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Cooks Ferry Indian Band Land Capability Assessment

FINAL REPORT

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1 Executive Summary

1.1 Overview

Cooks Ferry Indian Band at Spences Bridge, like many rural communities, is experiencing major challenges in maintaining a viable socio-economic future due to urbanization and population dynamics. Dependence on a limited range of economic bases such as agriculture, mining, forestry, fishing, and recreation ties opportunities for employment to the success of these industries. The migration of skilled people, and notably younger generations, to urban centers has resulted in a decline of human resources. There has been little attention given to developing a community-based resources inventory to guide communities as they seek to incorporate emergent and innovative opportunities. The utilization of a computer based land capability classification framework is a first step in providing an ecological base for resources planning and development.

1.2 Methods

This project developed a map based capability framework to assist the local band by providing ecologically based planning that addresses development concerns. Involving the community in a transparent process was essential to the project's success. The framework begins with an initial consultative meeting with the Cooks Ferry representatives to identify their concerns and priorities. The project focus was on reserve lands belonging to the band and the larger region. A land capability assessment, consisting of considerations for agriculture, forestry, recreation and wildlife as defined by the national Canada Land Inventory (CLI) was developed, and land areas were identified that had the best potential for each activity using a computer based GIS map sieving process.

1.3 Results & Discussion

Several areas were found with moderate to high capabilities for a variety of uses. Water was a major concern for optimizing activities. Opportunities for improving agricultural production on CFIB IRs exist, dependent on irrigation. Representatives of the Cooks Ferry band reported that the framework provided an objective physical basis—the map—that was useful in focusing dialogue and facilitating the planning process. They plan to use the base information as a living document for future planning. Participants also recognized that land capability assessment is only a first step. Incorporating local knowledge is necessary for identifying local food sources and spiritual sites, to optimize the map's usefulness to the band.

2 Table of Contents

1	EXECUTIVE SUMMARY	2
1.1	OVERVIEW	2
1.2	METHODS.....	2
1.3	RESULTS & DISCUSSION	2
2	TABLE OF CONTENTS.....	3
3	INTRODUCTION	5
3.1	BACKGROUND	5
3.2	COMMUNITY PARTICIPATION	6
3.3	REGION	6
3.4	LAND CAPABILITY	7
4	METHODS.....	8
4.1	OVERVIEW.....	8
4.2	GIS ANALYSIS / METHODOLOGY	9
4.2.1	<i>Data acquisition</i>	<i>9</i>
4.2.2	<i>Software used</i>	<i>9</i>
4.2.3	<i>Regional analysis.....</i>	<i>9</i>
4.2.4	<i>Agricultural analysis.....</i>	<i>10</i>
4.3	MAPPING	10
5	RESULTS	10
5.1	RECREATION	10
5.2	WATERFOWL.....	11
5.3	UNGULATES	11
5.4	FORESTRY	12
5.5	OPTIMAL LAND USE	12
5.6	AGRICULTURE.....	12
5.6.1	<i>Unimproved.....</i>	<i>12</i>
5.6.2	<i>Improved</i>	<i>13</i>
5.6.3	<i>Potential Agricultural and other Land Use conflicts</i>	<i>14</i>
5.7	DETAILED AGRICULTURAL CAPABILITY.....	14
6	DISCUSSION.....	17
6.1	RECREATION	17
6.2	WATERFOWL.....	17
6.3	UNGULATES	17
6.4	FORESTRY	18
6.5	AGRICULTURE.....	18
6.5.1	<i>Potential Agricultural and other Land Use conflicts</i>	<i>18</i>
6.5.2	<i>Modified Land Capability Classification for Tree Fruits and Grapes.....</i>	<i>19</i>
7	COMMUNITY CONSULTATION – REVIEW.....	19
7.1	LIMITATIONS	19
7.2	LOCAL KNOWLEDGE	20
7.3	FUTURE OPPORTUNITIES.....	21

8	CONCLUSION	22
9	BIBLIOGRAPHY.....	23
10	APPENDICES	25
10.1	LAND CAPABILITY FOR AGRICULTURE LEGEND.....	26
10.2	REGIONAL SCALE MAPS	29
10.3	CFIB INDIAN RESERVE AGRICULTURAL CAPABILITY DETAILED MAPS.....	43
10.4	CANADA LAND INVENTORY REPORT NO. 1 EXCERPT FOR LAND CAPABILITY FOR FORESTRY	68
10.5	GIS ANALYSIS METHODOLOGY - DETAILED.....	73
10.5.1	<i>Map sieving for regional level analysis.....</i>	<i>73</i>
10.5.2	<i>Forestry analysis.....</i>	<i>73</i>
10.5.3	<i>Agricultural analysis</i>	<i>74</i>
	FIGURE 1. MAP OF THE PROJECT AREA OF INTEREST FOR LAND CAPABILITY ASSESSMENT.....	7
	FIGURE 2. LAND CAPABILITY FOR UNGULATES REGIONAL MAP	11
	FIGURE 5. OPTIMAL LAND USE SECTOR BY CAPABILITY CLASSIFICATION.....	12
	FIGURE 3. LAND CAPABILITY FOR AGRICULTURE, IMPROVED CLASSIFICATION RATING	13
	FIGURE 4. LANDS WITH AGRICULTURAL AND OTHER LAND USE CAPABILITY CLASSIFICATION RATING 1 - 4.....	14
	FIGURE 6. UNIMPROVED AND IMPROVED AGRICULTURAL CAPABILITY CLASSIFICATION RATINGS OF THE BASQUE RANCH	15
	FIGURE 7. DETAILED ANALYSIS OF CAPABILITY AND LIMITATIONS OF THE BASQUE RANCH, UNIMPROVED AND IMPROVED	16

3 Introduction

3.1 Background

Globally, small rural communities, including First Nations or indigenous groups, often have difficulty developing innovative economic opportunities. Rural communities often depend on the local land and resource base for their economic well-being. Industries such as forestry, agriculture, fisheries, guiding, and other tourism and recreation industries provide main sources of income, yet they are influenced by seasons and external conditions. Rural communities also experience higher unemployment rates, for longer periods of time, than urban communities since they are affected by external factors beyond the community and the individual's control, such as seasonal industries, government policy, and global market forces (UN, 2014).

As a result of urbanization and changes in social and economic patterns between urban and rural areas, small communities may lack resource expertise and technical land use planning ability. In contrast, better employment opportunities in urban cities tempt young people to migrate out of rural communities, thus restricting the opportunity to establish good local resource expertise (Canadian Council on Learning, 2006). In the province of British Columbia, the Ministry of Agriculture, through consultation with numerous First Nations groups, has identified a need and an opportunity to assess First Nations agriculture (MOA, 2012).

The goal of this project is to provide ecological, biophysical land capability information to the Cook's Ferry Indian Band (CFIB) that will assist them in making informed land use planning decisions. A regional assessment and detailed land capability maps were created in partnership with CFIB. The CFIB has a connection with UBC, and has expressed interest in the past in collaborating on land use planning and capacity building projects with UBC. In a Comprehensive Community Plan (Phase 2) published by CFIB in 2016, one of 8 main themes identified is land and resource management for long term sustainability (CFIB, 2016). Development of reserve lands and natural resources thus are two of the highest priorities identified in the community planning process. In particular, developing agricultural capability was identified as a priority during meetings with CFIB. A major limitation to agricultural and other economic development is the effective utilization of limited water sources. While there is currently some agricultural activity occurring on CFIB land, additional unused water allocation may be available to improve agricultural capability and increase production.

Land capability is the classification of lands according to their capability to support a certain resource activity (CLI, 1970). Each activity or land use sector is presented in map format. To analyze and develop a comprehensive evaluation of potential uses of the land, individual maps need to be integrated. Map sieving is the process of overlaying spatial data with a variety of attribute information, and filtering the layers to display a desired result, such as optimal land use capability ratings (Collins et al., 2001). Using biophysical capability spatial data, map sieving was used to assess land capability classification for various land uses.

The maps were shared with CFIB, setting a framework for dialogue. Important suggestions, local knowledge, and future opportunities were discussed and incorporated into the framework. This traditional or local knowledge complements ecological and biophysical capability information to provide the basis for land use planning (Black, 2016). Local knowledge

is essential to guide further land use planning work, and the contribution of this project is to engage the stakeholders in the process of understanding and using the capability information.

3.2 Community Participation

Participation with the CFIB community was paramount to the success and meaningfulness of the project. Meetings were held throughout the project to involve the community in a transparent process. The objective is to provide CFIB with information that they can use to inform land use planning decision making, but is not a dictation of land use. Understanding the ecological capabilities of the land is the first step in developing a land use plan for First Nations, or other special groups, that incorporates ecological parameters and local knowledge (Black & McBean, 2016; Ellis, 2005). The final results of the project will be given to CFIB and Esh-Kn-Am Cultural Resources Management Services (CRMS), who will utilize and adapt the information as needed.

A GIS technician for Esh-Kn-Am CRMS was involved during the process. The purpose was to include someone from the community at the technical level to provide continuity after the project is complete. The technician provided excellent insight and suggestions, and learned the purpose and utilization of the spatial capability data. Through future adaptation and updates, the document can be considered a 'living document.'

3.3 Region

The area of interest (*Figure 1*) includes CFIB lands within the Lower Thompson River valley, specifically the section of river downstream from Kamloops Lake and above the confluence with the Fraser River. Specifically, it is the land between Spences Bridge and Ashcroft, extending to the secondary terraces above the river valley (*Figure 1*). It is a hot and dry region, experiencing low annual precipitation and high summer temperatures. Annual precipitation is approximately 270 mm, with much of the precipitation falling during the summer months. The average maximum temperature in July and August is 30°C (climate.weather.gc.ca, accessed March 2017). May, June, and July are the months with the highest average precipitation. High temperatures during the summer results in little moisture retained in the soil available for plants.

The lower elevations of the valley primarily belong to the interior bunchgrass (BG) ecosystem, according to the biogeoclimatic ecosystem classification (BEC) system. Moving upwards in elevation Ponderosa Pine (PP) forests develop, eventually leading to Interior Douglas Fir (IDF) forests and to Engelmann Spruce – Subalpine Fir (ESSF) forests in the upland areas (MFLNRO, 2016).

Young et al, (1992) reports that the soils in the area are primarily Orthic Dark Brown Chernozems in lower Interior Bunchgrass zones, Brunisols in upland Interior Douglas Fir and Ponderosa pine zones, and some Luvisols. The terrain in the area is characterized by fluvoglacial terraces, leaving inclined, undulating to hilly, workable terraces separated by steep, gullied slopes formed by erosion. Generally, the soils are well to rapidly drained.

The region currently has active agricultural activity, including alfalfa and livestock operations. Ranching occurs in upland areas where livestock can range. CFIB currently has developed pivot irrigation at the privately owned, historic Basque Ranch, approximately 30km

north of Spence's Bridge in the BG zone. Logging operations are active in the upland areas. Camping, both organized and unorganized, provides opportunities for recreation such as sport fishing in the river and motorized vehicles in the uplands. (Walkem, 2017, pers. com.)

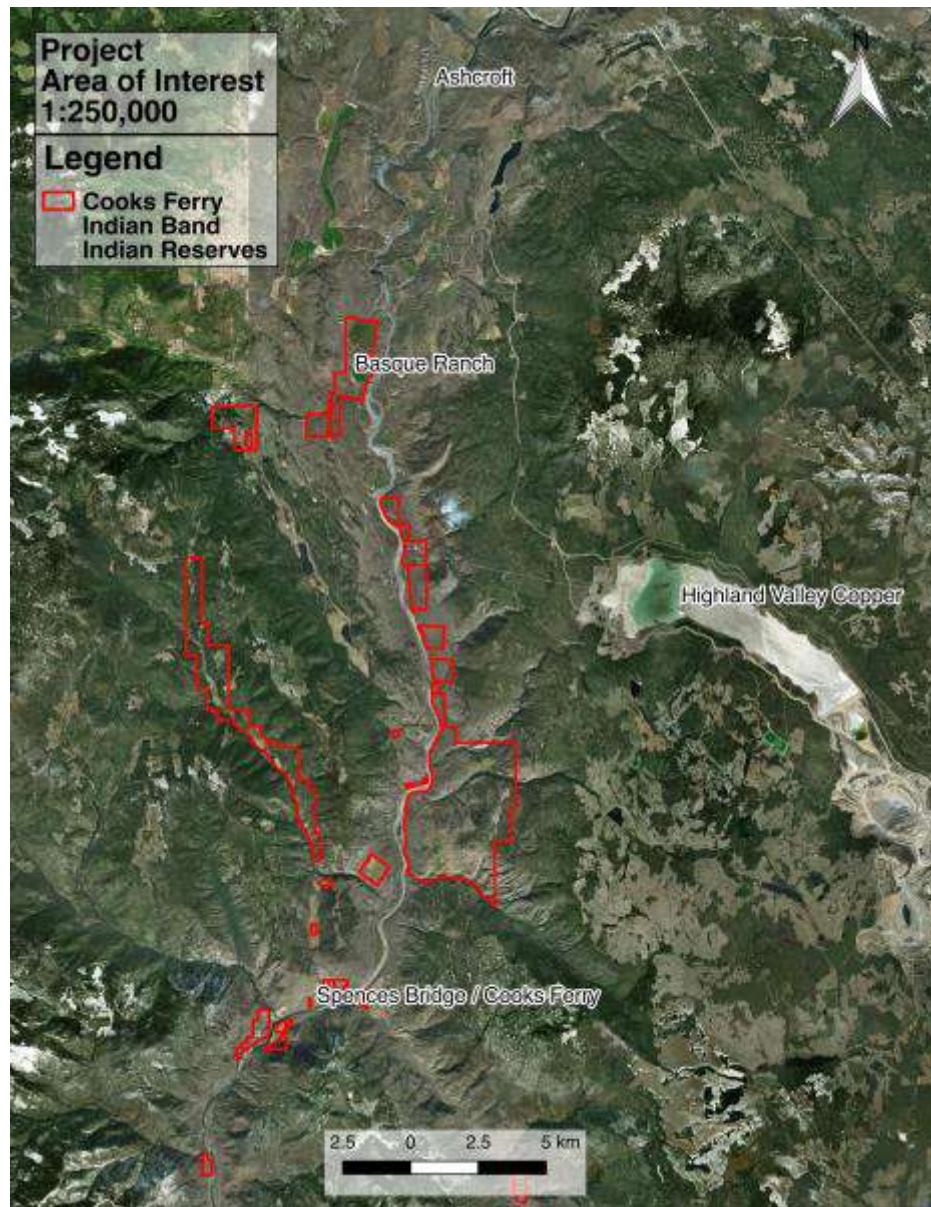


Figure 1. Map of the project Area of Interest for Land Capability Assessment. The IRs illustrated include only the high priority IRs, and do not include all CFIB's IRs.

3.4 Land Capability

Land capability is the classification of lands according to their capability to support a certain resource activity such as agricultural crops, commercial timber, wildlife, or recreational values. Capability is primarily evaluated on soils, landforms, and climate. It is assessed regardless of present land use, social and economic factors and assumes good management practices of the land for continued production. For these reasons, it is considered an objective,

ecological biophysical assessment, and is an appropriate basis for land use planning. Capability is designed primarily for planning and not for specific management. Once the capability is established, further investigation into land use planning can be pursued to develop management plans (Canada Land Inventory, 1970).

The Canada Land Inventory (CLI) survey, completed during the 1960's and 1970's, was intended to take stock of the country's lands and their potential. The CLI was designed as a tool for rural development planning. Lands are given a classification rating 1 through 7. Class 1 rated lands are considered the best lands, with no restrictions on their use for that sector. The rating increases as additional physical limitations exist on the land, and class 7 lands are those considered not capable of supporting the land use sector. Polygons or land units in the survey mapping are given the same classification ratings, and are considered to have relatively homogenous characteristics.

Agricultural capability is based primarily on soils and climate, considering limitations that may constrain mechanized agriculture. An unimproved and an improved classification rating are given along with the types of limitation that exist. Some limitations may be readily improved, such as moisture or stoniness, and others may not be improved, such as shallow soils or terrain. Forest capability assesses the mean annual increment (cubic meters per hectare per year) of commercial timber under intensive forest management, based on soils, climate, and forest cover type. Capability for wildlife reflects the characteristics of the land and climate that supports ungulates or waterfowl, two types of wildlife chosen for their broad appeal to the public. Finally, recreation capability is the attractiveness of a site, as well as its ability to support intensive use over a sustained time.

4 Methods

4.1 Overview

An initial meeting was held with Chief Walkem and the Council of CFIB on April 26, 2017. The purpose of the meeting was to present the project proposal and receive feedback on items of importance to CFIB regarding land use planning. Capability was defined, and the value of assessing capability as a basis for future land use planning was discussed in some detail. It was communicated that the project was intended to provide a tool for the community's use. Chief Walkem discussed the band's desire to expand agricultural production on their lands. For this reason, agriculture capability was assessed in greater detail than recreation, wildlife, and forestry capability, which were assessed at a broad scale. The Chief and Council discussed items of main concern extending beyond capability, such as current and past uses on various lands, irrigation water sources and infrastructure, and water allocation.

The study area was identified through discussions with CFIB, geographical landform constraints, and existing mapping boundary extents. CFIB identified 12 Indian Reserves (IRs) that are considered high priority for assessing agricultural capability (Appendix 10.3). The high priority IRs generally fall within the BG and IDF zones of the Lower Thompson Valley between Spences Bridge and south of Ashcroft. The upper glaciolacustrine terraces provide a reasonable landform extent for relatively detailed (1:50,000) agricultural capability mapping. The height of

land on either side of the valley provides a reasonable landform extent for relatively general (1:250,000) capability mapping.

The primary data utilized for spatial analysis was the Canada Land Inventory survey data at the 1:250,000 scale and 1:50,000 scale. The Canada Land Inventory Land Capability for Forestry survey did not cover the area of interest. Capability classification ratings were interpolated from recent spatial yield and forest cover data (MFLNRO, 2016). The methodology for the interpolation is described in Appendix 10.5.

GIS based map sieving was used to analyze the data and produce maps. Map sieving is a form of spatial analysis for land use allocation and suitability analysis through overlay of multiple maps (Collins et al., 2001). GIS allows for greater flexibility and techniques in map sieving and land use capability and suitability planning (AbdelRahman et al., 2016; Chen, 2014). Using GIS a similar process, described in Appendix 10.5, was conducted. The objective was to identify optimal and conflicting land uses according to the classification rating.

A follow up meeting was conducted on July 14, 2017 to review progress on the project and the maps, and to receive feedback. During the meeting with CFIB representatives, a projector was used to demonstrate the GIS program, prepared with layers that displayed the regional level assessment. The detailed IR maps with figures and tables were also printed and provided to the participants. The maps in particular were useful as a visual tool to foster discussion regarding land use and identify areas of local concern and importance. The feedback provided by CFIB is discussed in the Feedback section of the report.

4.2 GIS Analysis / Methodology

4.2.1 Data acquisition

Land capability for recreation, ungulate, and waterfowl data was obtained from the federal Agriculture and Agri-Food Canada website, map 092i (Ashcroft) at the 1:250,000 scale (<http://sis.agr.gc.ca>). Land capability for agriculture data was obtained from the Agricultural Land Commission website (<http://www.alc.gov.bc.ca>). A selection of this data was made using the area of interest. Land capability for forestry was interpolated from Vegetation Resources Inventory data, available from the BC Ministry of Forests, Lands, and Natural Resource Operations Data Catalogue (<https://catalogue.data.gov.bc.ca>). Data for CFIB IRs was provided by Esh-kn-am Cultural Resource Management Services.

4.2.2 Software used

QGIS 2.18 software was selected as the GIS platform. It is an open source GIS platform available from www.qgis.org. QGIS is compatible with other GIS platforms, such as ESRI's ArcGIS which is the software used by Esh-Kn-Am CRMS.

4.2.3 Regional analysis

GIS vector geoprocessing tools were used to identify optimal land use types at the regional (1:250,000) scale. The objective was to assign all land surface an optimal land use type (e.g. waterfowl) based on the best capability rating. The completed map displays what the best-

rated land use capability is. The analysis also identified where two or more land uses with the same capability classification overlap.

