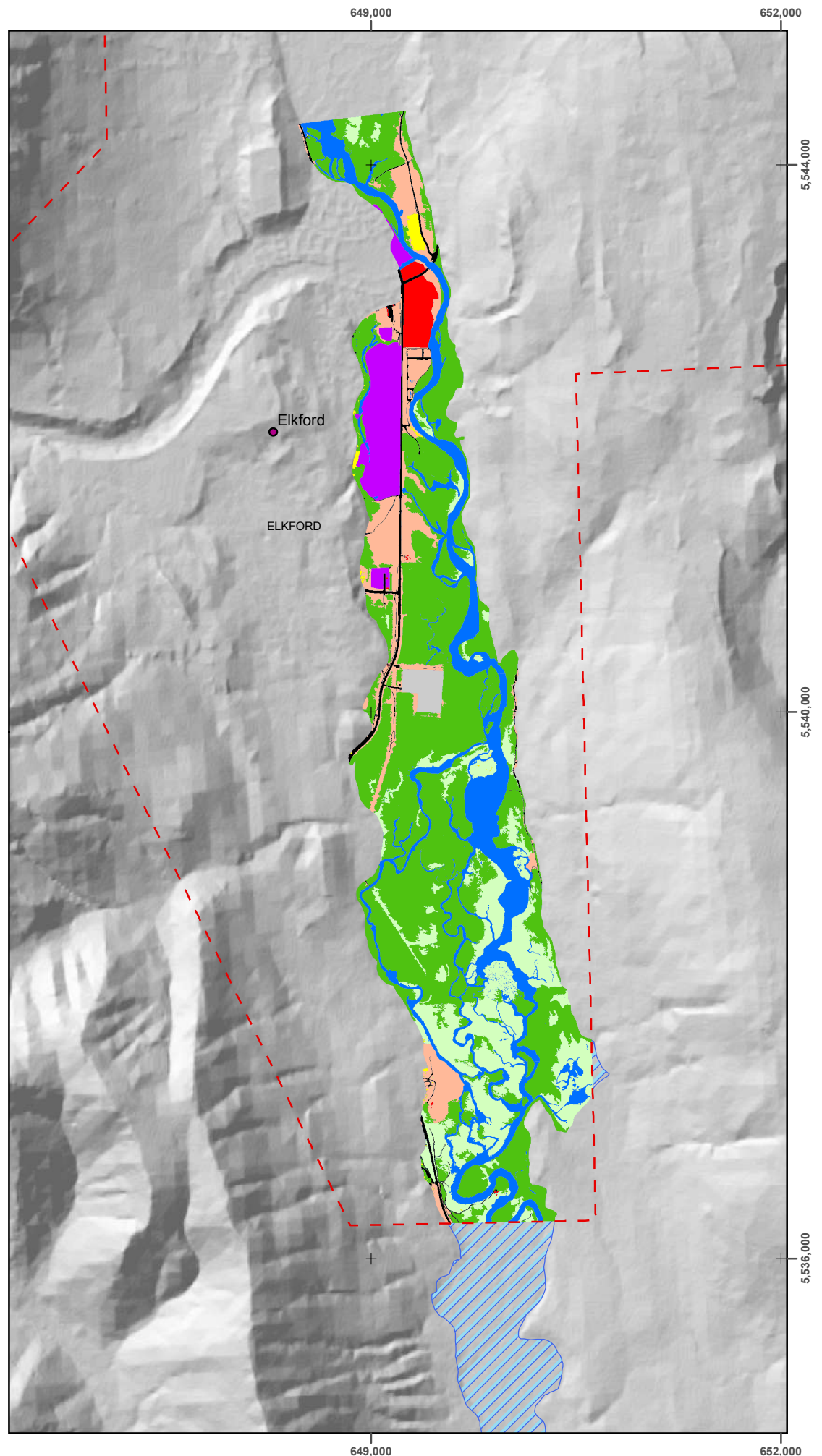
LAND COVER TYPE DERIVED FROM:
LIDAR, ORTHOPHOTOS, DEM
- TECK COAL

PROJECT COMPLETED BY:

LOTIC
ENVIRONMENTAL



MAP CREATED:
NOVEMBER 19, 2013



ELK RIVER VALLEY BOTTOM ASSESSMENT

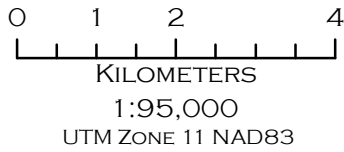
AREA ID: ZONE 2
AREA: ELKFORD TO SPARWOOD
(RDEK)

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:

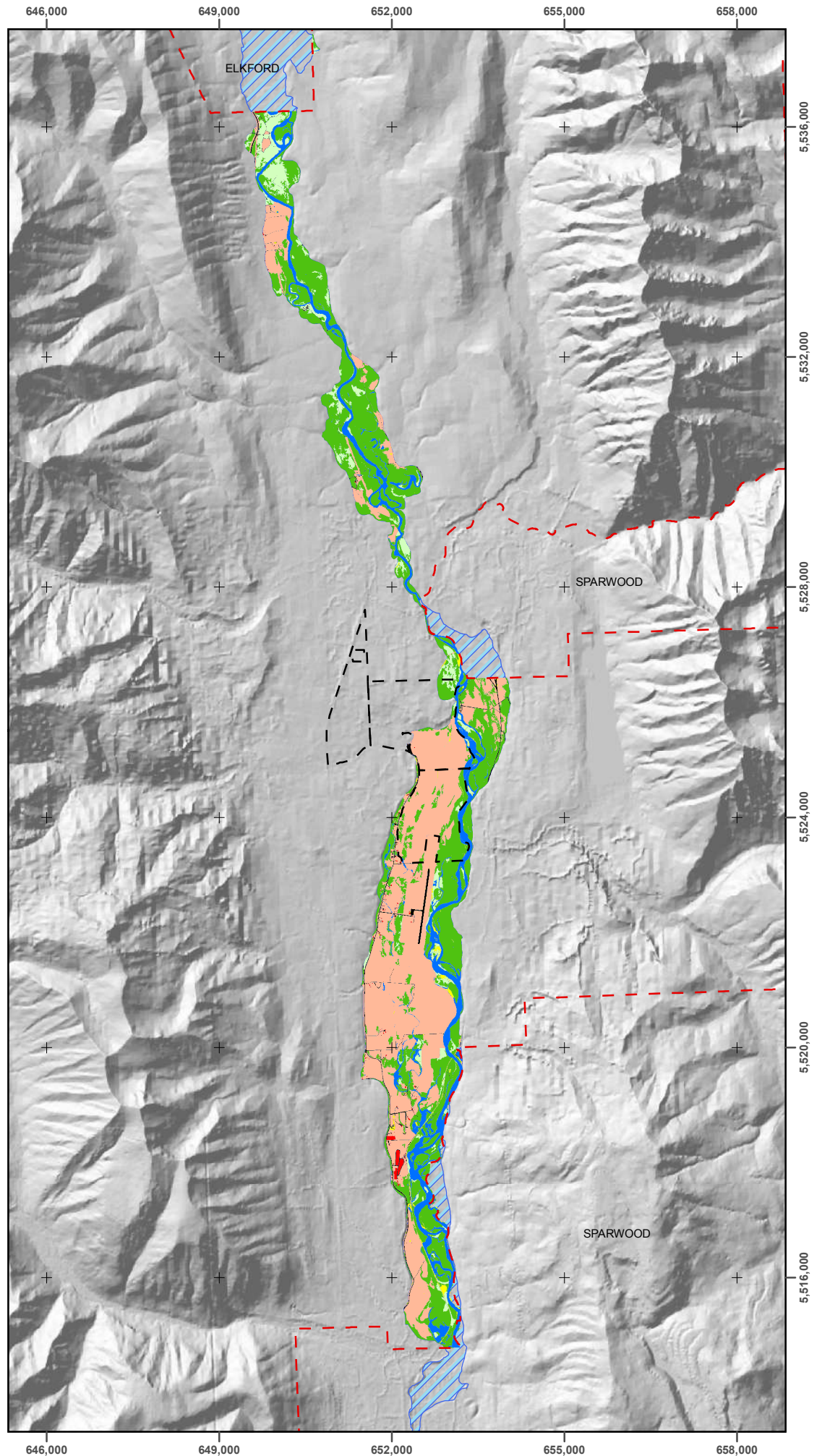
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 - GEOBASE CDED
- MUNICIPAL BOUNDARIES
 - REGIONAL DISTRICT OF EAST KOOTENAY
- PARKS
 - BC PARKS
- NGO CONSERVATION AREAS
 - THE NATURE TRUST OF BC
 - DUCKS UNLIMITED CANADA
- LAND COVER TYPE DERIVED FROM:
 - LIDAR, ORTHOPHOTOS, DEM
 - TECK COAL

PROJECT COMPLETED BY:

LOTIC
ENVIRONMENTAL



MAP CREATED:
NOVEMBER 19, 2013



ELK RIVER VALLEY BOTTOM ASSESSMENT

AREA ID: ZONE 3

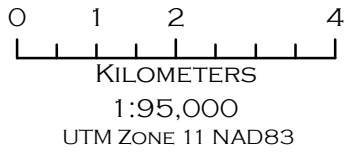
AREA: DISTRICT OF SPARWOOD

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:

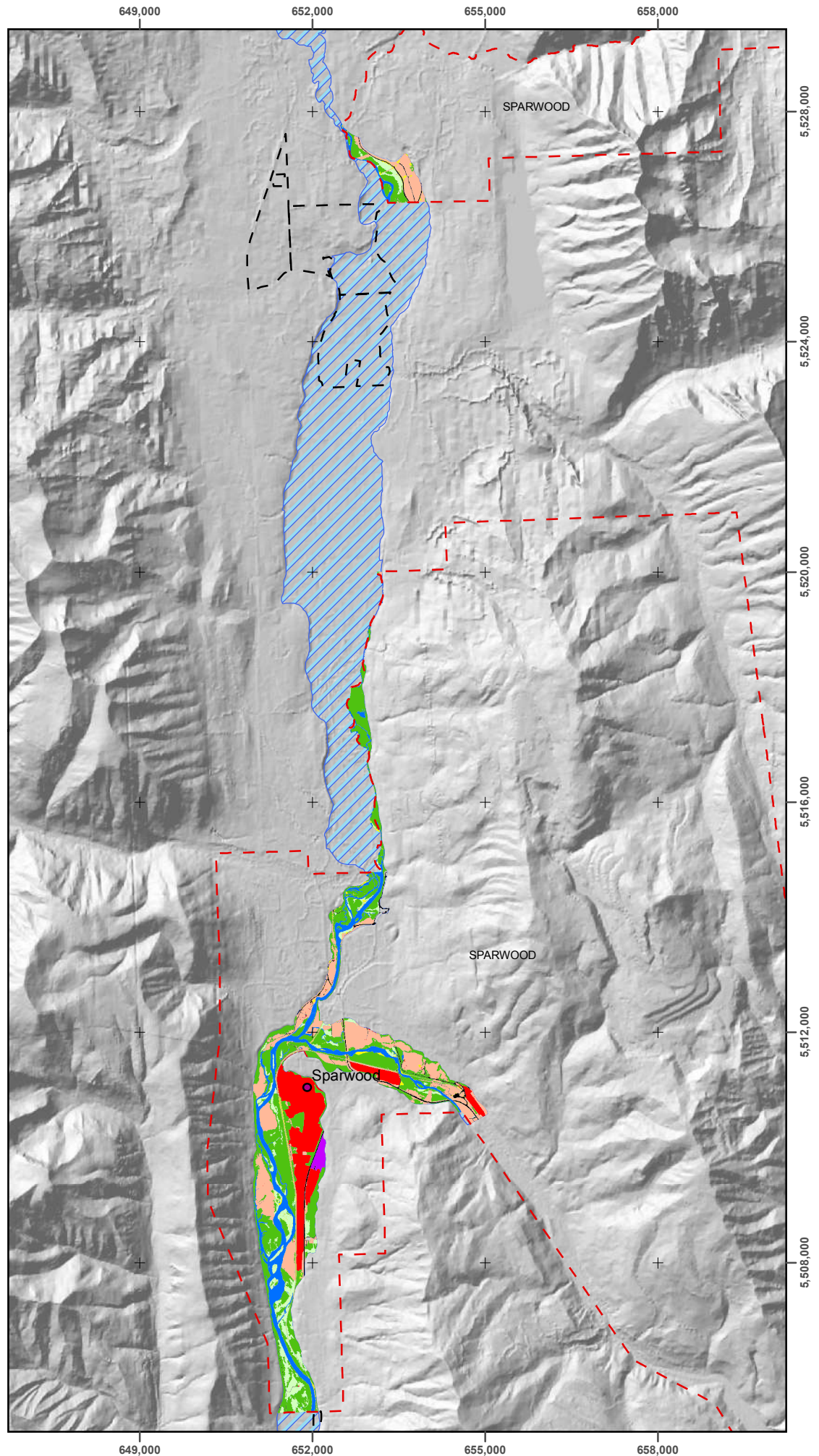
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 - GEOBASE CDED
- MUNICIPAL BOUNDARIES
 - REGIONAL DISTRICT OF EAST KOOTENAY
- PARKS
 - BC PARKS
- NGO CONSERVATION AREAS
 - THE NATURE TRUST OF BC
 - DUCKS UNLIMITED CANADA
- LAND COVER TYPE DERIVED FROM:
 - LIDAR, ORTHOPHOTOS, DEM
 - TECK COAL