4.2.4 Agricultural analysis

Due to consultation with the community, agriculture was determined to be the main focus for the detailed mapping. Agricultural capability data was available at a scale of 1:50,000. Capability data was sieved with the IR boundaries, to identify the extent of the capability within each IR polygon. Scale was an issue, as there is a wide variety of sizes of IR, including some that are smaller than the smallest land unit that can be mapped at 1:50,000 scale. Small changes were made to some boundaries based on observed discrepancies from satellite imagery. Detailed analysis of capability data, including charts, tables, and a description were included with each IR map set.

4.3 Mapping

A number of map types were developed through the map sieving process. Three map types are presented:

- 1) Regional capability maps, showing the capability classification ratings for each of the five land uses at the 1:250,00 and 1:125,00 scales;
- 2) Regional maps, showing the optimal land use capability classification ratings for recreation, ungulates, and waterfowl in the region at a 1:250,000 scale, and where agriculture capability class 1 – 4 lands conflicted with other land use capability class 1 – 4 lands;
- 3) Detailed agricultural capability maps at the 1:50,000 scale for each high priority IR identified by CFIB, including figures and tables on limitations and capability ratings.

Some maps have a slightly larger or smaller scale for illustrative purposes.

Examples of these maps are included and discussed further in Results and Discussion, and all maps are included in Appendix 10.2 and 10.3.

5 Results

5.1 Recreation

Lands along the Thompson river valley bottom contain the highest recreation capability classification in the area of interest, particularly north of Spences Bridge towards Basque and Ashcroft. Small polygons directly in the town of Spences Bridge and at the confluence of the Nicola and Thompson rivers are also given high capability ratings. The polygon in Spences Bridge identifies the rock formations and the waterfall adjacent to the town.

The highest rating is 3 within the valley. The closest class 2 rating is outside of area of interest, at the west end of Kamloops Lake. Most the river valley, where land is in proximity to the river, is class 3 and 4. The primary recreational features are angling, viewing, and organized camping. Upland areas have lower capability classification ratings, typically 5 and 6. These areas

offer opportunities for upland wildlife viewing and topographic patterns. Areas with small surface water bodies may have opportunities for wetland wildlife viewing.

A class 3 polygon exists in the Venables valley, identifying canoeing and wetland wildlife viewing as recreational features.

5.2 Waterfowl

Although generally a dry landscape, a number of sites with shallow surface waters (wetlands) exist that provide capability for waterfowl. High capability areas are also present with smaller waterbodies such as lakes and ponds, with appropriate vegetation for waterfowl habitat.

The areas with the best waterfowl capabilities are in the Venables valley, Hat Creek valley, and a variety of smaller lakes in the uplands east of the Thompson river, for example the Pemynoos lakes. One area of class 4 and three areas of class 5 capability were identified in the Highland Valley Copper (HVC) mine system (not pictured), permanently altered due to mining activities.

Numerous class 5 areas were identified in the upland area surrounding HVC, where numerous shallow surface waters exist. Generally, the limitations to capability are a reduced marsh edge and a water depth restriction.

5.3 Ungulates

Ungulate capability varies throughout the landscape (*Figure 2*). Some areas of high capability were identified within the BG zone, slightly elevated from the valley bottom. Large areas of moderate capability are present throughout the upland areas. Areas of class 2 lands for sheep and deer are present in the area around Spences Bridge, and areas of class 3 extend along the valley. The areas at lower elevations are also classed with a 'W', meaning winter range that animals from the surrounding area depend on. The primary limitations in the region

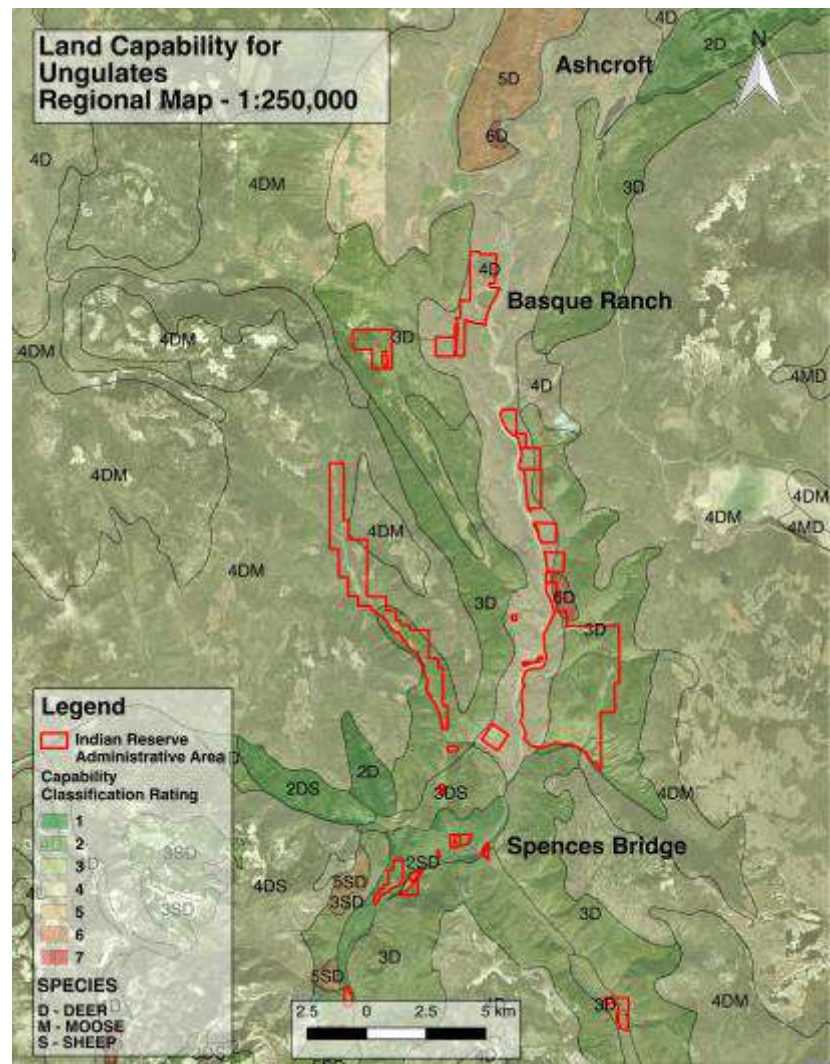


Figure 2. Land Capability for Ungulates Regional Map

are restrictive snow depth and restrictive soil depth. Lands considered capable of supporting moose and deer populations are present in the upland regions.

5.4 Forestry

Lands with the highest capability for forestry are in upland areas in ESSF and IDF forests, typically north aspects where more moisture is available to increase capability. Generally, most of the upland area is class 6, and most of the valley bottom is class 7. The best forest capabilities in the lower elevations are within the deeply incised creek draws, often where Douglas fir and Ponderosa pine are the dominant species. There are areas where the dominant forest cover type was a non-commercial tree species, including trembling aspen.

Some small fields under agricultural production and a variety of upland sites are not classified due to a lack of site index data in the VRI data.

5.5 Optimal Land Use

Using map sieving, the optimal land use for recreation, ungulates, and waterfowl rated class 1 – 4 was identified, including areas of overlapping land uses (*Figure 5*). The region was predominantly best rated for ungulate capability. Around the Basque ranch and north towards Ashcroft, recreation was the optimally rated capability in the lower elevations, while slightly upland recreation and ungulate capability conflict. Water bodies within the Venables valley were identified as optimal for waterfowl, adjacent to lands optimal for recreation and ungulates.

5.6 Agriculture

5.6.1 Unimproved

The primary limitations within the valley are terrain and moisture. Where terrain is not a major limitation, i.e. on the terraces present within the

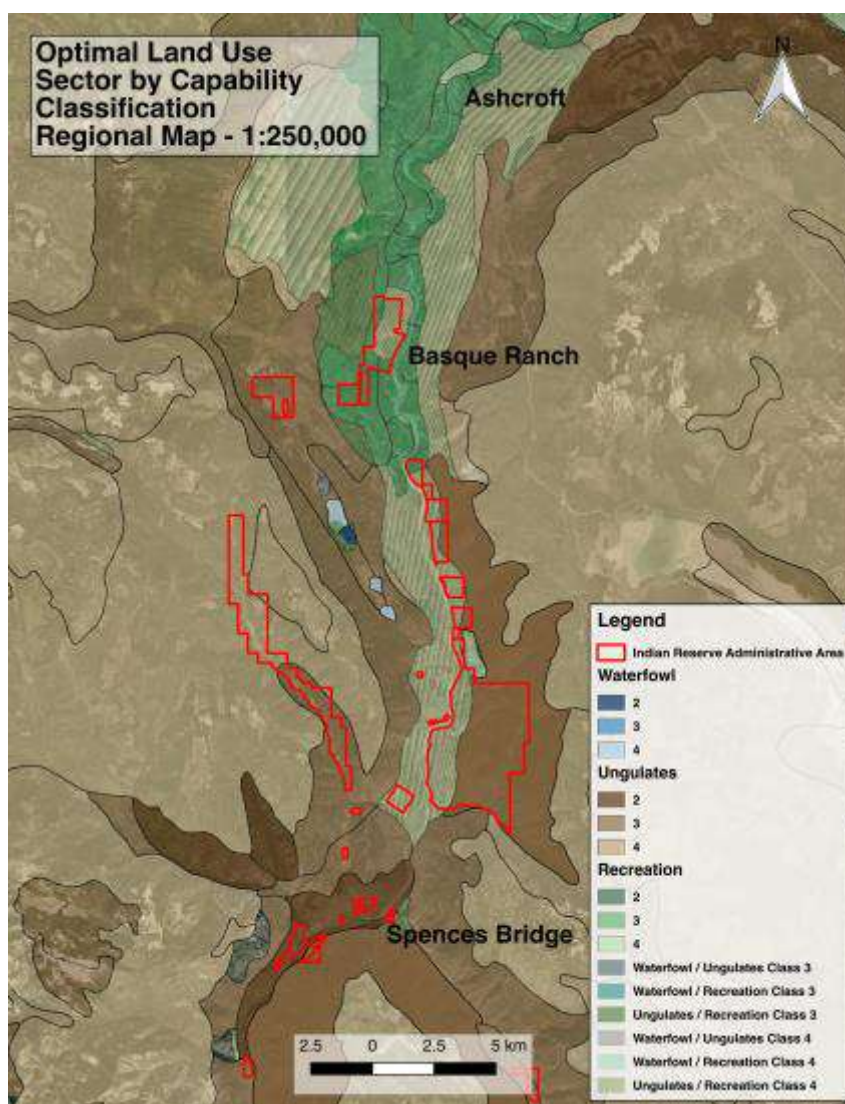


Figure 3. Optimal land use sector by capability classification

BG zone, the best unimproved capability is class 4, but typically class 5. Many of the steep slopes that separate the terraces are limited by erosion or shallow soils, resulting in class 6 or 7 lands. These lands are typically restricted to producing perennial forage crops. Improvement practices are feasible on class 5 lands, whereas on class 6 lands they are typically not feasible.

5.6.2 Improved

Many areas within the region experience significant upgrades to the capability classification ratings when improvements are made to remove hazards or limitations (Figure 3). Moisture is the most common limitation that can be improved with the best results in the region. Class 1 through 4 lands are considered possible if irrigation improvements can be made. Stoniness is the next limitation that can be improved to upgrade agricultural lands.

The land around and including the Basque Ranch experienced the largest increases in capability through irrigation improvements. Some class 5 lands are improved to class 1 lands, meaning no limitations to producing a wide range of climatically adapted crops. Classes 2 – 4 lands have increasingly less range of crops that can be produced as the severity of limitations increase. Additional management is also likely required.

Other improvements to class 1, 2, 3, and 4 lands are possible in the region primarily through irrigation. These lands are primarily within the valley bottom and secondary terraces of the Thompson valley, the Venables valley, and narrow portions of the Nicola valley. Generally, lands north of the Basque ranch tend to have greater capability before and after improvement than lands south of the ranch. The HVC site has portions of land that were once considered improvable up to class 4 lands.

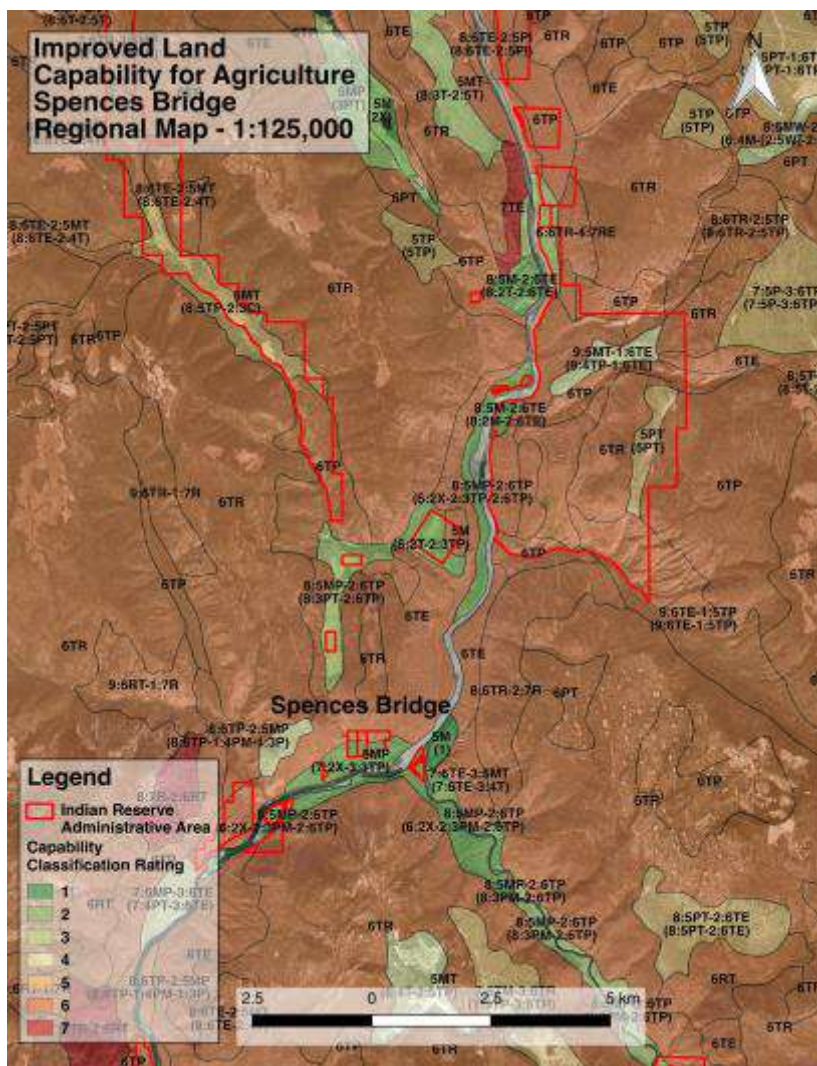


Figure 4. Land Capability for Agriculture, Improved Classification Rating

5.6.3 Potential Agricultural and other Land Use conflicts

Areas where Class 1 – 4 improved agricultural lands and Class 1 – 4 other land uses overlap, or conflict, are identified in *Figure 4*. No areas of class 1 – 4 forestry conflicted with improved agricultural lands. Ungulates and agriculture conflicted in a variety of locations, namely in the Nicola valley, portions of the Thompson valley bottom and upland areas, such as the Pemynoo 9 IR and the Venables valley. Recreation and agriculture conflicts occurred around the Basque ranch and north towards Ashcroft, but also at the confluence of the Nicola and Thompson rivers and the small lakes in the Venables valley. Waterfowl and agriculture conflicts occurred only in the Venables valley.

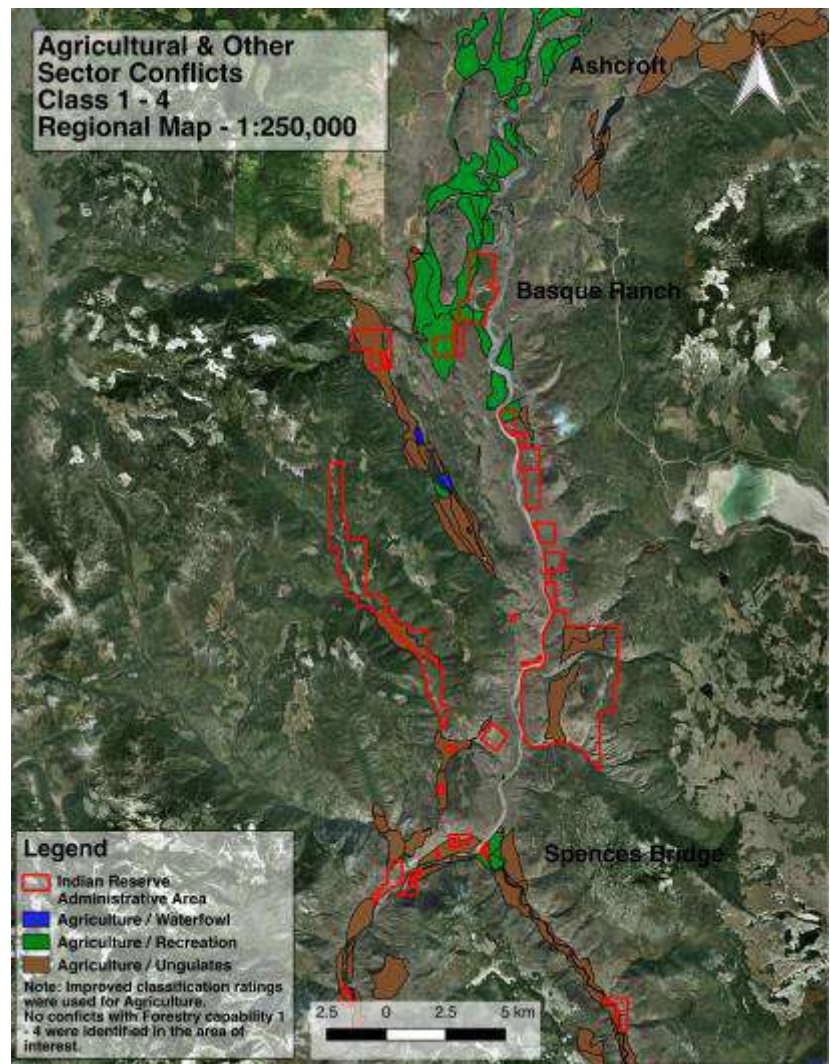


Figure 5. Lands with agricultural and other land use capability classification rating 1 - 4

5.7 Detailed Agricultural Capability

As a result of consultation with CFIB, a detailed look at the agricultural capability of various IRs was completed. Of particular importance to the community is the 430-hectare historic Basque ranch. Currently under agricultural production, additional ecological information about the ranch and the surrounding lands may provide additional knowledge. See *Figure 6* and *7* for the mapping and analysis completed for Basque ranch. The same process was applied to the all 12 high priority IRs and is available in Appendix 10.3.

The results show that a significant improvement is possible when irrigation is used. Class 5 lands, limited by primarily moisture, can be improved to Class 1 lands with no limitations. Nearly 300 hectares is considered capable of agricultural production.

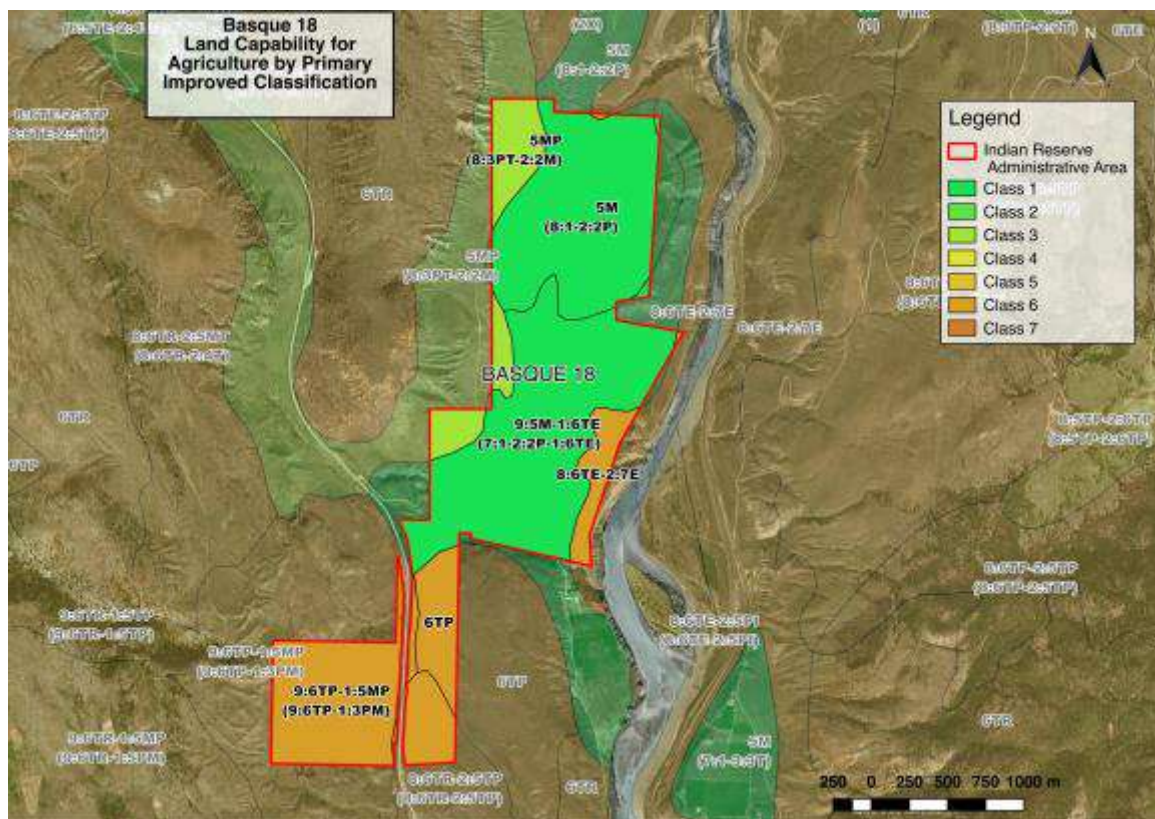
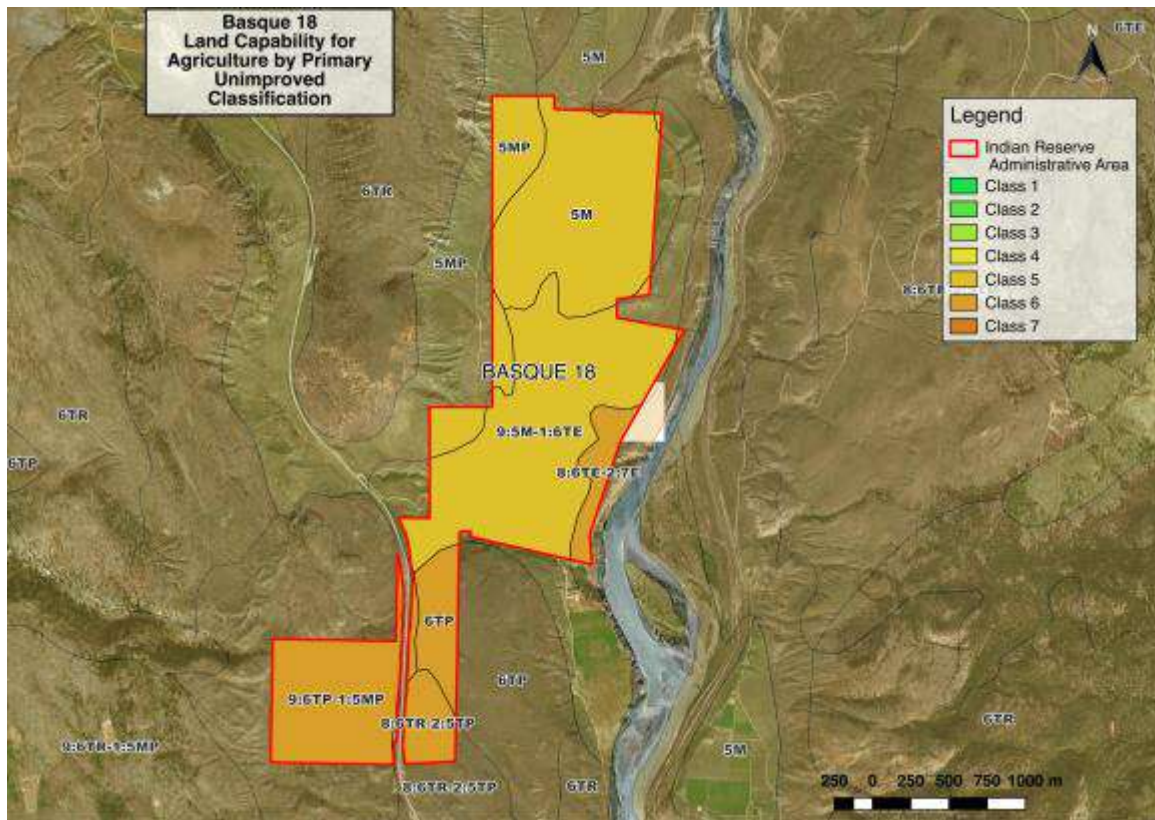


Figure 6. Unimproved (top) and improved (bottom) agricultural capability classification ratings of the Basque ranch

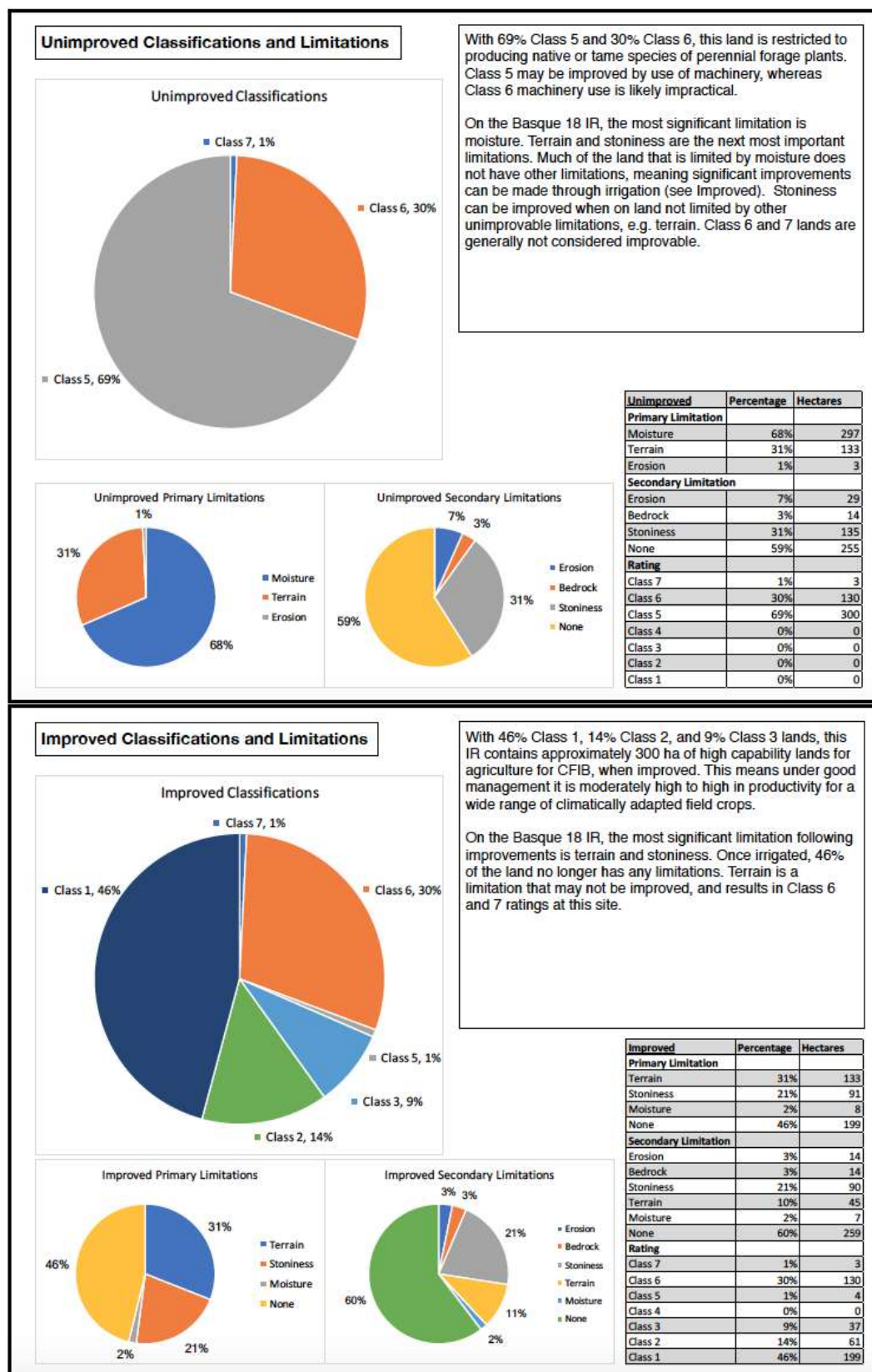


Figure 7. Detailed analysis of capability and limitations of the Basque ranch, unimproved (top) and improved (bottom)

6 Discussion

6.1 Recreation

Angling represents the most considerable advantage for recreational capability in the region. Other features include wetland and upland wildlife, organized camping, small surface waters, topographical features and rock formations. The river valley from the Basque ranch north is suggested as the region with the greatest recreation capability. The lower Thompson river, particularly near Spences Bridge, was once famous for its summer steelhead run, and attracted visitors from afar. Significantly reduced returns (less than 400 individuals in 2016) have impacted this fishery and its attractiveness to anglers (Bison, 2016; Levy and Parkinson, 2014). Regardless, the valley bottom is considered high capability for supporting recreational activities and should be considered when making land use planning decisions. The community may consider options such as minimizing development, restricting motorized use, and establishing and maintaining organized camping sites to take advantage of the capability. A number of IRs are adjacent to the river, primarily within class 4 rated lands.

CFIB discussed recreation licensing they had obtained for the area around the Pemynooos lakes, in the upland area east of the Thompson and south of HVC. Due to the pine beetle infestation and subsequent salvage logging, much of the forest has been cut in recent years. These lakes have been rated a class 5 for recreation capability. Opportunities exist at this lake chain for camping, fishing, and motorized recreation in the surrounding areas. Wildlife viewing may be possible, once forests regenerate to provide wildlife cover.

6.2 Waterfowl

Due to the relatively small areas for waterfowl capability in the region, they should be given importance when considering land use. The Venables valley appears to hold the most capability for supporting waterfowl. No IRs are in this valley. The Hat Creek valley contains a large polygon of class 3 lands. The primary limitation in the area is water depth restrictions, and additional decreases in water depths should be prevented if waterfowl capability is to be managed.

6.3 Ungulates

The region boasts extensive areas that have high to moderate capability of supporting deer, moose, and sheep. The area is well known for its California Big Horn sheep. Higher capabilities exist lower in the valley and extend up the deeply incised draws, where winter range may be possible due to decreased snow depths and potential escape terrain. Current land use may conflict with actual ungulate land suitability, such as roadways, logging, and built up areas. Hunting is an important means of food security and cultural practice for the community (Walkem, 2017, pers. com.). It is important to be able to quantify and communicate the importance of land in terms of food security or ungulate capability when discussing land use planning with stakeholders in the region, such as logging and mining activities, and government.

6.4 Forestry

Generally, forest capability increases with elevation. In a moisture limited climate regime, even incremental increases in moisture can be beneficial to productivity. Low forest capability (Class 6 and 7) dominate in the valley bottom, except where there appears to be moisture such as in the deeply incised creek draws. The deeply incised creek draws are often areas of high wildlife capability. Some areas with higher classification ratings (1-3) appear to have been cut over when compared with satellite imagery. Impacts from pine beetle infestations have changed logging practices often through large salvage logging cuts.

While other forestry yield and planning tools are available and in use, the capability tool provides a comparison with other land use sectors. Including the forestry capability allows the community to better articulate the trade-offs between different land uses. As forests are re-planted and regenerated, wildlife and recreational capabilities should be considered as part of the management plan.

6.5 Agriculture

Generally, unimproved land on terraces in the valley is well suited to production of forage. Some of the sloped areas in the BG, PP, and IDF zones are given an unimproved rating of 6, making them challenging but perhaps suitable for natural forage production. Many class 5 lands can be upgraded to 1 – 4 lands through improvements, primarily irrigation and stone removal. CFIB IR lands are also capable of upgrades through improvements. The best case is the Basque ranch, where nearly 300 hectares of land may be capable of agricultural production (*Figure 6 & 7*). It is well known that the site is of good agricultural productivity, as it is historically a productive farm.

Unimproved class 5 lands may be valuable without improvement. Without improvements, they may be good producers of forage, or of tree fruits and grapes (see below). Improvement in the valley is largely dependent on availability of water for irrigation, in sufficient volumes and with appropriate delivery infrastructure.

Opportunities may exist for innovative approaches to agriculture, such as agroforestry. Intercropping field crops with fast growing tree species such as hybrid poplars may be beneficial in improving soil moisture retention through changes in the microclimate, and provide an additional income source, if sufficient water is available. High value non-timber forest products, such as mushrooms or pine nuts, could be considered for intensive management on upland areas considered lower agricultural capability, and potentially demand less irrigation.

6.5.1 Potential Agricultural and other Land Use conflicts

Areas where Class 1 – 4 improved agricultural lands and Class 1 – 4 other land uses overlap, or conflict, were identified. No areas of class 1 – 4 forestry conflicted with improved agricultural lands. Ungulates and agriculture conflicted in a variety of locations, namely in the Nicola valley, portions of the Thompson valley bottom and upland areas, such as the Pemynoo 9 IR and the Venables valley. Recreation and agriculture conflicts occurred around the Basque ranch and north towards Ashcroft, but also at the confluence of the Nicola and Thompson rivers and the small lakes in the Venables valley. Waterfowl and agriculture conflicts occurred only in the Venables valley.

6.5.2 Modified Land Capability Classification for Tree Fruits and Grapes

The Okanagan and Similkameen valleys were recognized by the CLI process as being special areas due to suitability to grow tree fruits and grapes, instead of common field crops. Production of tree fruits and grapes is more well adapted to sloping and stony sites than other common field crops. The Ashcroft area is mentioned in the 1983 Land capability classification for agriculture in British Columbia document (Kerk et al., 1983) as a potential future region that could be considered for the modified land capability survey. Terrain and stoniness do not represent a limitation in the range of crops that can be produced, as they do with field crops. Instead, increased severity of physical limitations such as terrain and stoniness require a greater level of effort for agricultural production. There is an opportunity in the undulating, hilly, and stony landscape of the Lower Thompson to produce tree fruits and grapes.

7 Community Consultation – Review

In general, the representatives of Cooks Ferry expressed satisfaction with the land capability analysis as it provided a physical representation, or map, of the areas of interest and thus helped facilitate dialogue and that the project was a good start, as it provides an objective, ecologically based inventory that can serve as a basis for land use planning by the community and is adaptable to alternate interpretations. In meeting with Chief and Council to review land capability mapping, certain limitations and suggestions for improvement were offered. These included additions and incorporation of local knowledge, and future opportunities for expanding the land use planning process. The feedback from the community is incorporated into the framework to reflect the issues raised and to provide guidance for future work in this field. Some next steps were discussed between UBC and CFIB.

7.1 Limitations

Scale is a major limitation. The minimum polygon area that can be identified is 12.5 hectares at 1:50,000 scale. This precludes small areas, such as small fields where capability may be relatively high compared to surrounding area and within a polygon. These small fields may be of great value for local communities. Scale poses a challenge for assessing the capability of small IRs if they fall within a larger polygon with multiple classification ratings. Soil survey maps may provide additional capability information for smaller areas at the desk top level.

Improved agricultural ratings do not address specific water requirements for crops. The capability rating assumes that sufficient water is available to meet crop water requirements. The crops within the range of climatically adapted crops may have a range of irrigation requirements.

Historical, cultural, and spiritual areas are not properly identified or classified. Areas of high importance may not be recognized by the parameters established for the Canada Land Inventory survey.

Agricultural capability considers only mechanized agriculture, and not foraging or other methods of obtaining food. Important plants such as bitter root, not managed with mechanized agriculture, are not included in the CLI and must be identified through local knowledge.

Recreation is a subjective evaluation, and certain groups or communities may place different values on different sites. Recreation values can reflect an individual's worldview. Recreation activities and pursuits can change over time, and land once considered low capability may be able to support a newer or popular activity. For example, mountain biking and ATVing are significant attractions for recreation users and require a different type of land than camping or angling. Decisions on types of recreation activities, e.g. motorized use vs non-motorized recreation, could be guided by recreational capability.

The CLI did not address capability for range. Livestock ranging is an important economic activity in the area, and a greater understanding of the quality and quantity of range lands would be of value. No system currently exists for classifying range lands in BC.

The capability classification system doesn't provide enough information to make land use decisions. It is objective and ecologically based, therefore it does not consider important factors such as land tenure, current land use, water availability for irrigation, distance to market, and access. These factors play a significant role in land use planning, and will need to be considered in future planning work.

7.2 Local Knowledge

Incorporating local knowledge into the early development of land use plans is critical to the success and accuracy of any planning document. Feedback during the review phase also identified a number of items of local knowledge appropriate to incorporate into the program. Inconsistencies between the land capability analysis and local knowledge were identified and incorporated into the framework.

Ungulates such as deer, a targeted hunting species, are typically found in upland areas where the classification is moderate to poor. The lands that are rated the best capability, e.g. the mid elevation valley winter range, do not often support populations of ungulates. This may be due to human activities in those areas. However, hunters typically travel to the upland class 4 areas when targeting ungulates. Ungulate winter range information has been improved through recent studies, and may be further refined than the CLI survey.

Concerns were identified with current logging practices, when compared to capability and dominant forest cover. Logging was identified as having occurred in areas where the dominant forest cover was non-commercial or low capability. Forest capability and cover type may aid in identifying riparian areas requiring consideration when logging. The community had experienced challenges identifying appropriate riparian boundaries in the past when communicating with the forest licensees.

The capability classification system may provide a value when assessing trade-offs for land use decision making, or in negotiation with other parties. For example, if land use decisions from industry or government may impact lands with a certain capability to support a particular resource, the community will be better equipped to quantify and communicate those concerns.

The following IRs were identified as containing small agricultural fields or permanent changes that were not captured by the 1:50,000 scale survey:

- Kloklowuck 7

- Shawniken 3
- Shpapzchinh 20
 - North and central parcels both have small fields
 - South parcel lost capability due to rail construction

7.3 Future opportunities

During the July meeting with CFIB, some next steps and future opportunities were discussed. Overall, the project was well received, and a willingness to undertake further projects between CFIB and UBC was expressed by both parties. Several future opportunities for furthering land use planning for CFIB were identified.

Assessing the agricultural capability of the smaller fields was considered an important step to having a complete capability inventory of their lands. At the desk level, soil maps may provide some insight, and field level soil sampling and GPS mapping would provide precise capability information. Refining the capability assessment to a more detailed scale would provide the community of fuller accounting of the lands available to them.

A classification of lands according to the *Modified Land Capability Classification for Tree Fruits and Grapes* would be beneficial to the community, to expand the capability classification to include a wider range of climatically adapted crops. This would provide a start to examining alternative agriculture opportunities, using an existing classification system and existing ecological information.

Undertaking a crop suitability assessment would provide insight into the appropriate types of crops that are desired by the community and would be ecologically suitable to the land. Alternative or innovative land uses may also be considered, such as agroforestry or aquaculture. This process would allow for calculating crop water requirements and irrigation feasibility studies.

Once water requirements have been quantified, the community can better articulate its need for water allocation. Water volumes can be better allocated and protected in future when plans are established and backed by capability and suitability information. In an arid climate, water resources must be carefully managed and planned to meet a wide range of needs.

Additionally, an assessment of the range capability of the region was identified as a useful planning tool. Members of the community currently hold range tenures, and it would be of use to know the capability of the tenure and the surrounding region.

It is proposed to provide a final update to CFIB on this project, at which time the community can discuss which of the above, or any other, future opportunities on which they wish to partner with UBC.

8 Conclusion

The land capability assessment of Cooks Ferry Indian Band found there are lands with moderate to high capabilities for a variety of land uses. Areas of conflicting capability for different land uses often centered around water sources or moisture. Lands with high capability for agriculture did not conflict with lands with high capability for forestry. Opportunities for improving agricultural production on CFIB IRs exist, if irrigation is feasible to produce suitable crops desired by the community. Refining the capability assessment by undertaking assessments of the small fields not captured at the 1:50,000 scale would improve the ecological inventory of CFIB lands. The results found in this project are not a dictation of land use, rather a tool for the community to use and build upon in the future as they pursue development of their lands.