PROJECT COMPLETED BY:

LOTIC
ENVIRONMENTAL



MAP CREATED:
NOVEMBER 19, 2013



ELK RIVER VALLEY BOTTOM ASSESSMENT

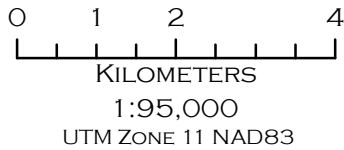
AREA ID: ZONE 4
AREA: SPARWOOD TO FERNIE
(RDEK)

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:

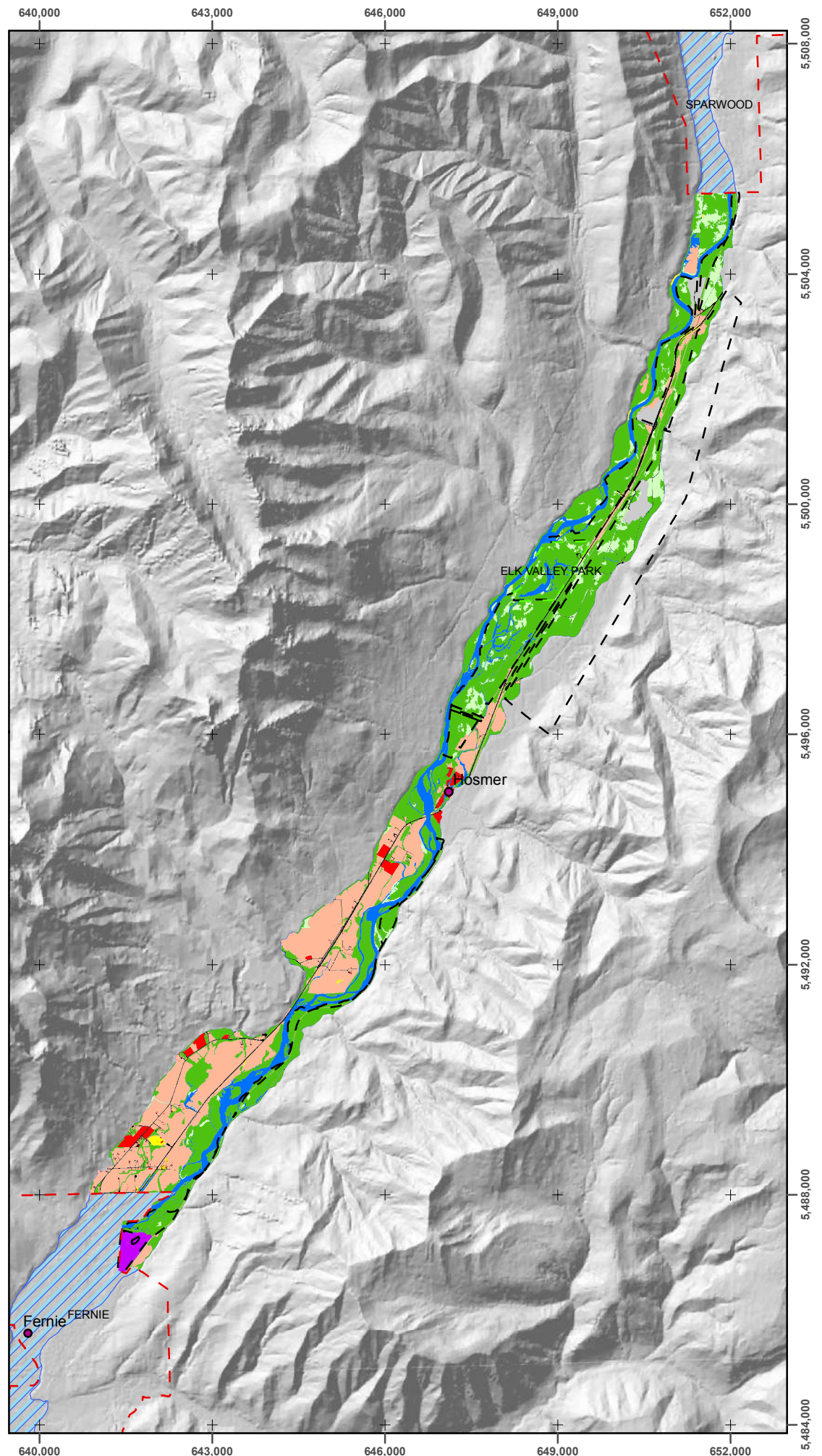
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 - GEOBASE CDED
- MUNICIPAL BOUNDARIES
 - REGIONAL DISTRICT OF EAST KOOTENAY
- PARKS
 - BC PARKS
- NGO CONSERVATION AREAS
 - THE NATURE TRUST OF BC
 - DUCKS UNLIMITED CANADA
- LAND COVER TYPE DERIVED FROM:
 - LIDAR, ORTHOPHOTOS, DEM
 - TECK COAL