An objective, ecologically based inventory of the land using GIS map sieving methods is a good start to land use planning. Community involvement is necessary to make the inventory useful and the inventory can be adapted to include important local knowledge. A transparent assessment process enables a transfer of the results and the process to the community. Project materials are shared with Esh-Kn-Am CRMS who works closely with CFIB. This provides the community the opportunity to update, modify, and adapt the information as they need so it is a living document. Areas of special cultural value, not identified in the assessment, can be included by the community, and given an appropriate weight when developing land use plans.

9 Bibliography

- AbdelRahman, M. A. E., Natarajan, A., & Hegde, R. (2016). Assessment of land suitability and capability by integrating remote sensing and GIS for agriculture in ChamaraJanagar district, Karnataka, India. *The Egyptian Journal of Remote Sensing and Space Sciences*, 19(1), 125-141.
- BC Ministry of Agriculture First Nations Agriculture Team. (2012). *First Nations agriculture needs assessment*
- Bison, R. (2016). *Status update for Fraser river late-run summer steelhead*. Province of British Columbia Ministry of Forests Lands Natural Resource Operations.
- Black, K., & McBean, E. (2016). Increased indigenous participation in environmental decision-making: A policy analysis for the improvement of indigenous health. *International Indigenous Policy Journal*, 7(4)
- Blower, D., & Canada. Canada Land Inventory. British Columbia Land Inventory. (1973). *Methodology; land capability for ungulates in British Columbia*
- Canadian Council on Learning. (2006). The rural-urban gap in education.
en.copian.ca/library/research/ccl/rural_urban_gap_ed/rural_urban_gap_ed.pdf
- Canada Land Inventory. (1972). *Interpretation of British Columbia recreation capability maps*
- Canada Land Inventory, British Columbia. Surveys and Mapping Branch, & Canada. Land Inventory (B.C.). (1963). *Land capability for wildlife-waterfowl maps: British Columbia*. Victoria, B.C.; Ottawa: Canada Land Inventory.
- Chen, J. (2014). GIS-based multi-criteria analysis for land use suitability assessment in city of Regina. *Environmental Systems Research*, 3(13)
- Collins, M. G., Steiner, F. R., & Rushman, M. J. (2001). Land-use suitability analysis in the United States: Historical development and promising technological achievements. *Environmental Management*, 28(5), 611-621.
- Cook's Ferry Indian Band. (2016). *Comprehensive community plan phase 2: Community engagement report*
- Canada Land Inventory. (1970). *The Canada Land Inventory: Objectives, scope and organization*. Report No. 1. Minister of Regional Economic Expansion. Ottawa: Queen's Printer for Canada.
- Ellis, S. C. (2005). Meaningful consideration? A review of traditional knowledge in environmental decision making. *Arctic*, 58(1), 66-77.

- Kenk, E., Cotic, I., British Columbia. Surveys and Resource Mapping Branch, & British Columbia. Soils Branch. (1983). *Land capability classification for agriculture in British Columbia*. Kelowna, B.C: Ministry of Environment, Surveys and Resource Mapping Branch and Ministry of Agriculture and Food, Soils Branch.
- Kowall, R. C., & British Columbia. Ministry of Agriculture. Soils Branch. (1972). *Methodology land capability for forestry in British Columbia; Canada Land Inventory*
- Levy, D., & Parkinson, E. (2014). *Independent review of the science and management of Thompson river steelhead* Prepared for Thompson Steelhead Technical Subcommittee c/o Cook's Ferry Indian Band, Spences Bridge, BC. 104p.
- United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352)
- Young, G., Fenger, M. A., & Luttmerding, H. A. (1992). *Soils of the Ashcroft map area*. MOE technical report no. 23 / BC soil survey report no. 26

10 Appendices

10.1 Land Capability for Agriculture Legend

SOIL CAPABILITY FOR AGRICULTURE

1. Explanatory Notes

In this classification all mineral and organic soils are grouped into classes on the basis of soil and climate characteristics. The classification rates the soils' potential and limitations for agricultural use. Soils in Classes 1 to 4 are considered capable of sustained production of common cultivated field crops, with the range of crops decreasing, and/or the need for management practices to overcome limitations increasing, from Class 1 to Class 4. Class 5 soils are capable of use only for permanent pasture, hay, or a single specialty crop. Class 6 soils are capable of use only for natural sustained grazing, and those in Class 7 are incapable of use for cultivated crops or grazing.

Note that the agriculture capability classification takes into account the range of crops possible, and not productivity (i.e. yield per hectare) of any crop.

Important factors on which the classification is based are:

- 1) The soils will be managed and cropped, under a largely mechanized system.
- 2) In B.C., most soils have been rated for improved and/or unimproved conditions. Lands requiring improvements, such as drainage, irrigation, stone removal, diking, or clearing which can feasibly (does not require a major reclamation project) be made by the farmer himself, are classified according to their continuing limitations to use after the improvements have been made. Land requiring improvements beyond the means of the farmer is classed according to its' present condition. Where major reclamation projects have been installed, the soils are classed according to the limitations that continue to exist. These assumptions apply to the unimproved ratings.

When improved ratings are shown, they then indicate the increase in capability due to irrigation and drainage (if drainage is not presently in effect).

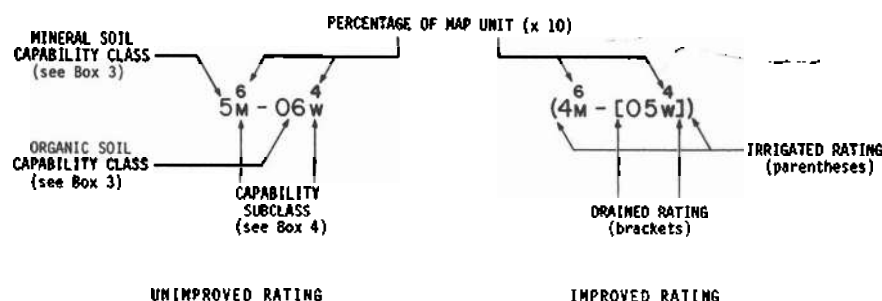
- 3) The following are not considered: distances to market, kind of roads, location, size of farms, type of ownership, cultural patterns, skill or resources of individual operators, and hazard of crop damage by storms.
- 4) The classification does not include capability of soils for trees, small fruits, ornamental plants, recreation, or wildlife. In climatically suitable areas (primarily the Okanagan Valley) the crop range was expanded to include tree fruits and grapes.

The agriculture capability classification consists of two main categories: (1) the capability class, and (2) the capability subclass. The capability class and subclass together provide the map user with information about the degree and kind of limitation for agricultural use for broad land use planning, and for the assessment of management needs.

2. Example of Map Symbol

In many areas of B.C., a dual rating system is applied to mineral soils - one under unimproved (by major reclamation projects) soil conditions and a second (parentheses) for improved (irrigated and/or drained) conditions. Where all the land is irrigated, as in irrigation districts, only the improved rating is shown. The improved rating is applied without taking into consideration the availability of water. The dual rating system was adopted to facilitate a more practical classification where climatic droughtiness and low soil moisture holding capacities are counteracted by irrigation water application as a matter of general practice. Increased production of a wider range of crops generally results under the improved conditions. Since improvement practices are not feasible for soils with Class 6 (except some organic soils) or 7 capability ratings, they are only given one rating.

In most cases organic soils are given two ratings - one in a natural state (unimproved) and an improved rating (brackets) for reclaimed or drained conditions where not already in effect. Where reclamation is not feasible the organic soil will have a single rating. Where reclamation is in effect, only the improved rating (brackets) is shown. In those areas of B.C. where mineral soils are given improved ratings, the improved rating indicates that upon irrigation the mineral soil improves to Class 4 and the organic soils when drained and irrigated improves to Class 5.



Explanation:

This agriculture capability map unit has both unimproved and improved ratings. Under unimproved conditions this unit is comprised of 60% Class 5 mineral soil with a low soil moisture holding capacity which limits crop growth and of 40% Class 6 organic soil with excess water limiting its' use to only natural grazing. The improved rating indicates that upon irrigation the mineral soil improves to Class 4 and the organic soils when drained and irrigated improves to Class 5.

3. Capability Classes

The capability class, the broadest category in this classification, is a grouping of soils that have the same relative degree of limitation or hazard for agricultural use. The intensity of the limitation or hazard becomes progressively greater from Class 1 to Class 7. The class indicates the general suitability of the soils for agricultural use.

Two sets of classes exist, one for mineral soils and one for organic soils. The classes are as follows:

MINERAL SOIL CAPABILITY CLASSES

CLASS 1 SOILS IN THIS CLASS HAVE NO SIGNIFICANT LIMITATIONS IN USE FOR CROPS.

Soils in Class 1 are level or have very gentle slopes; they are deep, well to imperfectly drained and hold moisture well. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for a wide range of field crops adapted to the region.

CLASS 2 SOILS IN THIS CLASS HAVE MODERATE LIMITATIONS THAT RESTRICT THE RANGE OF CROPS OR REQUIRE MODERATE MANAGEMENT PRACTICES.

The soils are deep and hold moisture well. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately high to high in productivity for a fairly wide range of field crops adapted to the region. Soils in this class are not generally suited to as wide a range of crops as soils in Class 1.

CLASS 3 SOILS IN THIS CLASS HAVE MODERATELY SEVERE LIMITATIONS THAT RESTRICT THE RANGE OF CROPS OR REQUIRE SPECIAL MANAGEMENT PRACTICES.

The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage, planting and harvesting; choice of crops; and methods of soil conservation. Under good management they are fair to moderately high in productivity for a fair range of field crops adapted to the region.

CLASS 4 SOILS IN THIS CLASS HAVE SEVERE LIMITATIONS THAT RESTRICT THE RANGE OF CROPS OR REQUIRE SPECIAL MANAGEMENT PRACTICES, OR BOTH.

The limitations may seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of soil conservation. The soils are low to medium in productivity for a narrow range of crops but may be highly productive for a few specially suited crops.

CLASS 5 SOILS IN THIS CLASS HAVE VERY SEVERE LIMITATIONS THAT RESTRICT THEIR CAPABILITY TO PRODUCING PERENNIAL FORAGE CROPS; IMPROVEMENT PRACTICES ARE FEASIBLE.

The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants, and may be improved by use of farm machinery. The improvement practices may include clearing of bush, cultivation, seeding, fertilizing, or water control. Productivity of certain forage crops may be high to very high. Some soils in Class 5 can be used for cultivated field crops provided unusually intensive management is used.

CLASS 6 SOILS IN THIS CLASS ARE CAPABLE ONLY OF PRODUCING PERENNIAL FORAGE CROPS; IMPROVEMENT PRACTICES ARE NOT FEASIBLE.

The soils provide some sustained natural grazing for farm animals, but the limitations are so severe that improvement by use of farm machinery is impractical. Soils may be placed in this class because the terrain may be unsuitable for use of farm machinery, or the soils may not respond to improvement, or the grazing season may be very short. In the case of organic soils, Class 06, improvement practices may be feasible.

CLASS 7 SOILS IN THIS CLASS HAVE NO CAPABILITY FOR ARABLE CULTURE OR PERMANENT PASTURE.

This class also includes rockland, other non-soil areas; and bodies of water too small to show on the maps.

ORGANIC SOIL CAPABILITY CLASSES

Organic soils are grouped into 7 classes, designated as 01 to 07. The organic soil class definitions are equivalent in terms of the relative capabilities and limitations for agricultural use as defined above for mineral soil capability classes. For this reason the organic soil class definitions are not presented here. For the description of organic soil classes refer to Reference #3 (Box 5).

4. Capability Subclasses

The subclass is a grouping of soils with similar kinds of limitations and hazards. It provides information on the kind of management problem or limitation. Except for Class 1 (mineral soils) and Class 01 (organic soils), which have no limitations, the classes are divided by subclasses on the basis of kinds of limitation to agricultural use. Therefore, each class includes many kinds of soils, similar with respect to degree of limitation; but soils in any class may require unlike management and treatment as indicated by the appended subclasses which provide information on the kinds of limitations or hazards.

SUBCLASS C: adverse climate - Used on a subregional or local basis to indicate an adverse departure from the regional climate. The main limitation is low temperature or low or poor distribution of rainfall during the cropping season, a combination of these, or local frosty areas.

SUBCLASS D: undesirable soil structure and/or low permeability - These soils are difficult to till, absorb water slowly, or the depth of the rooting zone is restricted by conditions other than a high watertable or consolidated bedrock.

SUBCLASS E: erosion damage - Past damage from erosion limits agricultural use of the land due to loss of productivity and the difficulty in farming land with gullies.

SUBCLASS F: fertility - Low natural fertility due to lack of available nutrients, high acidity or alkalinity, low exchange capacity, high levels of calcium carbonate or presence of toxic compounds.

SUBCLASS I: inundation - Where flooding by streams, lakes or marine tides limits agricultural use.

SUBCLASS M: moisture - A low moisture holding capacity, caused by adverse inherent soil characteristics, limits crop growth. (Not to be confused with climatic drought, covered by Subclass C.)

SUBCLASS N: salinity - The soils are adversely affected by soluble salts.

SUBCLASS P: stoniness - Stones interfere with tillage, planting and harvesting.

SUBCLASS R: shallowness to solid bedrock - Solid bedrock is less than one metre from the surface.

SUBCLASS S: soil limitations - A combination of two or more of the subclasses D, F, M and N.

SUBCLASS T: adverse topography - Either steepness or the pattern of slopes limits agricultural use.

SUBCLASS W: excess water - Excess water, other than from flooding, limits use for agriculture. The excess water may be due to poor drainage, a high water table, seepage or runoff from surrounding areas.

SUBCLASS X: minor cumulative limitations - Soils having a moderate limitation due to the cumulative effect of two or more adverse characteristics which individually would not affect the class rating. (This subclass is always used alone and only one class below the best possible in a climatic subregion).

5. Sources of Further Information

REFERENCES

1. Canada Land Inventory, 1972 reprint. Soil Capability Classification for Agriculture. Report No. 2, Department of Regional Economic Expansion, Ministry of Environment, Ottawa. 16 pp.
2. Climate Division, 1978. Climate Capability Classification for Agriculture in British Columbia. RAB Technical Paper 1, Resource Analysis Branch, B.C. Ministry of Environment, Victoria. 23 pp.
3. Runka, G.G., 1973. Methodology - Land Capability for Agriculture - B.C. Land Inventory (CLI). Soil Survey Division, B.C. Dept. of Agriculture, Kelowna. 25 pp.

AGRICULTURE CAPABILITY MAPS ARE AVAILABLE FROM:

The Map Library, Assessment and Planning Division, Ministry of Environment, Victoria, British Columbia V8V 1X4.

6. Credits

Mapped by:

Date mapped:

Date and scale of photography:

Drafted by Cartography Section, Terrestrial Studies Branch, Ministry of Environment.

Date drafted:

Revised:

Base map provided by Surveys and Mapping Branch, Ministry of Environment, Victoria, B.C.

10.2 Regional Scale Maps

**Project
Area of Interest
1:250,000**

Legend

 **Cooks Ferry
Indian Band
Indian Reserves**

Ashcroft

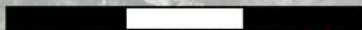


Basque Ranch

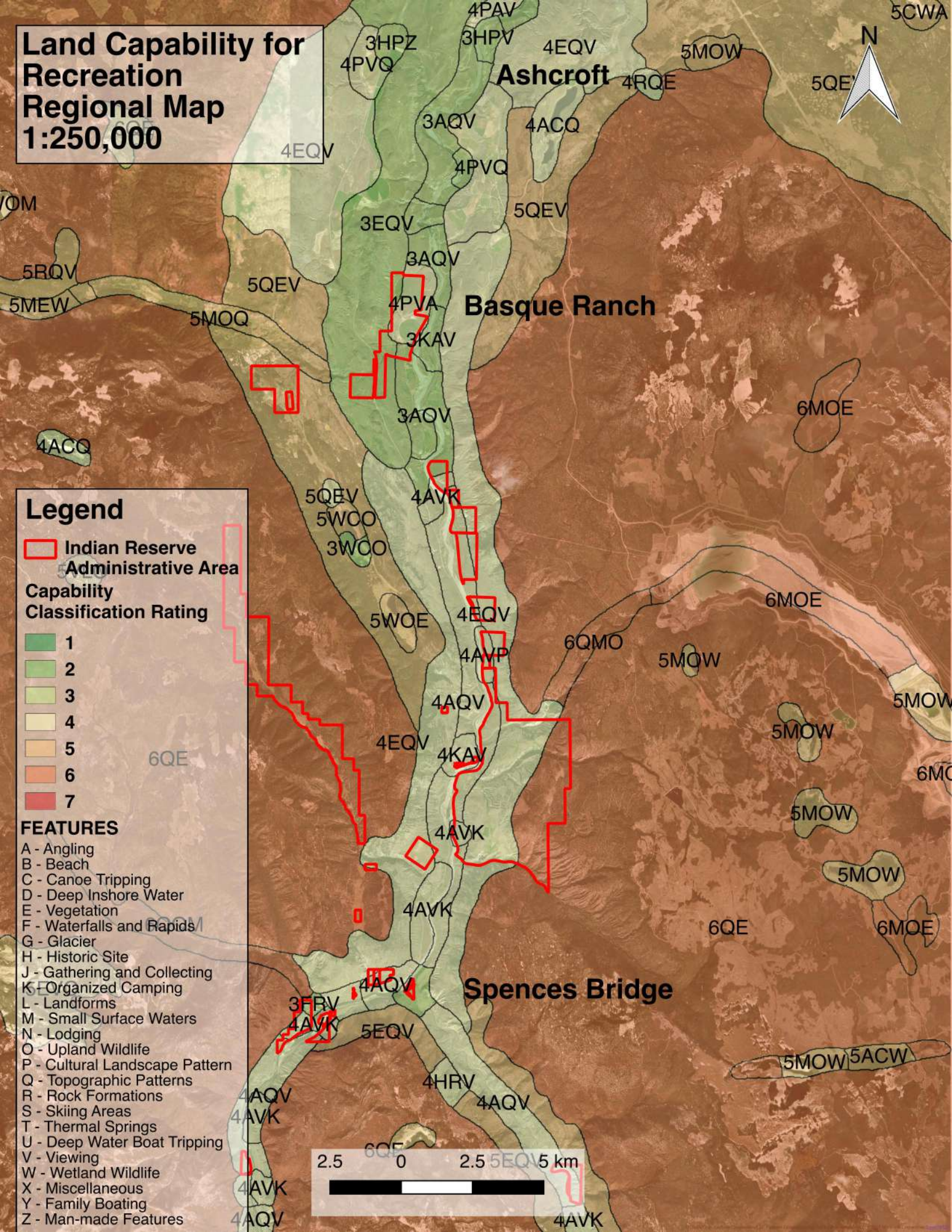
Highland Valley Copper

Spences Bridge / Cooks Ferry

2.5 0 2.5 5 km



Land Capability for Recreation Regional Map 1:250,000



Land Capability for Waterfowl Regional Map - 1:250,000



4JZ 5JZN
3JN

5TJZ

Ashcroft

5JZ

Basque Ranch

6NZ

5TJ

Legend

Indian Reserve
Administrative Area

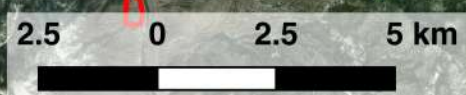
Capability Classification Rating

- 1
- 2
- 3
- 3M
- 4
- 5
- 6
- 7

SUBCLASSES

- A - Aridity
- B - Free-flowing water
- C - Adverse climate
- F - Low fertility
- G - Poor landform
- I - Inundation, excessive water level fluctuation
- J - Reduced marsh edge
- M - Excessive or deficient soil moisture
- N - Adverse soil and water characteristics
- R - Restrictive soil depth
- T - Adverse topography, excessive steepness, flatness
- Z - Water depth restriction

Note: No Class 7 is shown for simplicity



Spences Bridge

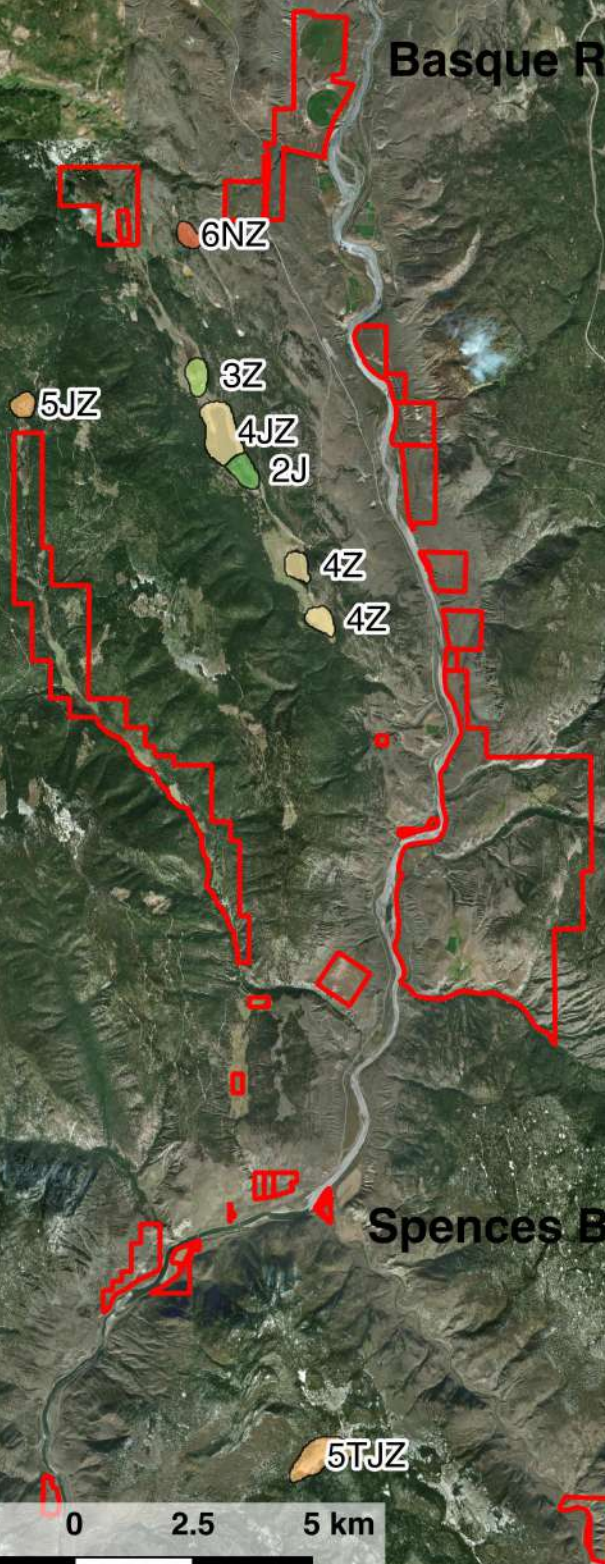
5TJZ

5JZ

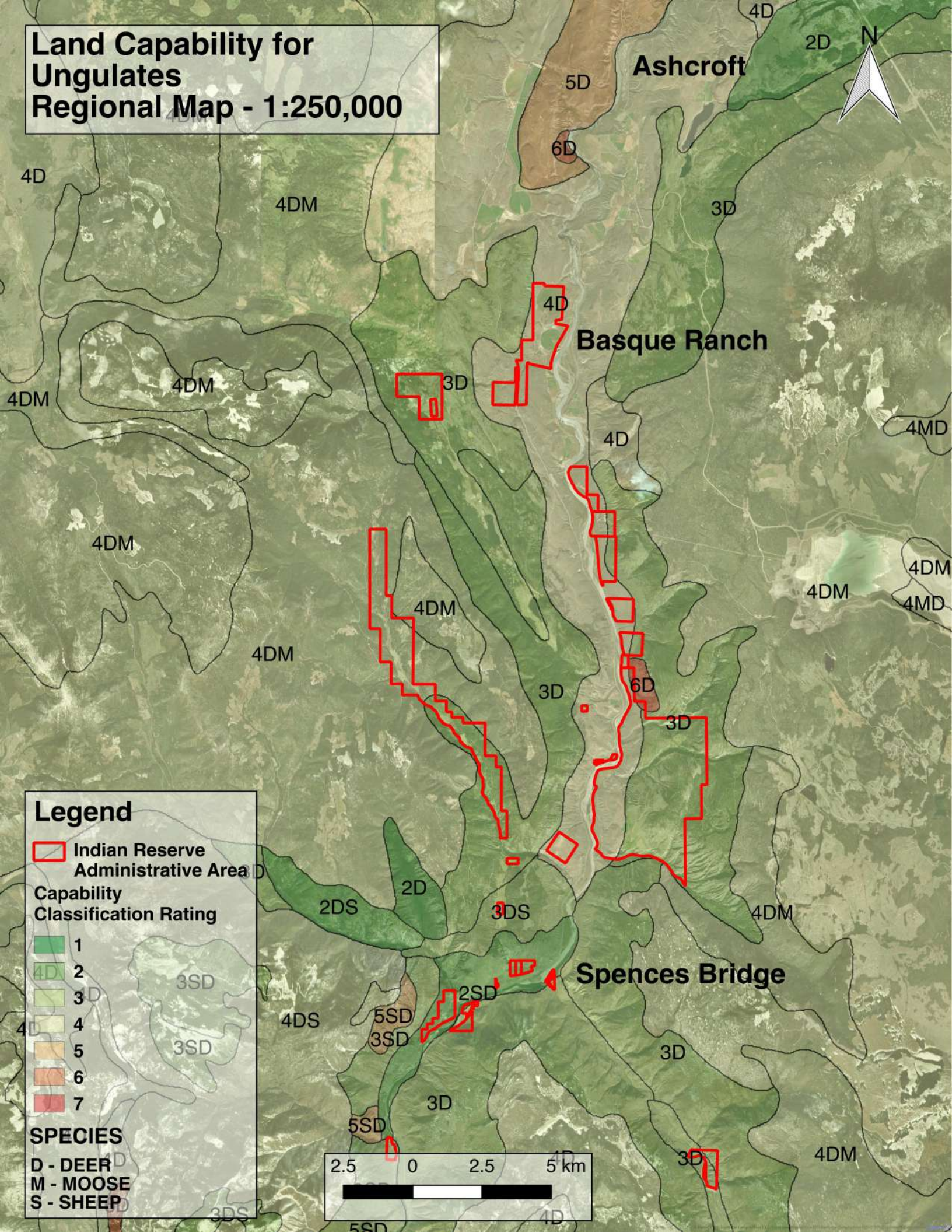
5JZ

5JZ

5JZ



Land Capability for Ungulates Regional Map - 1:250,000



Land Capability for Forestry Regional Map - 1:200,000



Basque Ranch

Spences Bridge

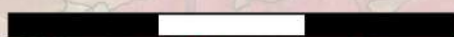
Legend

 Indian Reserve
Administrative Area

Capability
Classification
Rating

-  1
-  2
-  3
-  4
-  5
-  6
-  7
-  Non Commercial
Species
-  No Data

2.5 0 2.5 5 km



Unimproved Land Capability for Agriculture Regional Map - 1:250,000

Ashcroft

Basque Ranch

Spences Bridge

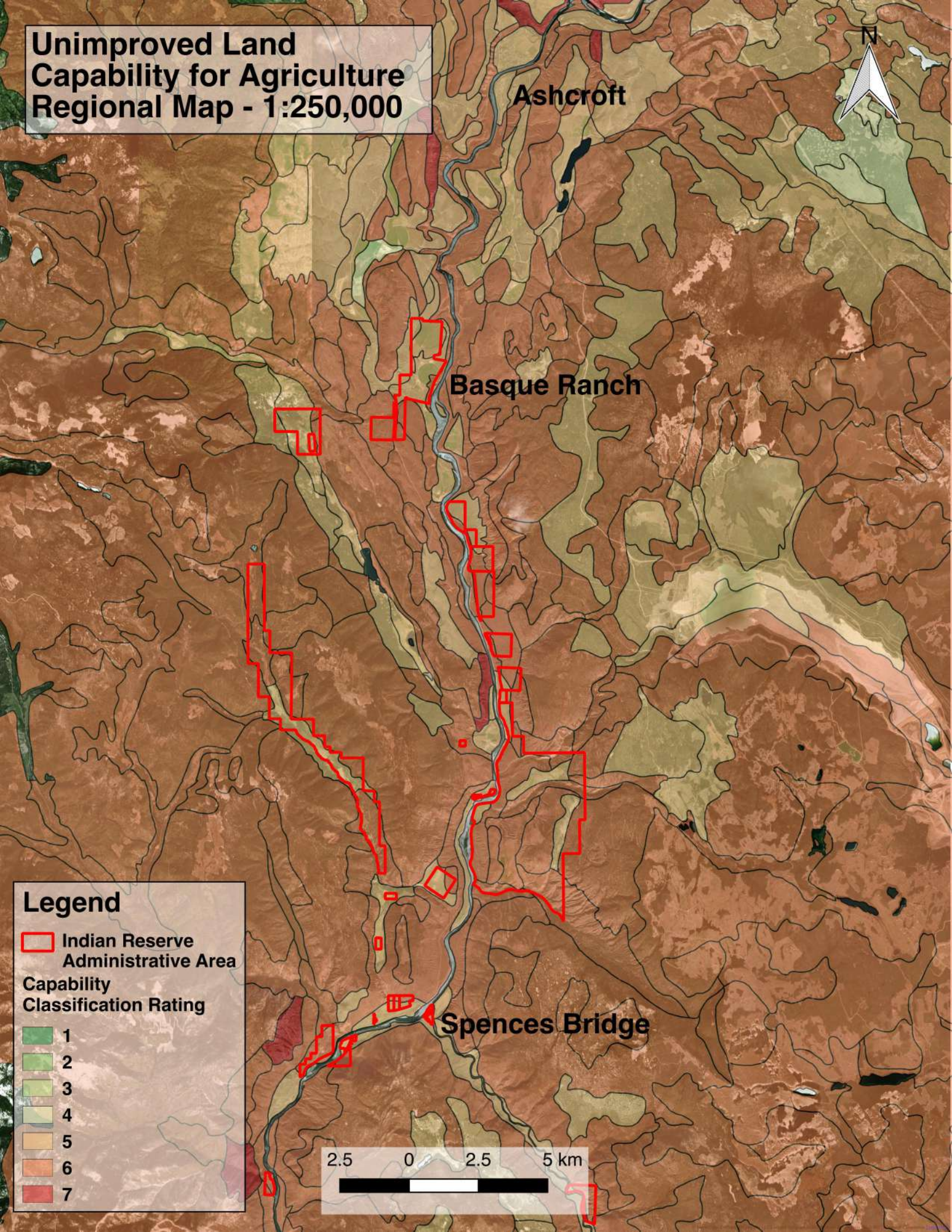
Legend

 Indian Reserve
Administrative Area

Capability
Classification Rating

-  1
-  2
-  3
-  4
-  5
-  6
-  7

2.5 0 2.5 5 km



Improved Land Capability for Agriculture Regional Map - 1:250,000

Ashcroft

Basque Ranch

Spences Bridge

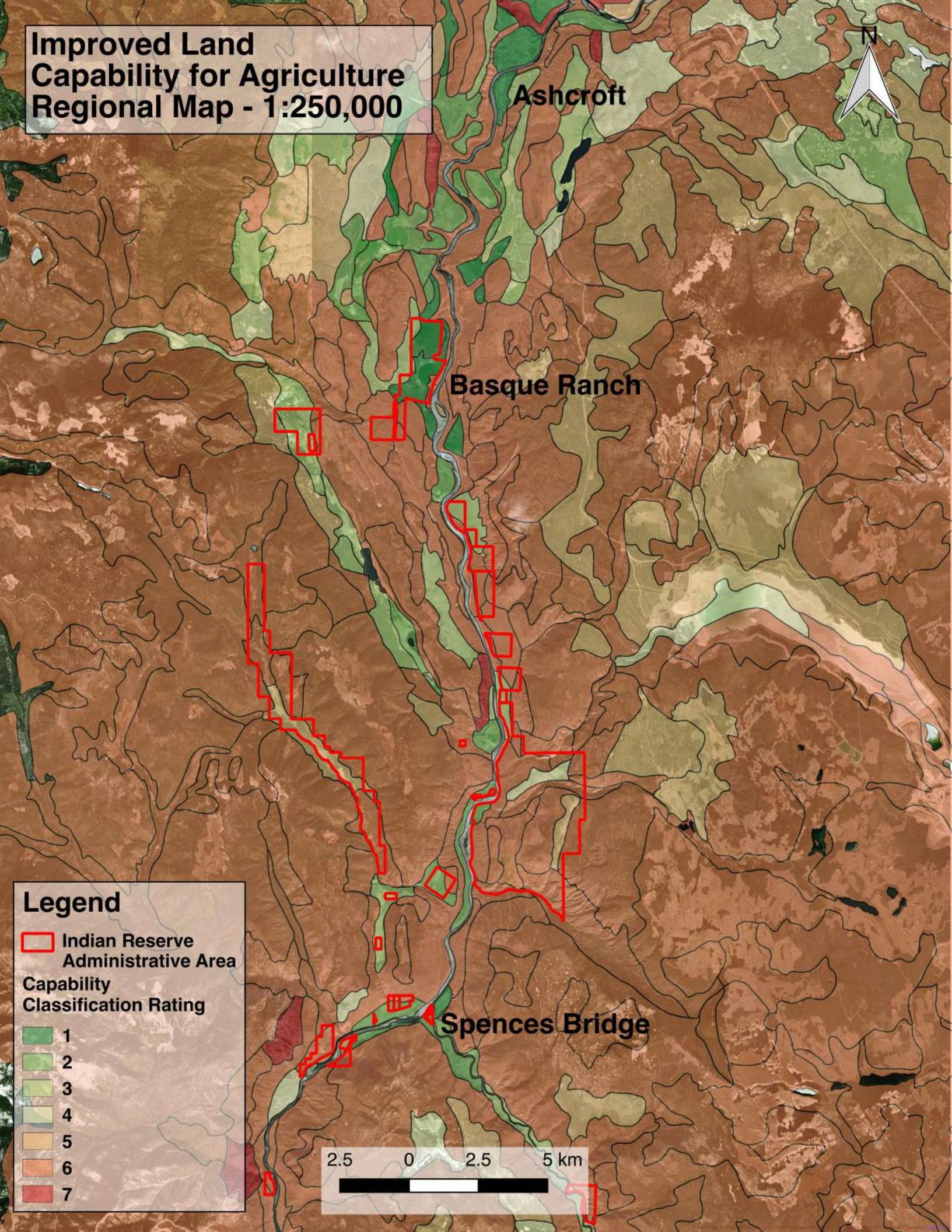
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 Indian Reserve
Administrative Area

Capability
Classification Rating

-  1
-  2
-  3
-  4
-  5
-  6
-  7

2.5 0 2.5 5 km



Unimproved Land Capability for Agriculture Spences Bridge Regional Map - 1:125,000

Legend

- Indian Reserve Administrative Area
- Capability Classification Rating
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7

Spences Bridge

Map scale: 2.5 0 5 km

Unimproved Land Capability for Agriculture Spences Bridge Regional Map - 1:125,000

Legend

- Indian Reserve Administrative Area
- Capability Classification Rating
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6

Spences Bridge

2.5 0 5 km

Unimproved Land Capability for Agriculture Spences Bridge Regional Map - 1:125,000

Legend

Indian Reserve Administrative Area

Capability Classification Rating

1
2
3
4
5
6
7

Scale: 2.5 0 5 km

Unimproved Land Capability for Agriculture Spences Bridge Regional Map - 1:125,000

Legend

- Indian Reserve Administrative Area
- Capability Classification Rating
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6

Spences Bridge

2.5 0 5 km

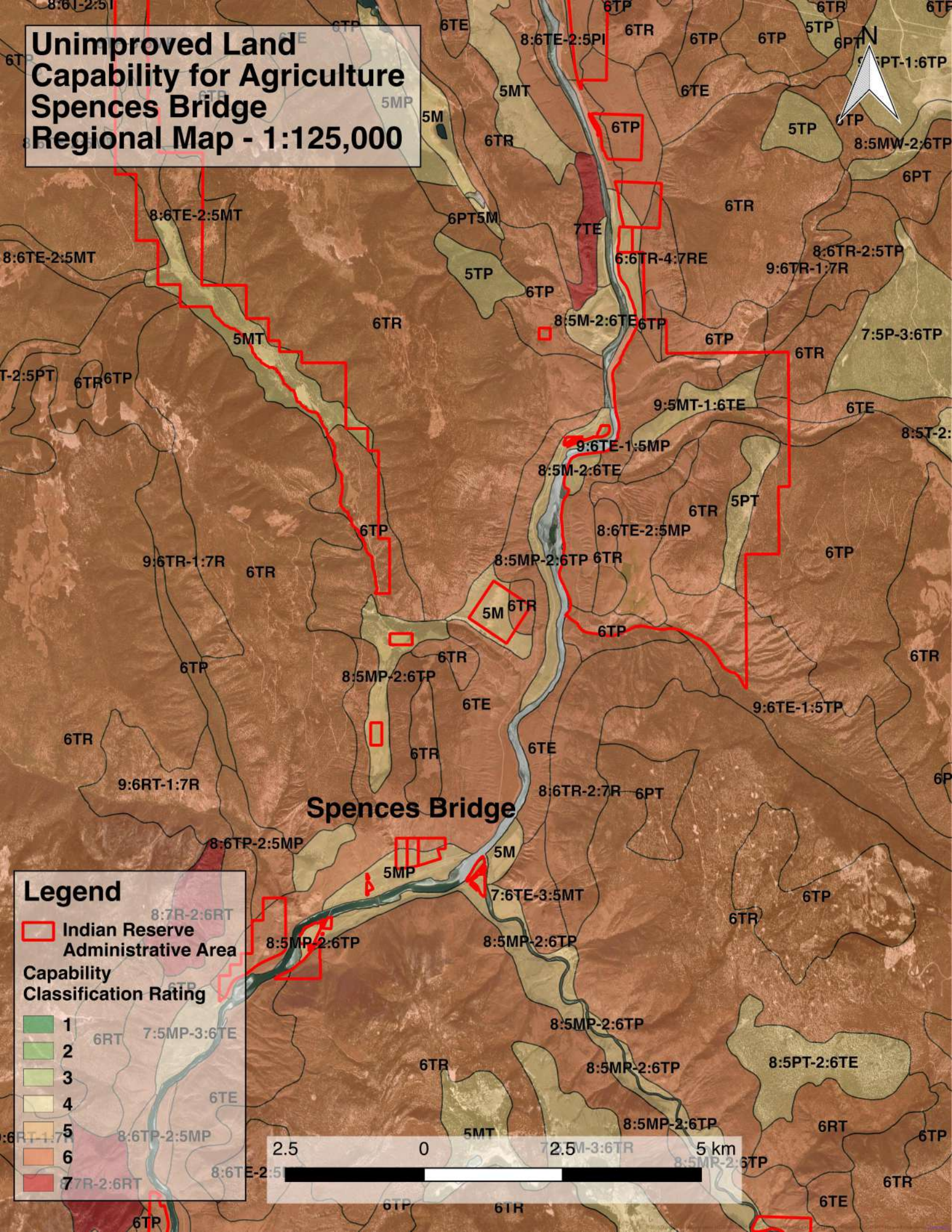
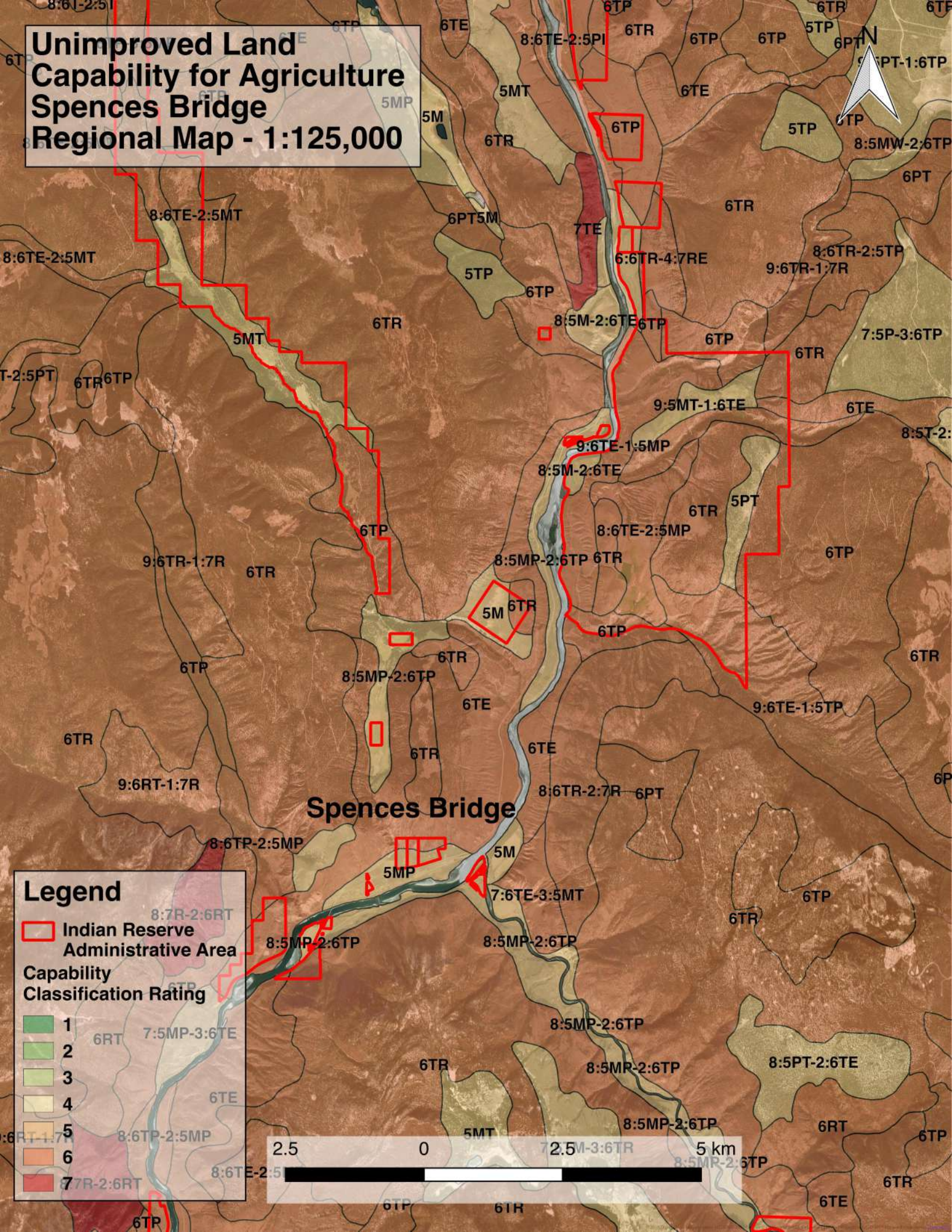
Unimproved Land Capability for Agriculture Spences Bridge Regional Map - 1:125,000