PROJECT COMPLETED BY:

LOTIC
ENVIRONMENTAL



MAP CREATED:
NOVEMBER 19, 2013



ELK RIVER VALLEY BOTTOM ASSESSMENT

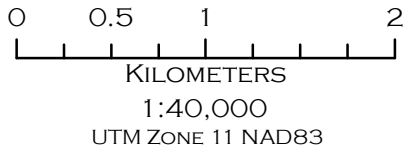
AREA ID: ZONE 5
AREA: CITY OF FERNIE

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:
HILLSHADE
- GEOBASE CDED

MUNICIPAL BOUNDARIES
- REGIONAL DISTRICT OF EAST
KOOTENAY

PARKS
- BC PARKS

NGO CONSERVATION AREAS
- THE NATURE TRUST OF BC
- DUCKS UNLIMITED CANADA

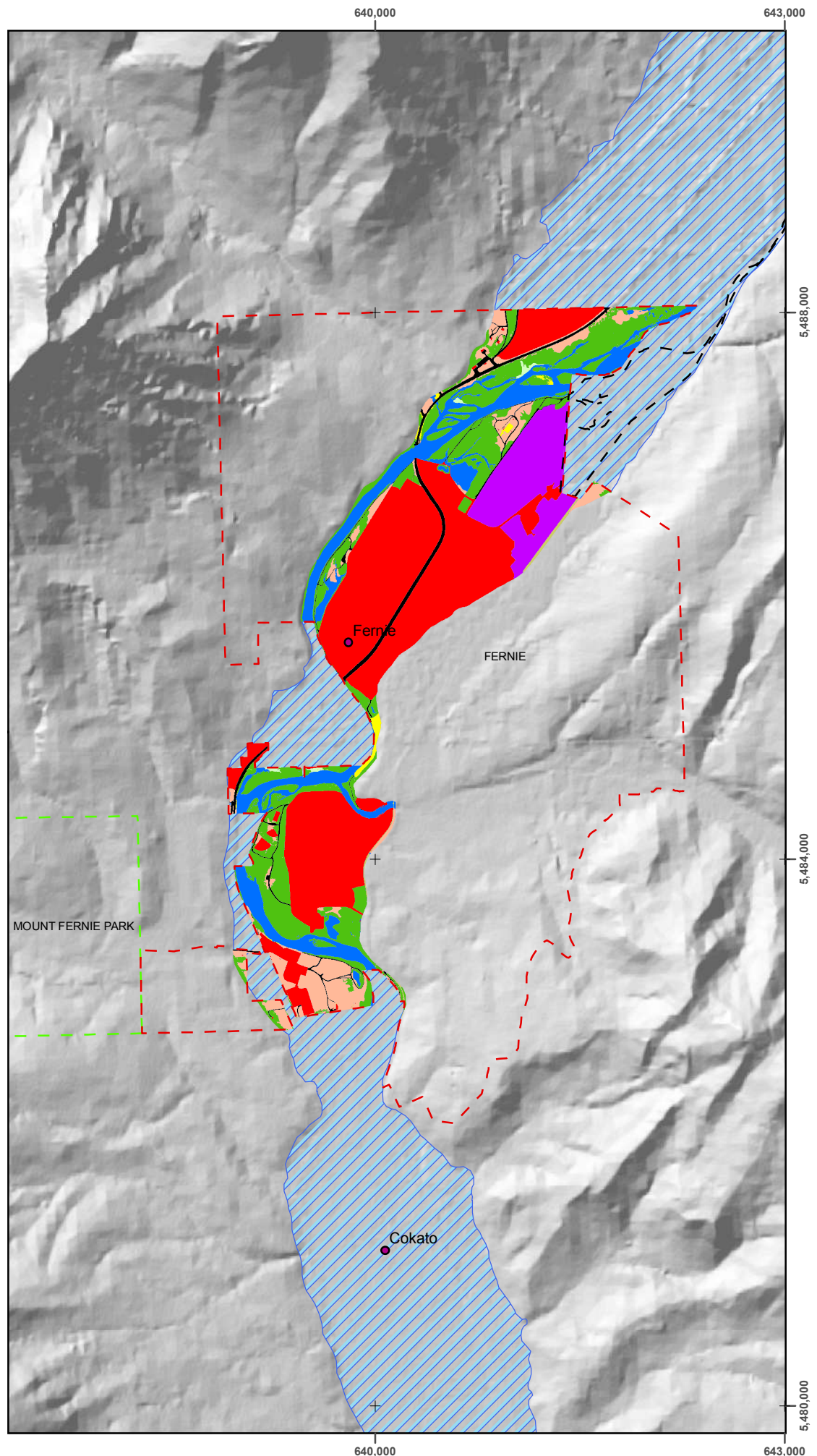
LAND COVER TYPE DERIVED FROM:
LIDAR, ORTHOPHOTOS, DEM
- TECK COAL

PROJECT COMPLETED BY:

LOTIC
ENVIRONMENTAL



MAP CREATED:
NOVEMBER 19, 2013



ELK RIVER VALLEY BOTTOM ASSESSMENT

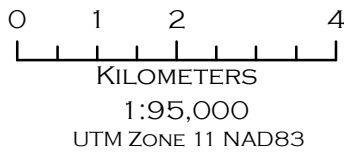
AREA ID: ZONE 6
AREA: FERNIE TO ELKO
(RDEK)

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:
HILLSHADE
- GEOBASE CDED

MUNICIPAL BOUNDARIES
- REGIONAL DISTRICT OF EAST
KOOTENAY

PARKS
- BC PARKS

NGO CONSERVATION AREAS
- THE NATURE TRUST OF BC
- DUCKS UNLIMITED CANADA

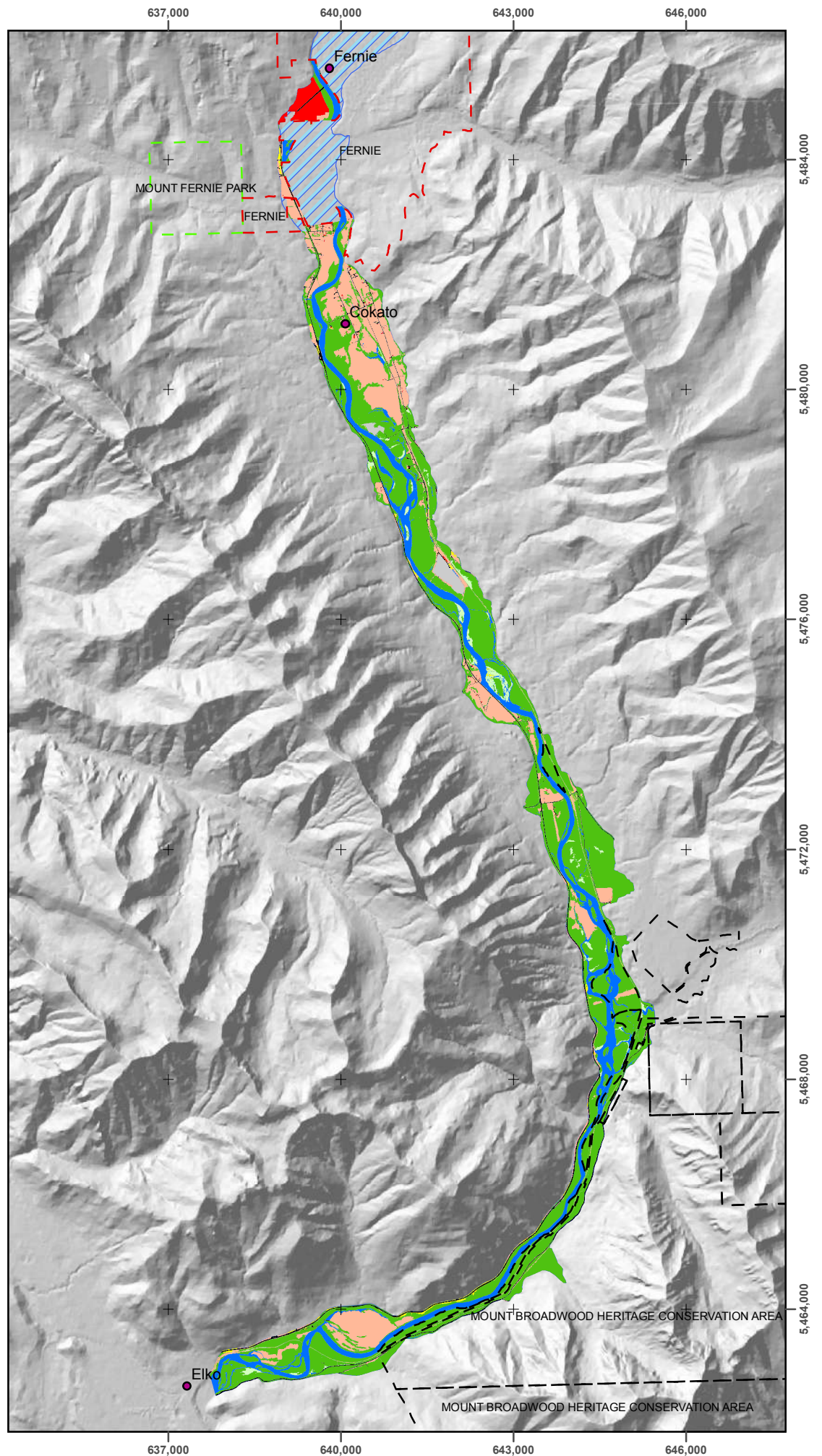
LAND COVER TYPE DERIVED FROM:
LIDAR, ORTHOPHOTOS, DEM
- TECK COAL

PROJECT COMPLETED BY:

LOTIC
ENVIRONMENTAL



MAP CREATED:
NOVEMBER 19, 2013



ELK RIVER VALLEY BOTTOM ASSESSMENT

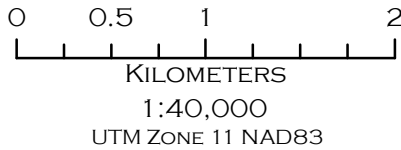
AREA ID: ZONE 5
 AREA: CITY OF FERNIE
 30 M RIPARIAN AREA

LAND COVER TYPE

- WATER
- FORESTED
- UNFORESTED NATURAL
- UNFORESTED DISTURBED
- VEGETATED RECREATION
- UNVEGETATED
- BUILT-UP
- ROAD
- RAILWAY
- INDUSTRIAL
- ADJACENT VALLEY BOTTOM AREA