Legend

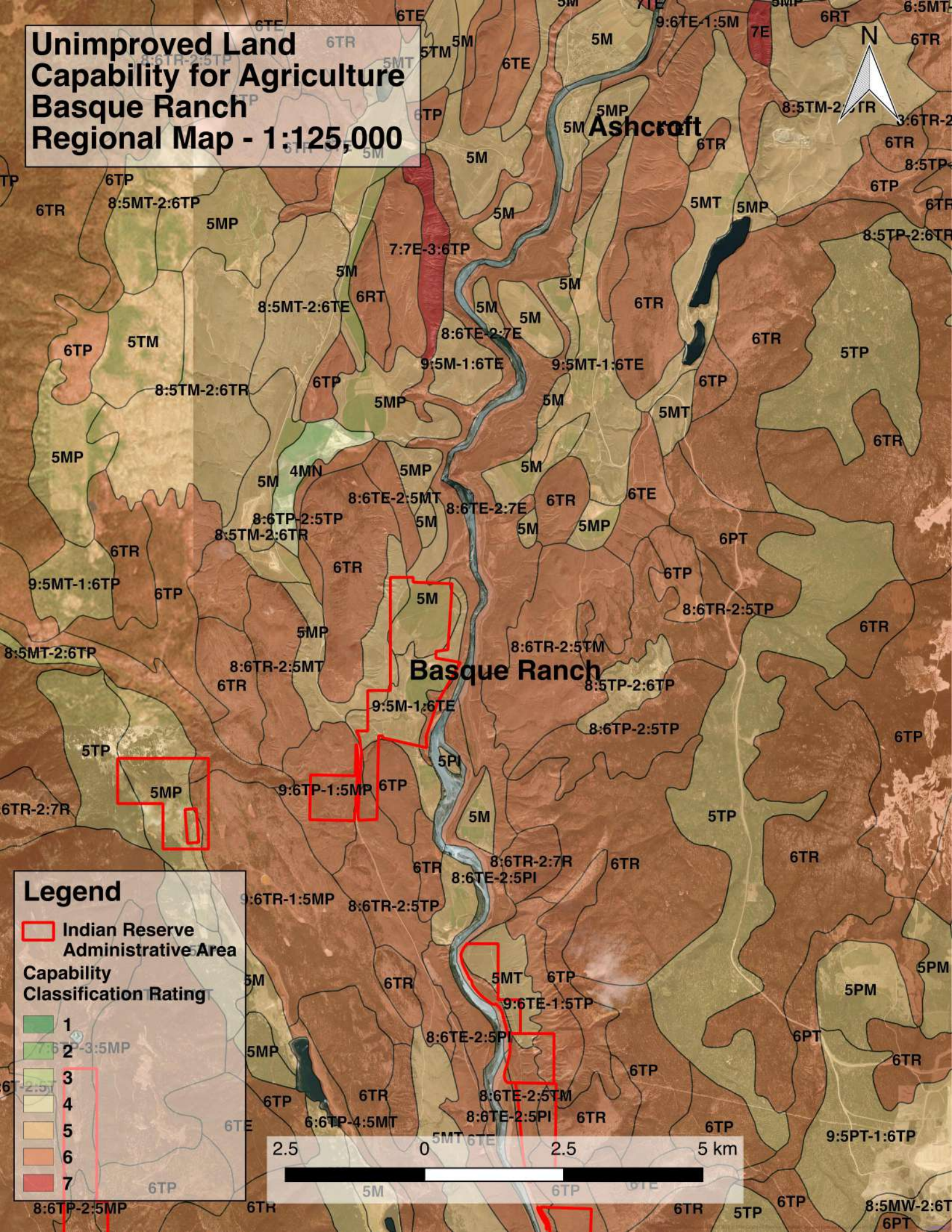
- Indian Reserve Administrative Area
- Capability Classification Rating
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6

Spences Bridge

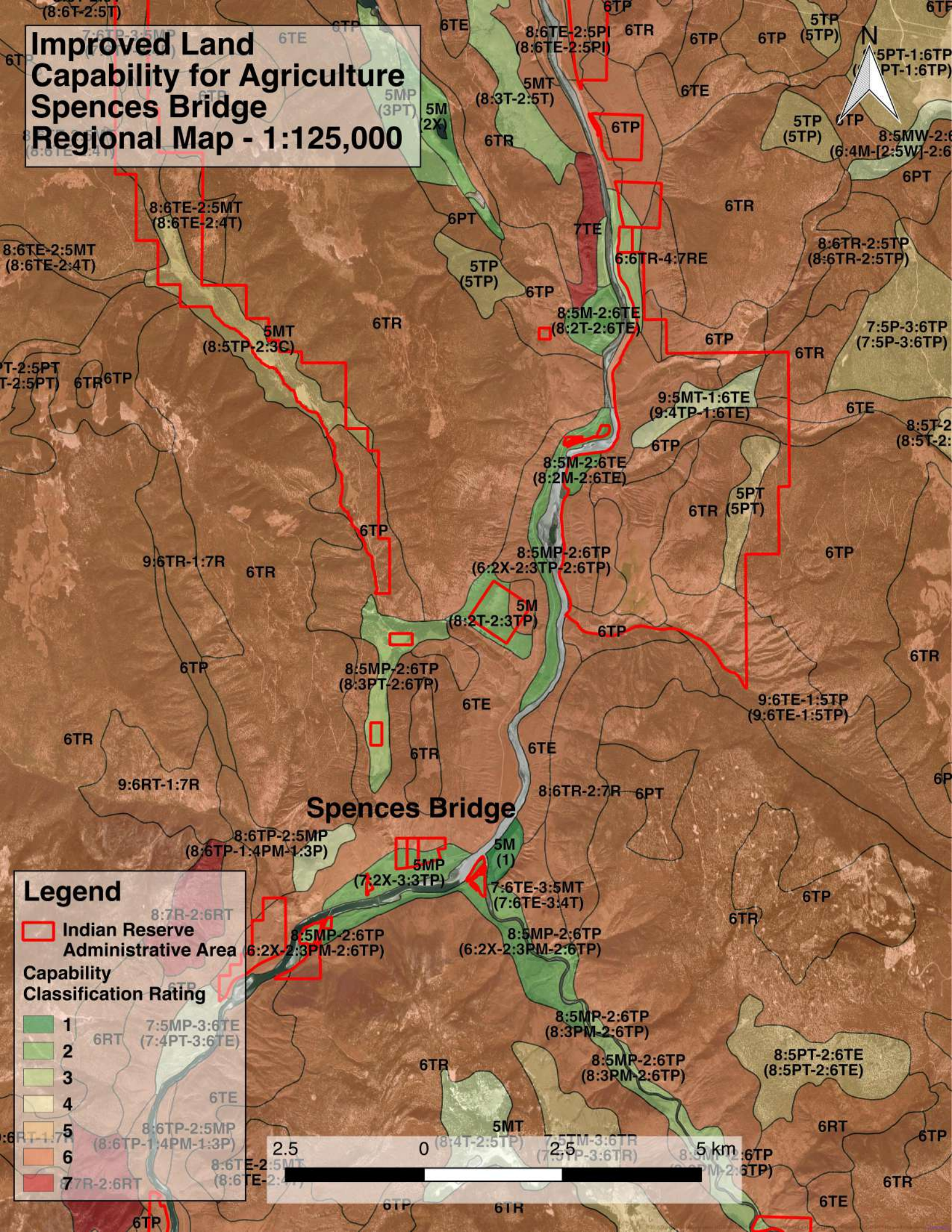
2.5 0 5 km



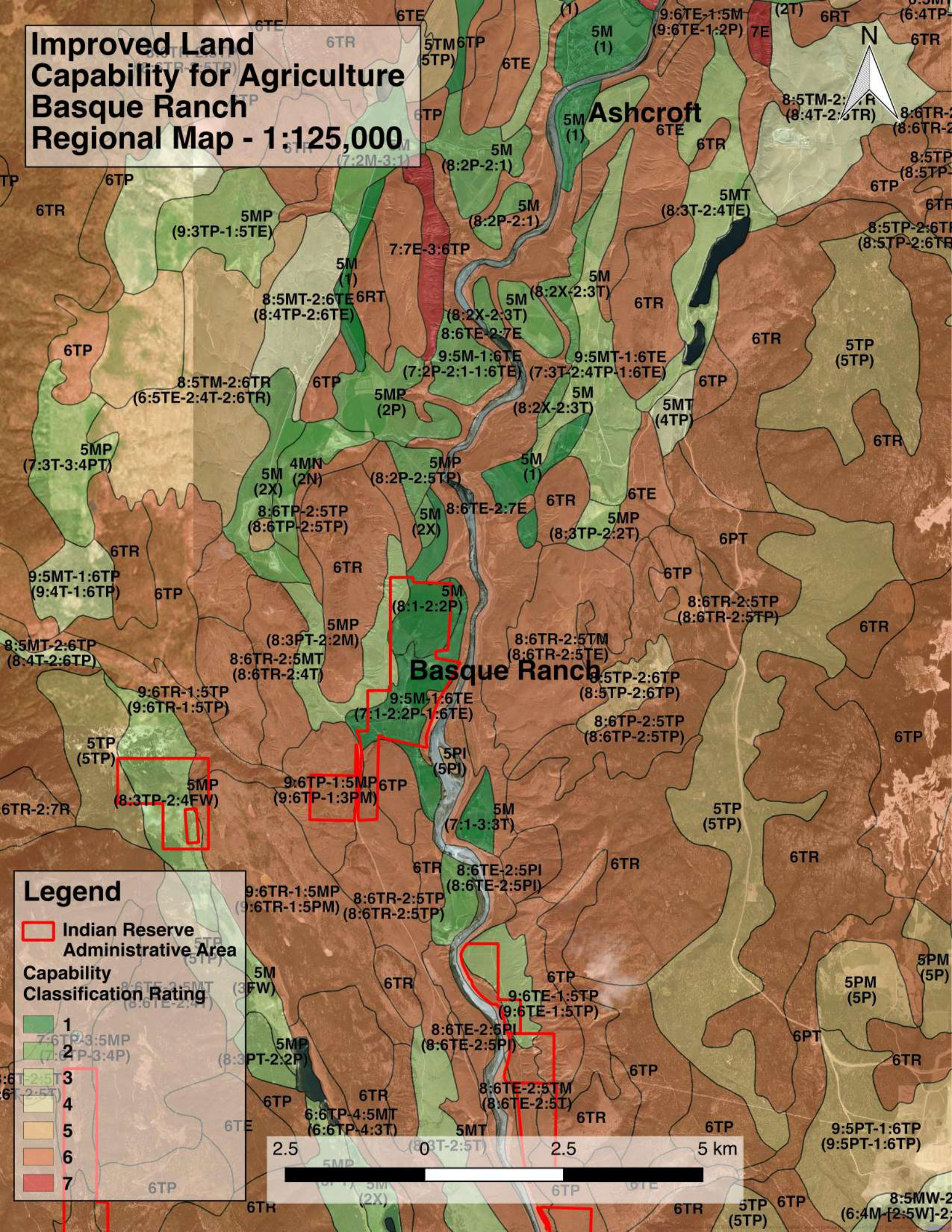
Unimproved Land Capability for Agriculture Basque Ranch Regional Map - 1:125,000



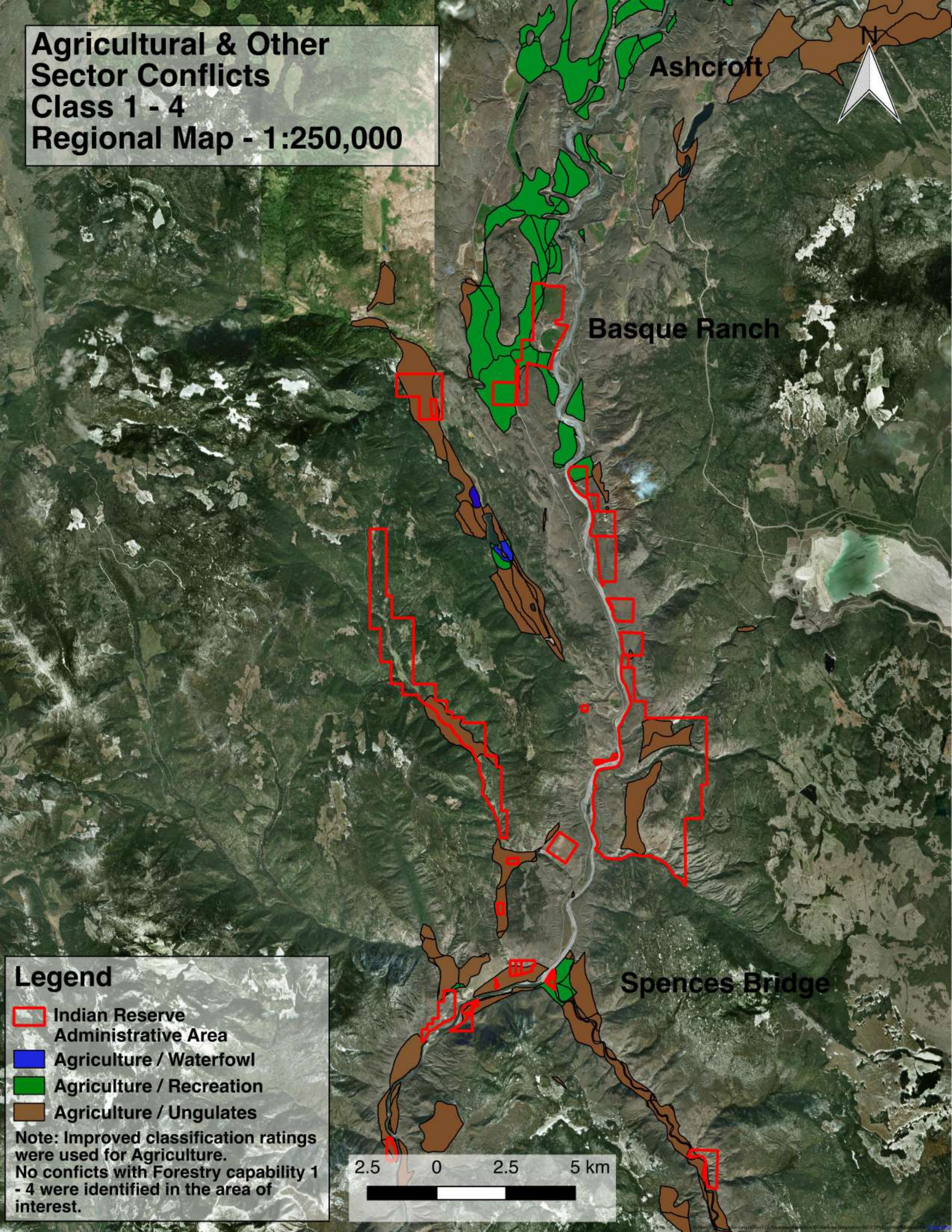
Improved Land Capability for Agriculture Spences Bridge Regional Map - 1:125,000



Improved Land Capability for Agriculture Basque Ranch Regional Map - 1:125,000



**Agricultural & Other
Sector Conflicts
Class 1 - 4
Regional Map - 1:250,000**



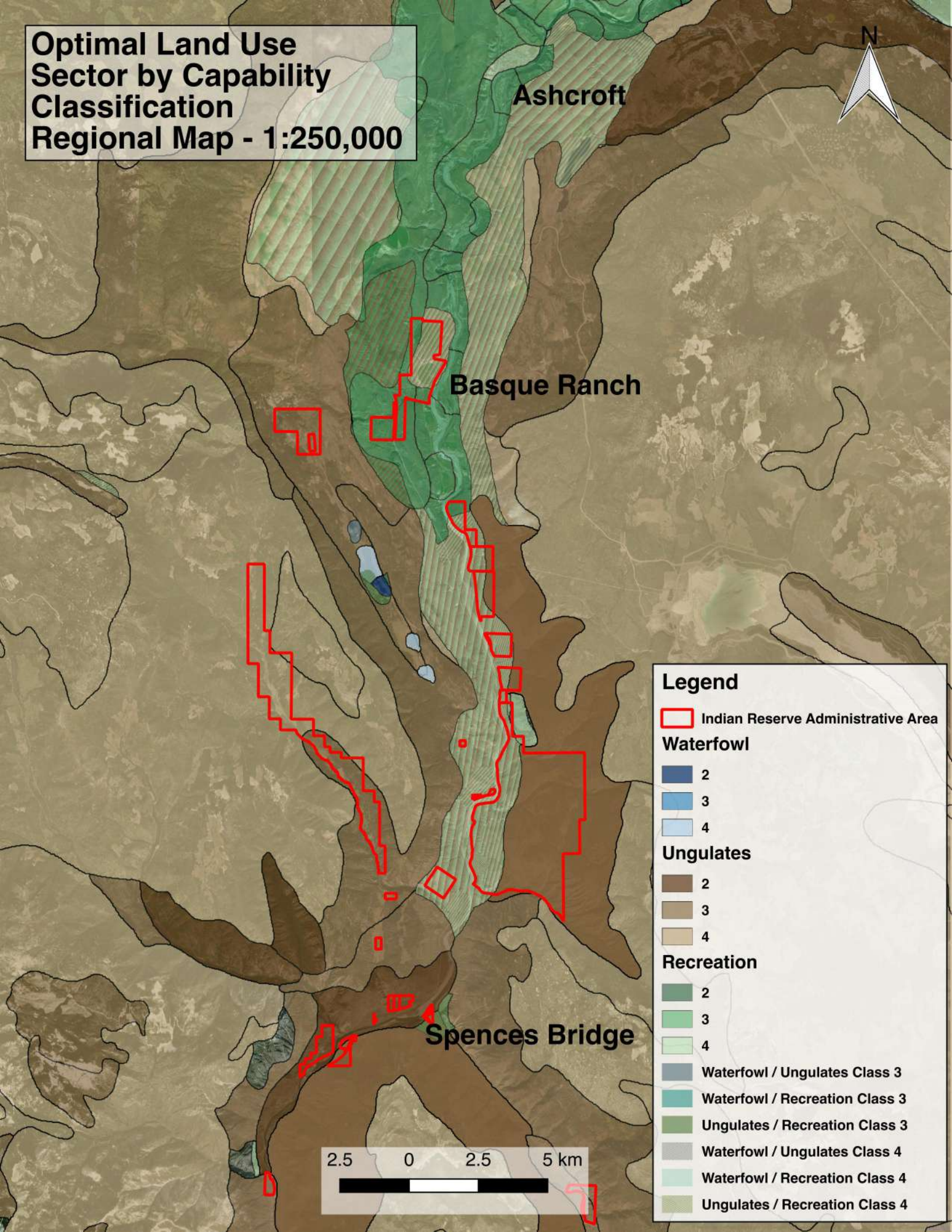
Legend

- Indian Reserve Administrative Area
- Agriculture / Waterfowl
- Agriculture / Recreation
- Agriculture / Ungulates

Note: Improved classification ratings were used for Agriculture.
No conflicts with Forestry capability 1 - 4 were identified in the area of interest.