LAND USE

- MUNICIPAL BOUNDARY
- PARK
- NGO - CONSERVATION AREA



DATA SOURCES:
 HILLSHADE
 - GEOBASE CDED

MUNICIPAL BOUNDARIES
 - REGIONAL DISTRICT OF EAST
 KOOTENAY

PARKS
 - BC PARKS

NGO CONSERVATION AREAS
 - THE NATURE TRUST OF BC
 - DUCKS UNLIMITED CANADA

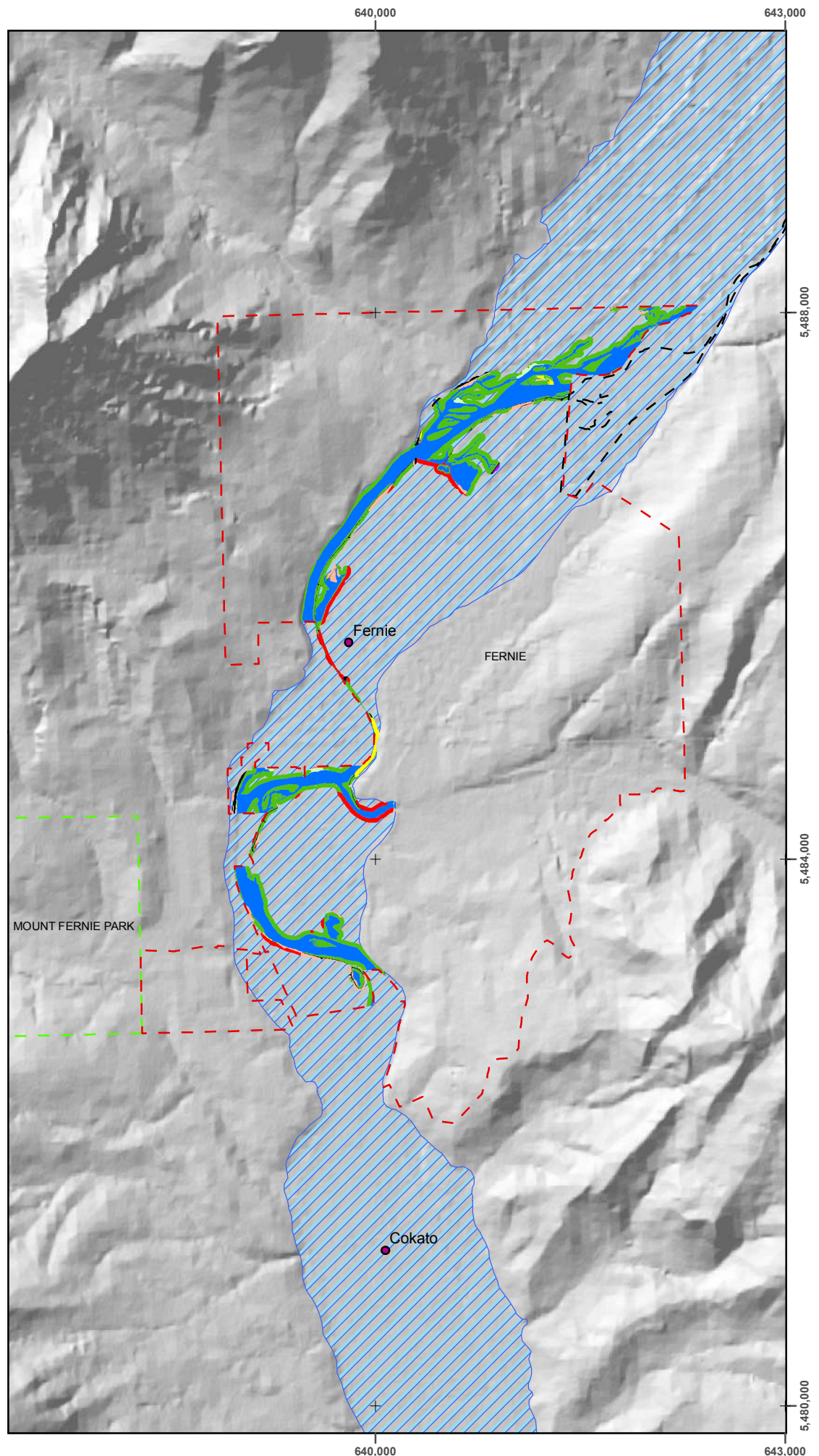
LAND COVER TYPE DERIVED FROM:
 LIDAR, ORTHOPHOTOS, DEM
 - TECK COAL

PROJECT COMPLETED BY:

LOTIC
 ENVIRONMENTAL



MAP CREATED:
 NOVEMBER 19, 2013



Appendix C. Land cover summary tables

Table C-1. Land coverage (ha) within the Elk River valley bottom

Jurisdiction Zone	Water	Forest	Unforested Natural	Unforested Disturbed	Vegetated Recreation	Built-up	Road	Industrial	Railway	Total	<i>Unvegetated (omitted)</i>
District of Elkford	121.1	345.9	120.7	65.6	34.0	12.6	16.1	7.5	0.0	723.5	<i>3.6</i>
Elkford to Sparwood (RDEK)	241.6	776.0	124.6	783.3	0.0	10.1	36.2	0.0	4.0	1975.7	<i>19.4</i>
District of Sparwood	136.8	370.2	75.7	201.0	8.6	135.4	26.7	5.1	14.8	974.3	<i>16.3</i>
Sparwood to Fernie (RDEK)	262.2	1046.3	135.8	564.9	23.6	38.8	63.2	38.0	20.4	2193.2	<i>16.4</i>
City of Fernie	67.0	109.0	1.3	40.7	45.5	206.9	17.0	0.0	1.9	489.4	<i>3.1</i>
Fernie to Elko	328.5	1081.6	36.1	416.1	0.0	36.2	76.6	19.5	20.2	2014.9	<i>17.0</i>
Grand Total	1157.1	3728.9	494.1	2071.6	111.9	440.0	235.9	70.1	61.3	8370.9	<i>75.8</i>

Table C-2. Land coverage (ha) within 30 m of the Elk River mainstem or tributaries within the valley bottom

Jurisdiction Zone	Water	Forest	Unforested Natural	Unforested Disturbed	Vegetated Recreation	Built-up	Road	Industrial	Railway	Total	<i>Unvegetated (omitted)</i>
District of Elkford	1.0	115.3	61.0	7.1	3.0	1.2	1.2	0	0	189.8	<i>0.5</i>
Elkford to Sparwood (RDEK)	0.5	233.1	36.6	47.9	0	0.4	2.4	0	1.9	322.8	<i>9.4</i>
District of Sparwood	0.1	122.6	27.4	22.4	0	0.5	2.2	0.2	2.4	177.7	<i>7.9</i>
Sparwood to Fernie (RDEK)	2.0	252.6	22.1	33.0	0.8	2.9	4.0	0.6	4.3	322.3	<i>5.9</i>
City of Fernie	0.6	53.6	1.0046	4.5	0.1	6.9	3.4	0	0	70.2	<i>1.95</i>
Fernie to Elko	2.0	262.2	18.8	31.2	0	0.5	8.8	0.5	5.5	329.5	<i>3.1</i>
Grand Total	1143.5	1039.4	166.9	146.1	3.9	12.6	21.9	1.3	14.1	2549.8	28.7

Table C-3. Valley bottom parks and conservation area land cover (hectares)

Name	Road	Railway	Built-up	Unforested Disturbed	Forest	Unforested Natural	Water	Unvegetated	Industrial	Vegetated Recreational	Total
Elk Valley Provincial Park	0	0	0	0	61	6	10	0	0	0	78
Big Ranch – Grave Prairie	0	0	0	166	59	4	6	1	0	0	236
Elk Valley Heritage Conservation Area	8	4	0	17	507	68	54	2	26	22	707
Mount Broadwood Heritage Conservation Area	10	1	0	3	92	0	1	0	0	0	106
Total	19	5	0	185	719	78	71	3	26	22	1127

Appendix D. Habitat protection policies

Table D1. Elk Valley Zoning (RDEK 2013)

Watershed Protection (WP-1) Zone (Section 7.13)	<i>No person shall clear natural and live tree cover in the WP-1 zone from land within 60 m of the ordinary high water mark of any lake nor within 25.0 m of the ordinary high water mark of any stream or watercourse, except for:</i> <ul style="list-style-type: none"> <i>(i) the removal of fallen or hazardous trees;</i> <i>(ii) the removal of debris which may damage water quality for domestic use;</i> <i>(iii) such clearing as may be necessary for public utility use.</i>
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Table D2. District of Elkford OCP (District of Elkford 2010)

General	<i>The natural environment is recognized as a significant feature in the District of Elkford. The Elk River and Boivin Creek are the two major watercourse within the municipal boundary.</i>
Foster engaged citizens and promote effective communications (Section 4.2)	<p>Policy 2: <i>The District shall work with the RDEK and other land owners outside the municipal boundaries to share in the management of forested areas in the Elk Valley. Maintaining a strong partnership with regional stakeholders (such as, but not limited to First Nations, Teck Coal, BCTB, Provincial forest license holders, RDEK, BC Gov. Alberta Gov. and private land owners) can enhance regional forest, resource and recreation management and wildfire planning.</i></p> <p>Policy 3: <i>The District shall work with regional stakeholders to identify and implement watershed management opportunities. Examples of important management areas that can promote sustained water quality include implementing guidelines for development in headwaters of tributaries and rivers in the region, and enforcing buffer zones in riparian areas, particularly those rivers and streams that feed into the aquifer.</i></p>
5.2 District Growth Boundary	<p><i>Objective 5.2.1: Create a compact community that uses land efficiently, avoids urban sprawl, reduces GHG emissions and preserves forest, recreational and environmentally significant lands.</i></p> <p><i>(e.g., Policy 6 – to protect the natural beauty, forest and recreational resources of the District of Elkford outside of the District Growth Boundary, the Land Use Plan designates the uses of the areas as primarily for recreation and maintenance of wilderness).</i></p>
Riparian Area Development Permit Area (DPA) (Section 9.1)	<p><i>The purpose of the designation of lands as Riparian Area DPA is the protection of the natural environment, its ecosystems, and biological diversity. The following guidelines apply to all development permit applications in Riparian Areas:</i></p> <p><i>No development or alteration of vegetation shall take place</i></p> <ul style="list-style-type: none"> <i>i. For a stream, within 30 m strip on both sides of the stream measured from the natural boundary;</i> <i>ii. For a ravine less than 60 wide, within a strip on both sides of the stream measured from the high water mark to a point that is 30 m beyond the top of the ravine;</i> <i>iii. For a ravine 60 m wide or greater, within a strip on both sides of the stream measured from the natural boundary to a point that is 10 m beyond the top of the ravine bank; and</i> <p><i>For all identified wetland and riparian aquatic ecosystems, within a 30 m wide leave strip or buffer area extending from the high water mark.</i></p>

Table D3. Sparwood (District of Sparwood 2002)

<p>General</p>	<p>The District of Sparwood is currently in the process of preparing a new OCP, scheduled to be finalized in March 2014.</p> <p>The current OCP does not have any specified environmental development permit areas. However, there is a statement that <i>natural lands in the form of floodplains, escarpments, streamways, gullies, etc., will be retained as much as possible in a natural state with minimal intrusion from other developments, excepting thereof park related facilities, pathways and necessary utility easements.</i> The OCP also has, <i>restricted development areas on greenbelt/floodplain to protect from hazards including flood, snow and rock avalanche potential.</i></p>
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Table D4. Fernie OCP (City of Fernie 2002)