2.5 0 2.5 5 km

**Optimal Land Use
Sector by Capability
Classification
Regional Map - 1:250,000**



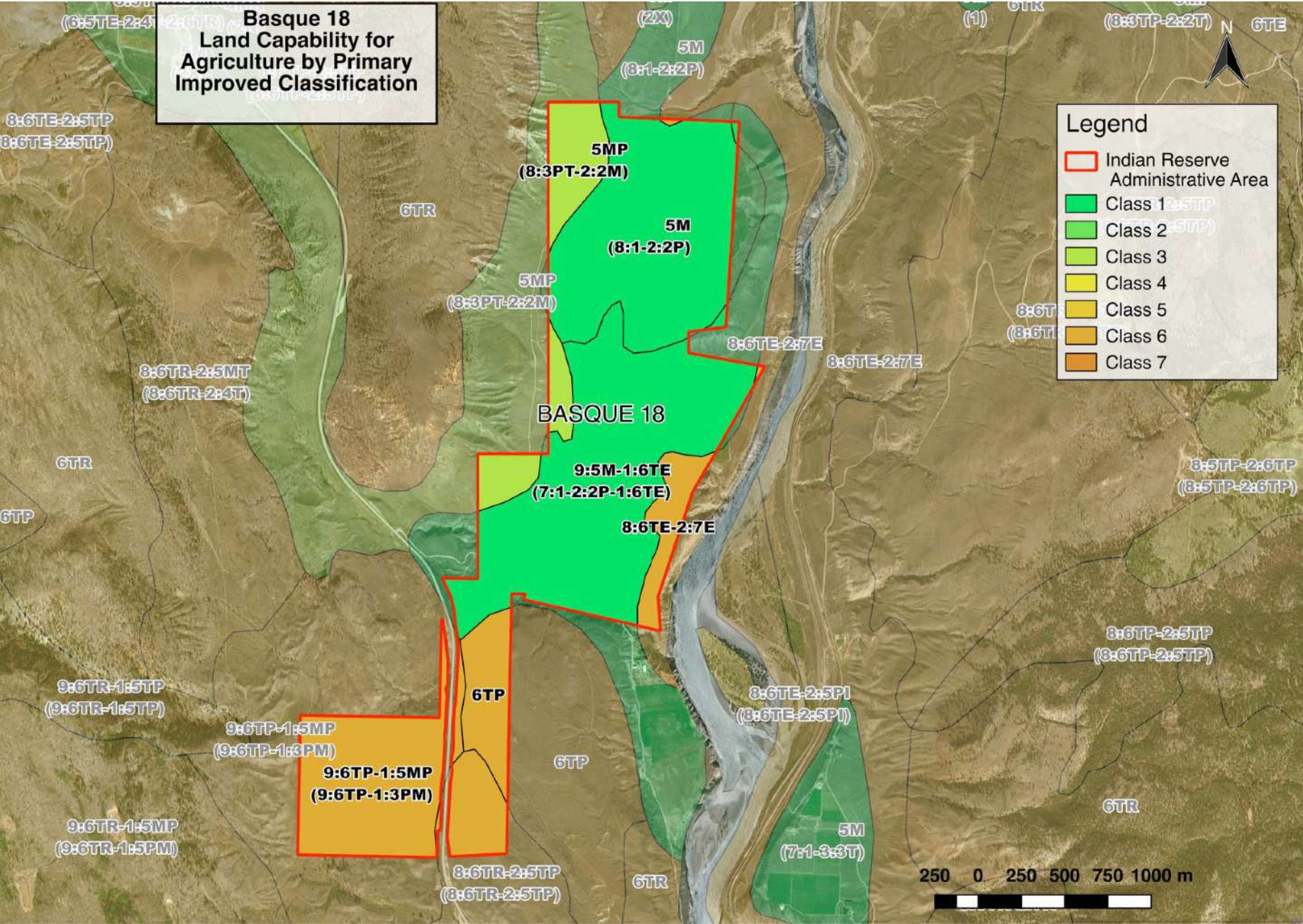
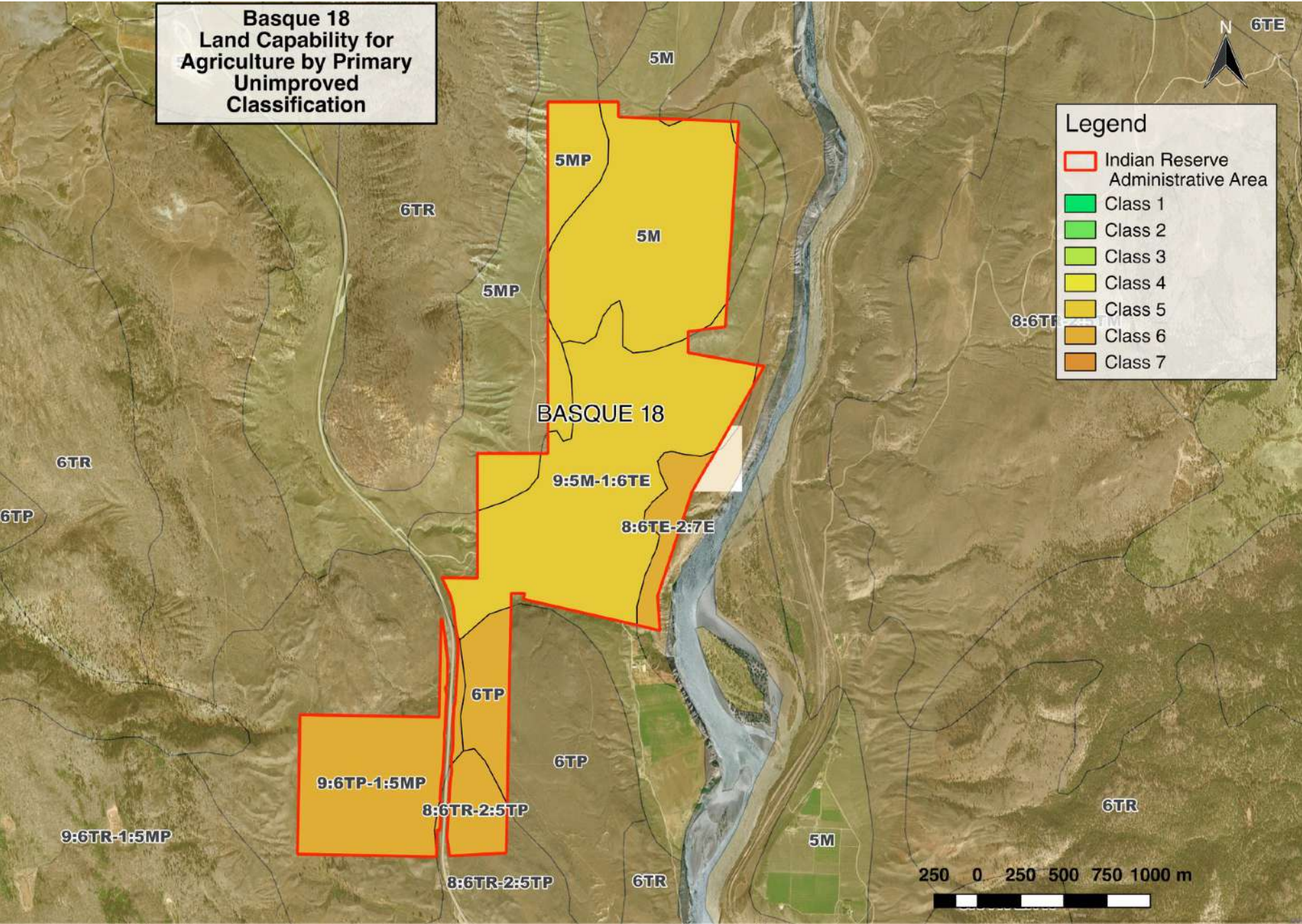
10.3 CFIB Indian Reserve Agricultural Capability Detailed Maps

The pages in this appendix include two maps for each Indian Reserve (IR); one illustrating the dominant unimproved capability classification rating, and the other the dominant improved capability classification rating. Charts, tables, and a brief summary are included that show the breakdown of the information included in the Canada Land Inventory survey. For further description of the classes and subclasses, please refer to Appendix 9.1 or 9.4.

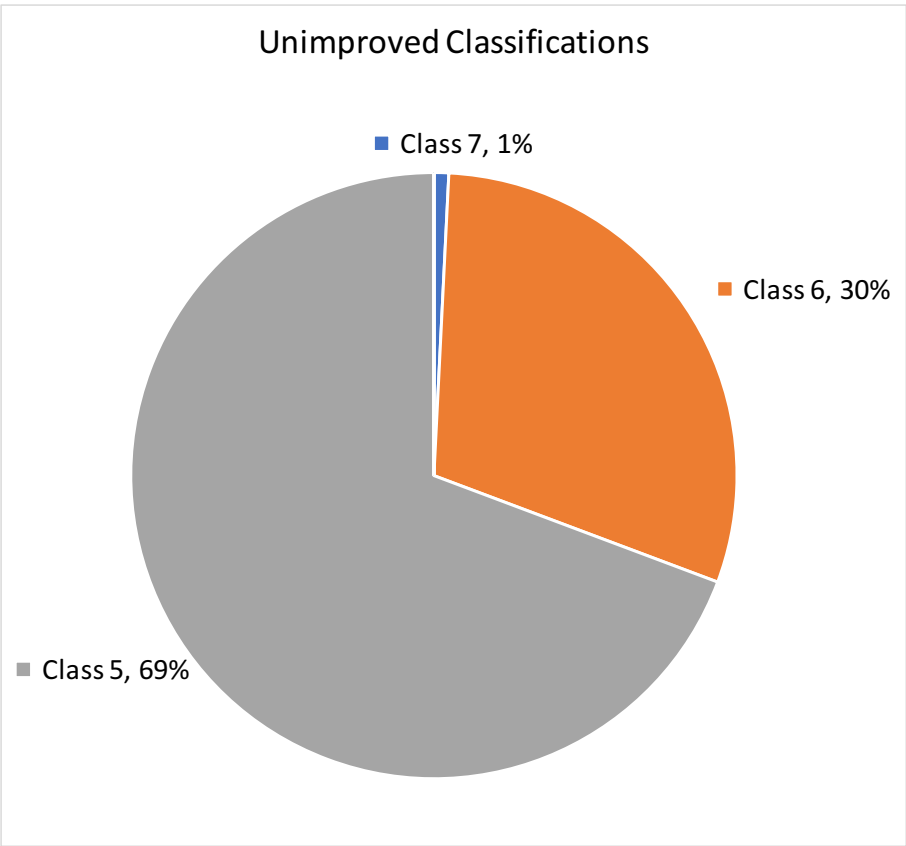
The following Indian Reserves are included:

- Basque 18
- Entlqwekkinh 19
- Kloklowuck 7
- Kumcheen 1
- Nicoelton 6
- Pemynoos 9
- Shawniken 3
- Shpapzchinh
- Skoonkoon 2
- Spatsum 11
- Spatsum 11A
- Spences Bridge 4

The maps are presented at a variety of scales to best fit the IR on the map. The Canada Land Inventory mapping was completed at a scale of 1:50,000, therefore some of the smaller IRs were not enlarged to retain the accuracy of the original scale.

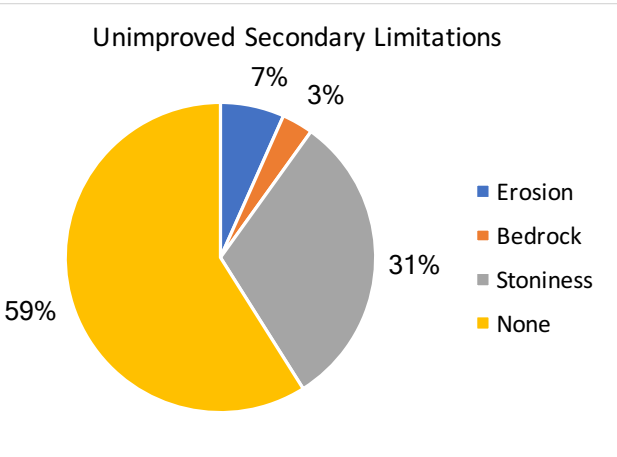
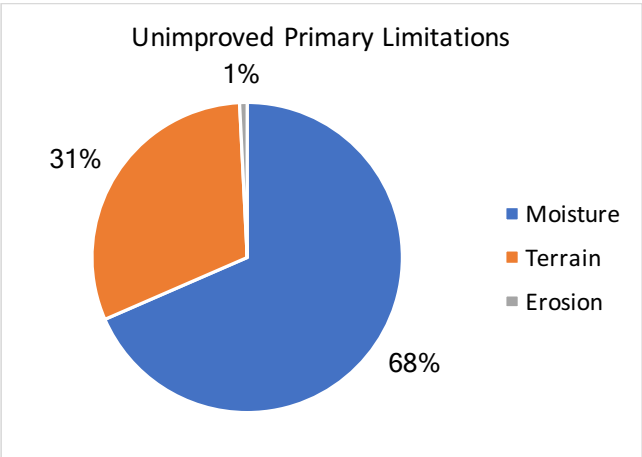


Unimproved Classifications and Limitations



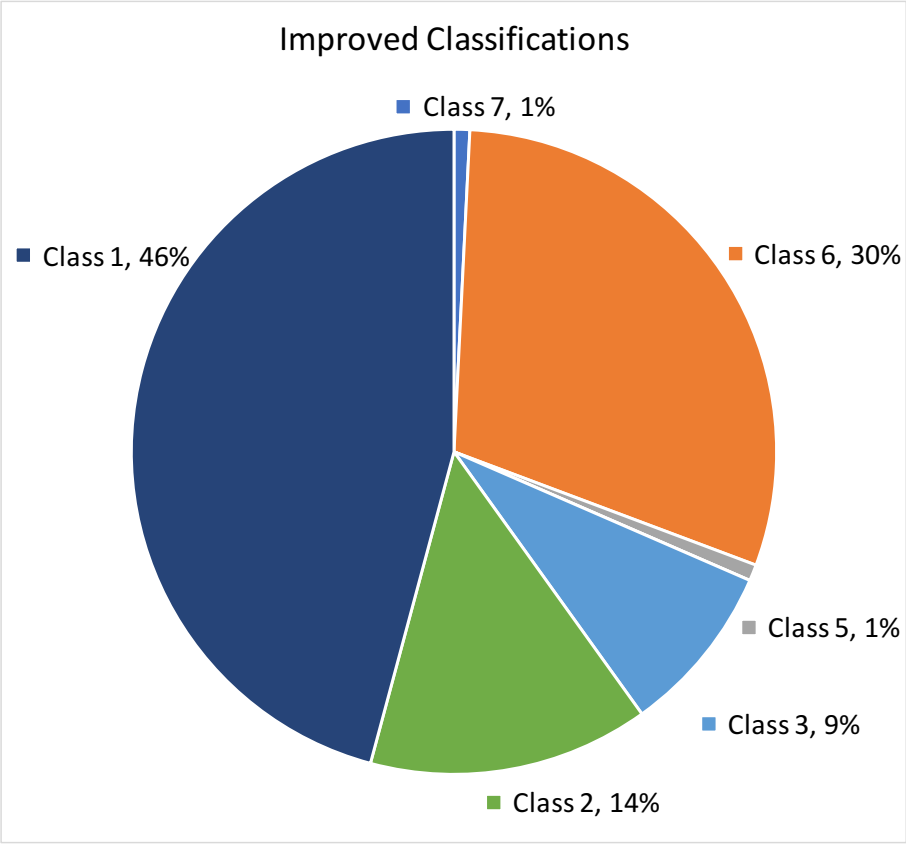
With 69% Class 5 and 30% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Basque 18 IR, the most significant limitation is moisture. Terrain and stoniness are the next most important limitations. Much of the land that is limited by moisture does not have other limitations, meaning significant improvements can be made through irrigation (see Improved). Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 and 7 lands are generally not considered improvable.



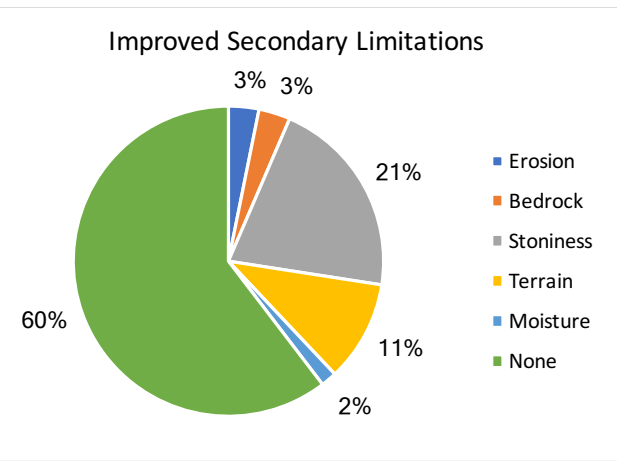
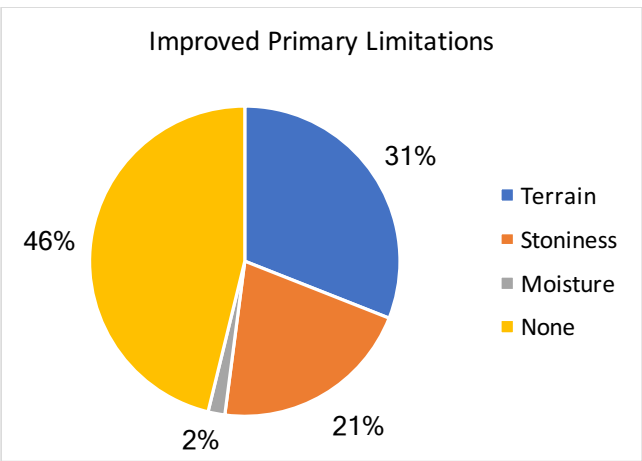
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	68%	297
Terrain	31%	133
Erosion	1%	3
Secondary Limitation		
Erosion	7%	29
Bedrock	3%	14
Stoniness	31%	135
None	59%	255
Rating		
Class 7	1%	3
Class 6	30%	130
Class 5	69%	300
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