<p>General</p>	<p>Fernie is in the process of updating their OCP</p> <p>The current OCP includes several objectives related to protecting natural land cover and biological diversity, including:</p> <ul style="list-style-type: none"> ○ Wildlife corridors and wildlife habitat areas ○ To prevent development in areas subject to known hazardous conditions ○ To preserve the integrity of the Elk River ○ To maintain and enhance surface and groundwater quality in area watercourses ○ To protect fish bearing watercourses from the impact of urban development
<p>Watercourse Protection Development Permit Area (Section 19.3)</p>	<p>The objective of this designation is to preserve the watercourse areas as natural areas, for passive park activities and for trails.</p> <p>Riparian Reserve Zone (RRZ) means a setback area established on both sides of a stream, that is comprised of the protected natural feature and its riparian (leave strip) area. The Riparian Reserve Zone is to remain in a largely undisturbed state, and is established to conserve and maintain the productivity of aquatic and riparian ecosystems (100% native vegetation retention). Riparian Reserve Zone shall be 30 metres. In some cases, where development or a disturbance has already occurred near the stream, the Riparian Reserve Zone may be less than 30 metres. The setback area will be determined based on an environmental review.</p> <p>Riparian Management Zone (RMZ) means a setback area of a stream generally located outside of the Riparian Reserve Zone, or where there is no Riparian Reserve Zone, it is that area located adjacent to a stream. The Riparian Management Zone is established to conserve and maintain the productivity of aquatic and riparian ecosystems where specified or approved development is permitted and is in the public interest (maintain no less than 50% native vegetation retention). The setback area will be determined based on an environmental review. The maximum width of the</p> <p>Measure Riparian Management Areas and Riparian Management Zones along ravines and other watercourse corridors with steeply pitched banks from the top of the ravine (minimum 15 m setback).</p>
<p>Wildlife preservation policies (Section 12.4)</p>	<p>(a) Work with local environmental groups, the Regional District of East Kootenay and relevant provincial and federal government ministries to establish a <i>Wildlife Corridor Identification and Protection Strategy</i> for the area.</p> <p>(b) Consider the impact trail construction has on wildlife throughout the community. Where appropriate, consider the expansion of existing programs such as “Bear Aware” to ensure peaceful co-existence between wildlife and human populations.</p> <p>(d) Develop guidelines to mitigate against the loss of wetlands, wildlife habitat and indigenous vegetation areas.</p>

Table D4. Fernie OCP (City of Fernie 2002)

<p>Natural Open Space (Section 14.12)</p>	<p>(e) Encourage the voluntary placement of conservation covenants on land deemed to be environmentally sensitive for use as public open space corridors or as natural open space.</p> <p>(f) Encourage, where appropriate, the use of wetlands for stormwater detention or retention purposes.</p> <p>(g) Notify development proponents that all development and infrastructure construction must result in "no net loss" to fish habitat in accordance with the Federal Fisheries Act, Provincial Legislation and policy directives.</p> <p>(h) Work with the Ministry of Water, Land and Air Protection to identify, preserve and manage lands designated as riparian management areas.</p>
	<p>As a result of topography and the presence of watercourses in the community, considerable natural open space areas exist in the City of Fernie. These undeveloped open space areas contribute significantly to the natural setting. Further, in many cases, these areas serve as locations for active and passive recreation. The OCP supports the preservation of these areas in their natural form for informal recreation uses.</p>

Appendix E. Stakeholder Feedback

Overall feedback on the Valley Bottom Assessment Report from the stakeholder presentations:

1) What are your general impressions of the data presented?

- Clarify methodology used to determine results. Express numbers in hectares and percentages.
- Clarify the 'report card' indicators for good, fair and poor and expand on how these figures were selected.
- People value the Elk River and are generally supportive of protecting riparian areas.
- Clarification of Fernie's 'fair' rating with exact figures that adequately reflect the age of Fernie, it has the largest population, and historically development occurred in the floodplain.
- The Report demonstrates that ERA is working in the entire watershed.
- Discuss the purpose of the protected areas in the valley bottom and green spaces in municipalities. Indicate the actual size of the conservation areas and how much is in the valley bottom.
- Expand on the benefits of riparian areas and the services this area provides for municipalities.

2) What could ERA do to help support your decisions to ensure watershed health?

- Include more information about riparian enhancement and restoration (e.g. local governments have the ability to encourage protection of riparian areas on private land through use of a covenant or agreement for protection and rehabilitation)
- Summarize in the Report the range of tools that municipalities have to support riparian enhancement and protection e.g. development permit areas (DPA), best practices for recreational trail construction in riparian areas, OCP's,
- Develop a targeted summary of the report for developers and private landowners.
- Further work needs to identify wildlife corridors, sensitive plant communities, aquatic sensitive areas and why they are important. BC MoE used to do this type of work but no longer have the capacity to do this sort of work. Does the report have the ability to identify sensitive areas?
- Make sure any recommendations are specific and practical with relevant strategies and guidelines to advise decision makers.
- Could the report establish benchmarks or thresholds for 'total disturbance' moving forward? When is too much development in the valley bottom?
- Would like to see Teck report to residents on other water quality indicators similarly to the valley bottom assessment using their constituents of concern: selenium, cadmium, nitrate, sulphate and rate of calcite formation.
- First Nations expressed a concern about the health of fish and the contaminants in the tissue of the fish, since many band members harvest and eat fish out of Lake Kocanusa.

3) How might a community-based water group like ERA collaborate with you to achieve Elk River watershed health?

- Explore opportunities for next steps, such as ground-truthing to conduct more detailed assessments of sensitive habitats (e.g., riparian areas and wetland).
- Coordinate watershed wide participation in ERA events around BC Rivers Day (e.g., ERA's Swim-Drink-Fish Festival on last weekend in September), Water Week, Earth Day)
- Expand the ERA Community-Based Water Quality Monitoring (CBWM) Program to collect more data using existing protocols such as Sensitive Habitat Inventory Mapping (SHIM), Streamkeepers, Wetlandkeepers, and Canadian Aquatic BioMonitoring Network (CABIN).
- ERA has a key role to play in community education raising watershed literacy in both the schools and general public.

- Sparwood would like to expand ERA's CBWM to Cummings Creek concentrating on the Whiskey Jack subdivision area to conduct a region wide inventory of sensitive habitats using SHIM, and similar work at the Jewel wetland.
- Work to expand the valley bottom assessment north of Elkford, especially in light of the feedback that it is has received substantial pressure (e.g., logging activities are taking out large amounts of timber from the valley bottom).
- By focusing on riparian areas this integrates nicely with the Elk Valley Cumulative Effects Management Framework (CEMF). The 'riparian area' has been identified as the first valued ecosystem component, and selected to indicate the effects of increased human actions in the watershed over time.
- First Nations would like to see protection of spawning habitat in the Elk River watershed and tissue sampling to ensure fish are healthy to eat by band members from Tobacco Plains.