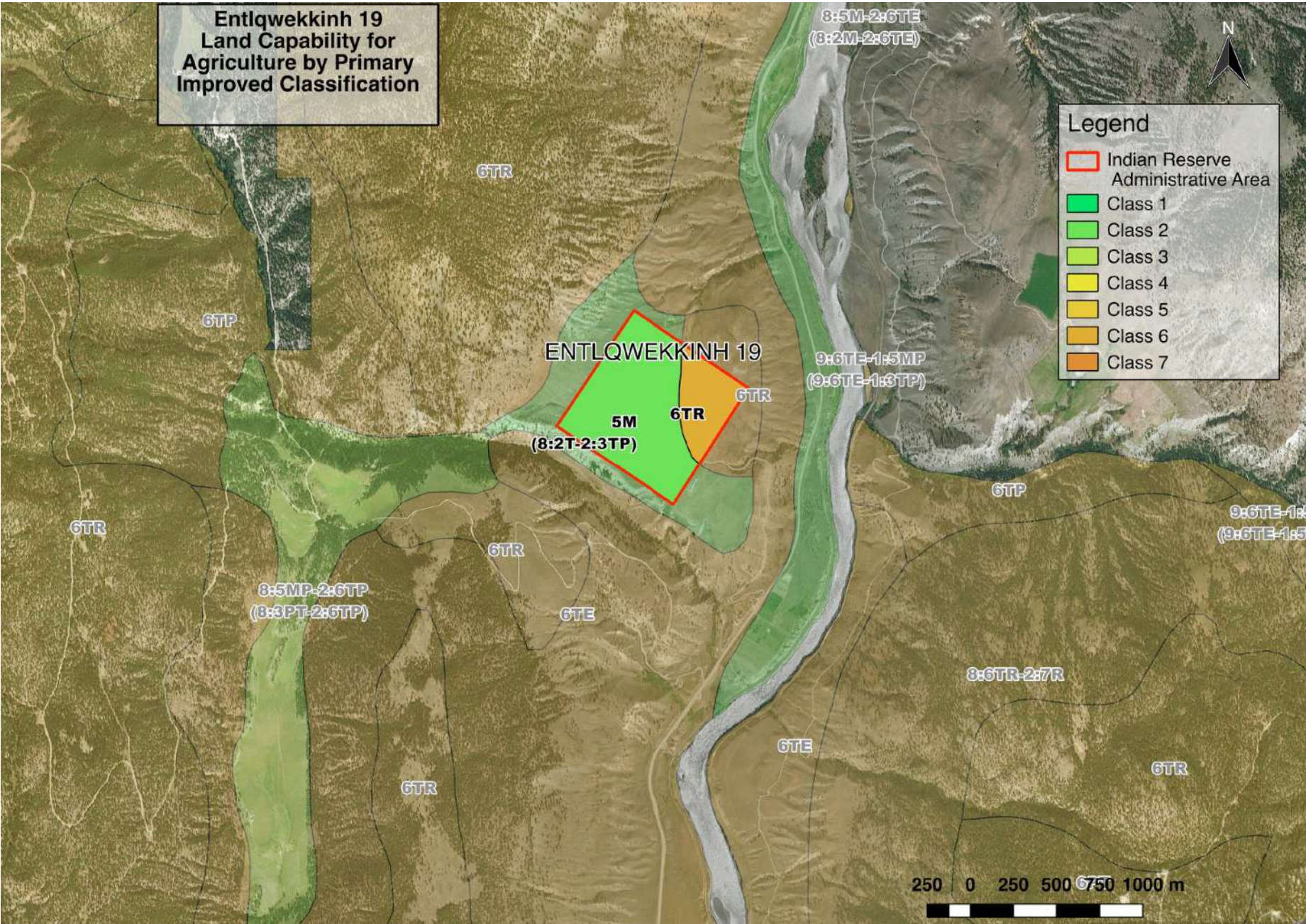
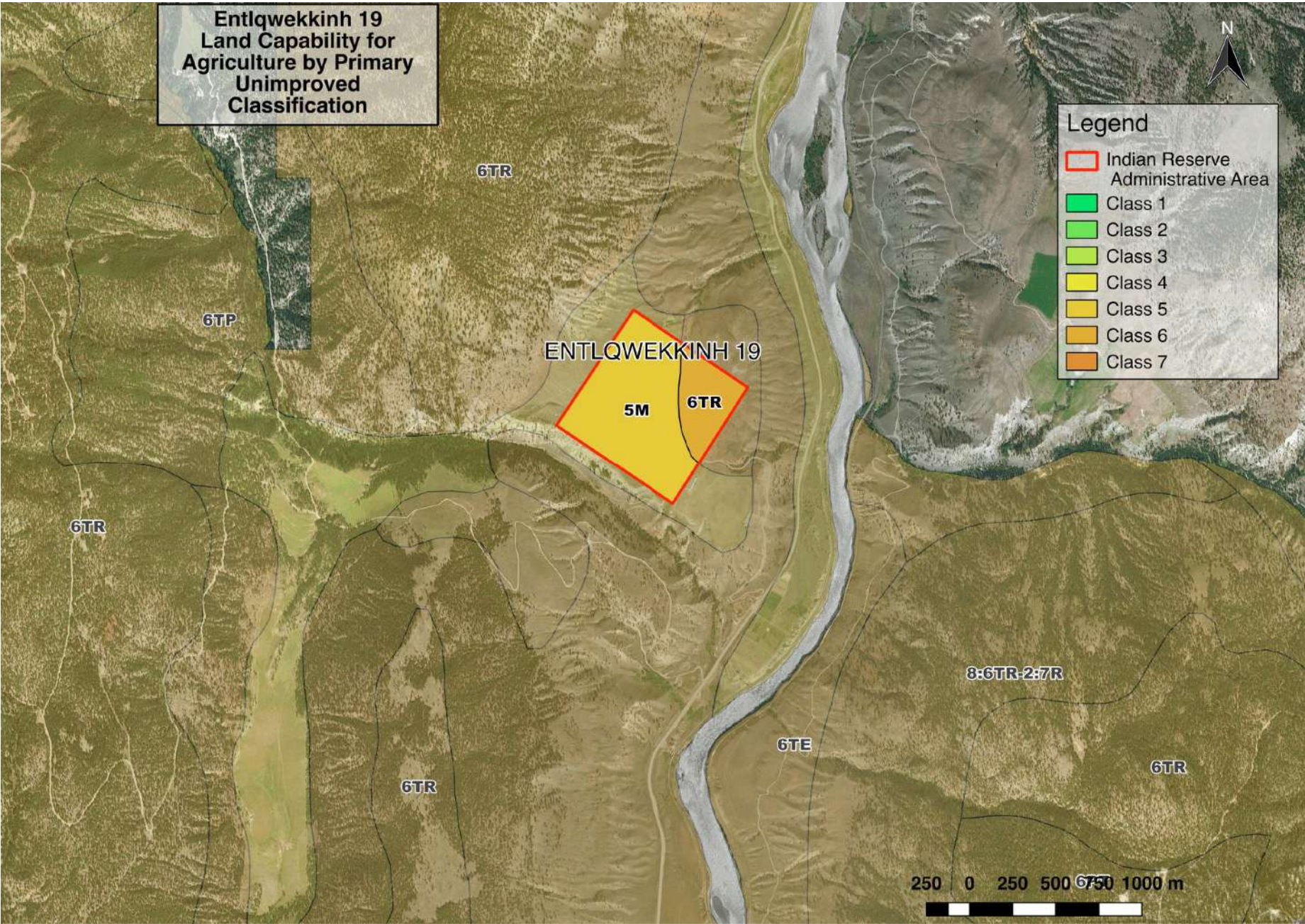


With 46% Class 1, 14% Class 2, and 9% Class 3 lands, this IR contains approximately 300 ha of high capability lands for agriculture for CFIB, when improved. This means under good management it is moderately high to high in productivity for a wide range of climatically adapted field crops.

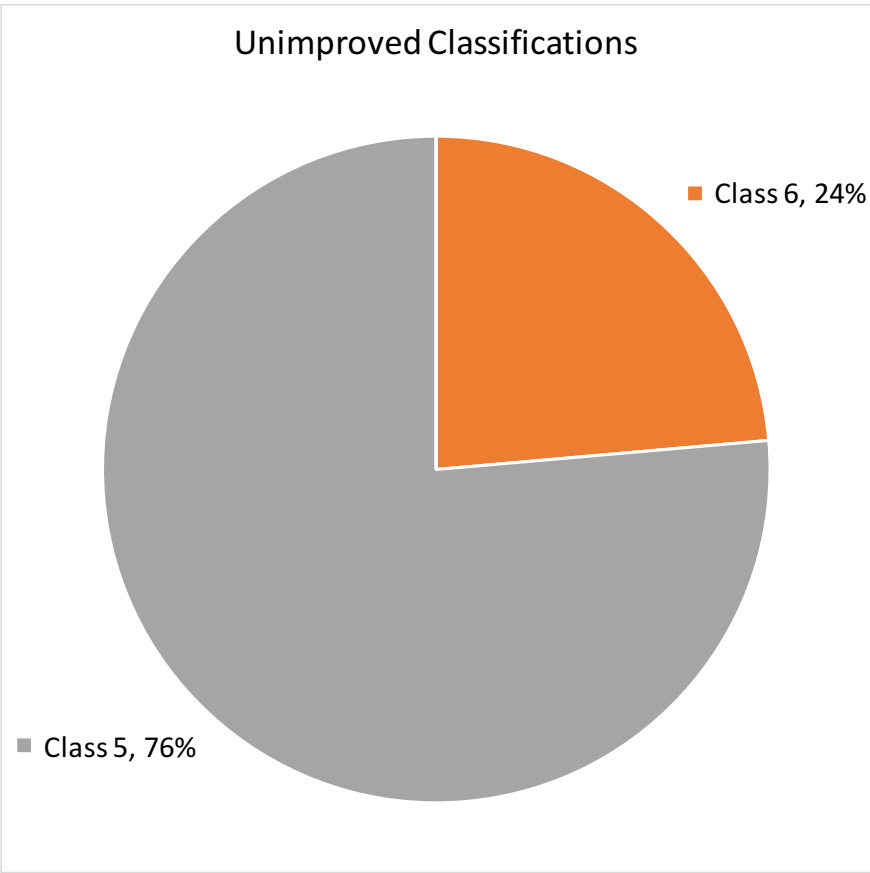
On the Basque 18 IR, the most significant limitation following improvements is terrain and stoniness. Once irrigated, 46% of the land no longer has any limitations. Terrain is a limitation that may not be improved, and results in Class 6 and 7 ratings at this site.



Improved	Percentage	Hectares
Primary Limitation		
Terrain	31%	133
Stoniness	21%	91
Moisture	2%	8
None	46%	199
Secondary Limitation		
Erosion	3%	14
Bedrock	3%	14
Stoniness	21%	90
Terrain	10%	45
Moisture	2%	7
None	60%	259
Rating		
Class 7	1%	3
Class 6	30%	130
Class 5	1%	4
Class 4	0%	0
Class 3	9%	37
Class 2	14%	61
Class 1	46%	199

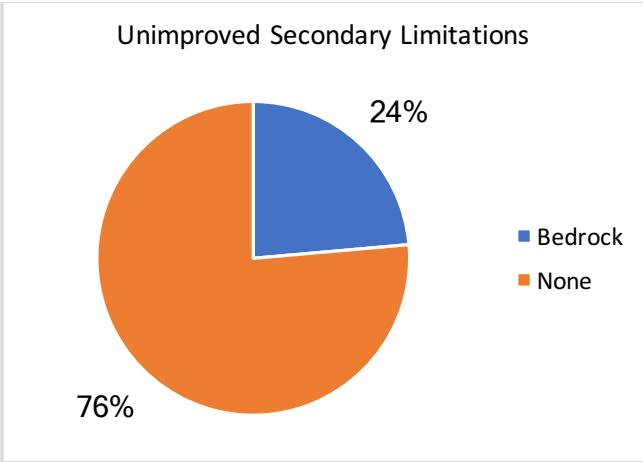
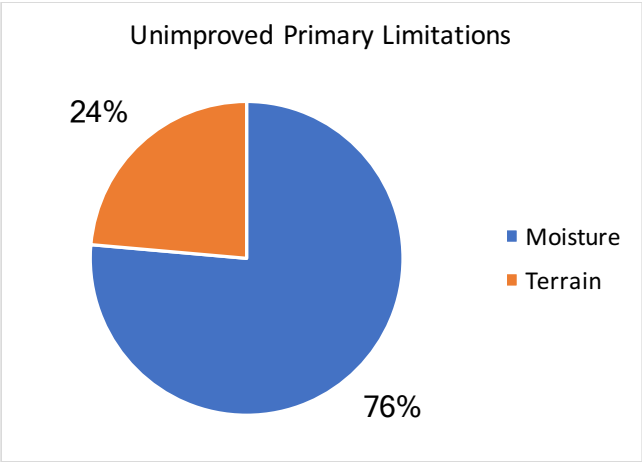


Unimproved Classifications and Limitations



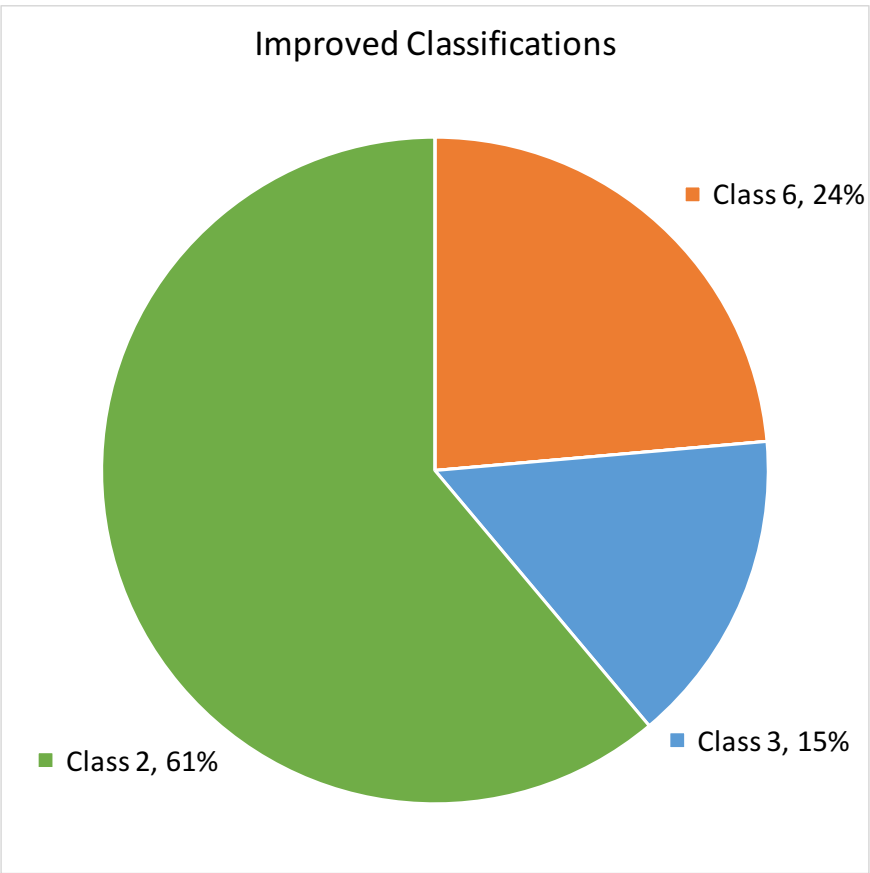
With 76% Class 5 and 24% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Entlqwekkinh 19 IR, the most significant limitation is moisture. Terrain and distance to bedrock are the next most important limitations. Much of the land that is limited by moisture is only marginally limited by terrain, meaning significant improvements can be made through irrigation (see Improved). Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



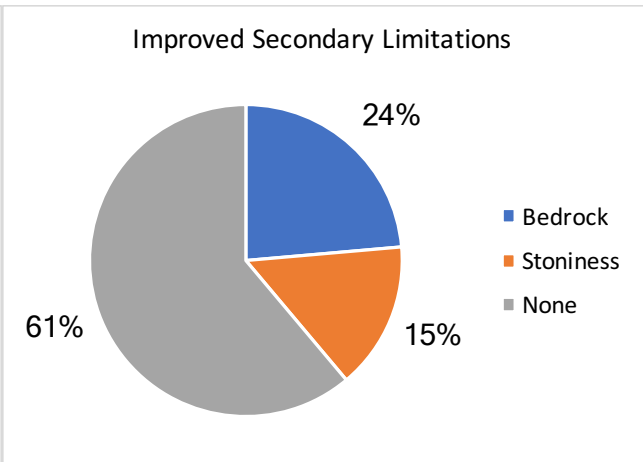
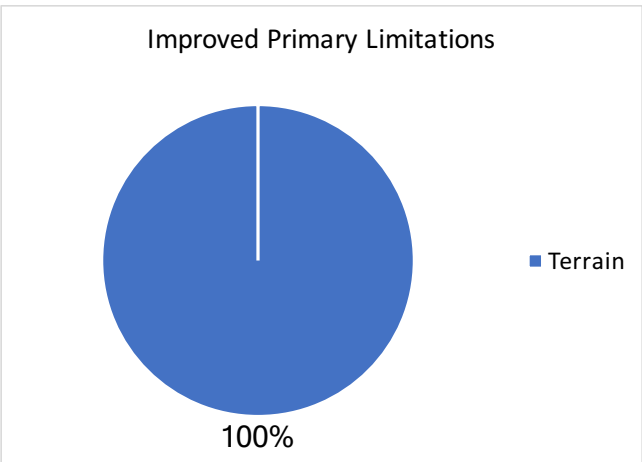
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	76%	50
Terrain	24%	15
Secondary Limitation		
Bedrock	24%	15
None	76%	50
Rating		
Class 7	0%	0
Class 6	24%	15
Class 5	76%	50
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

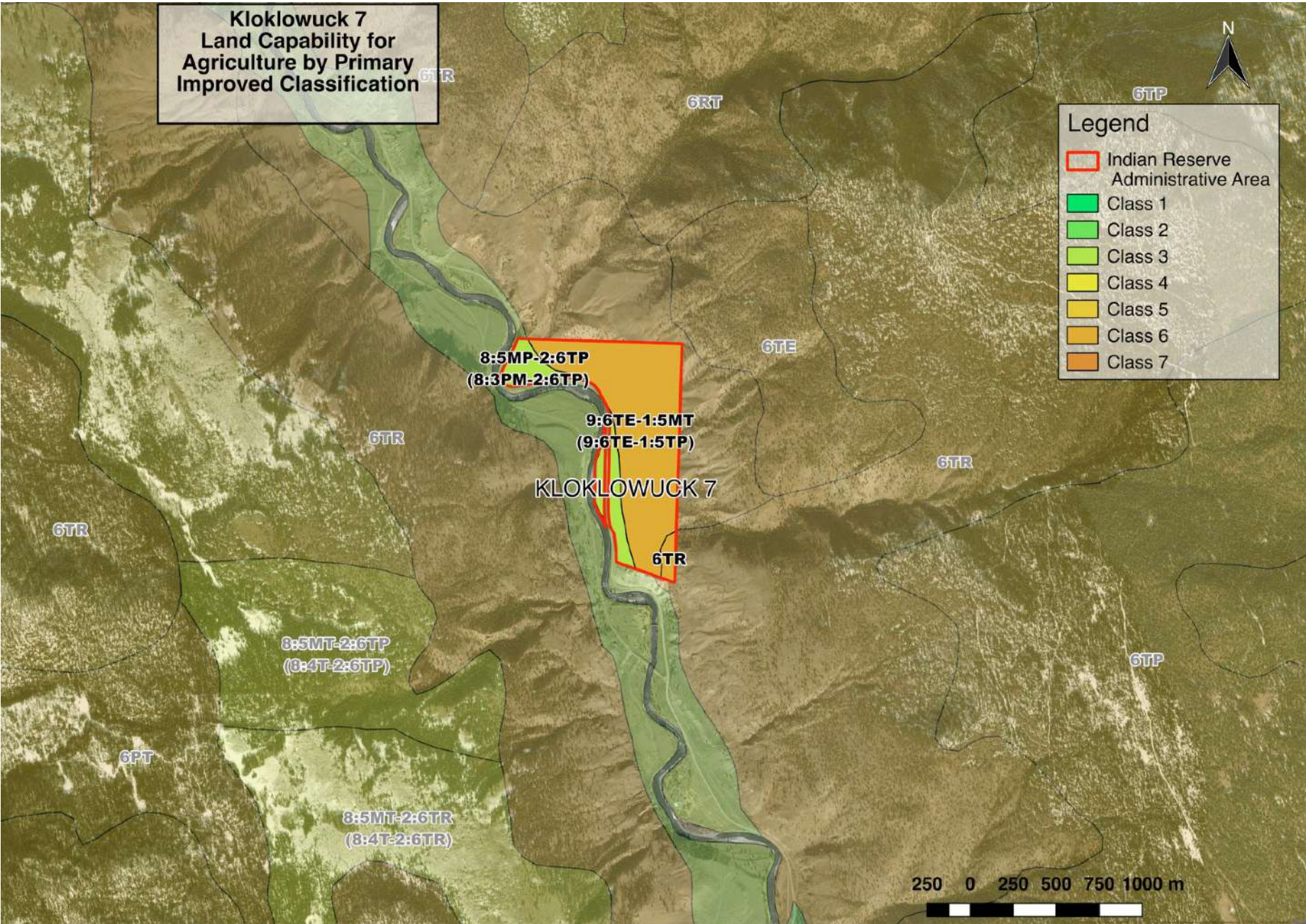
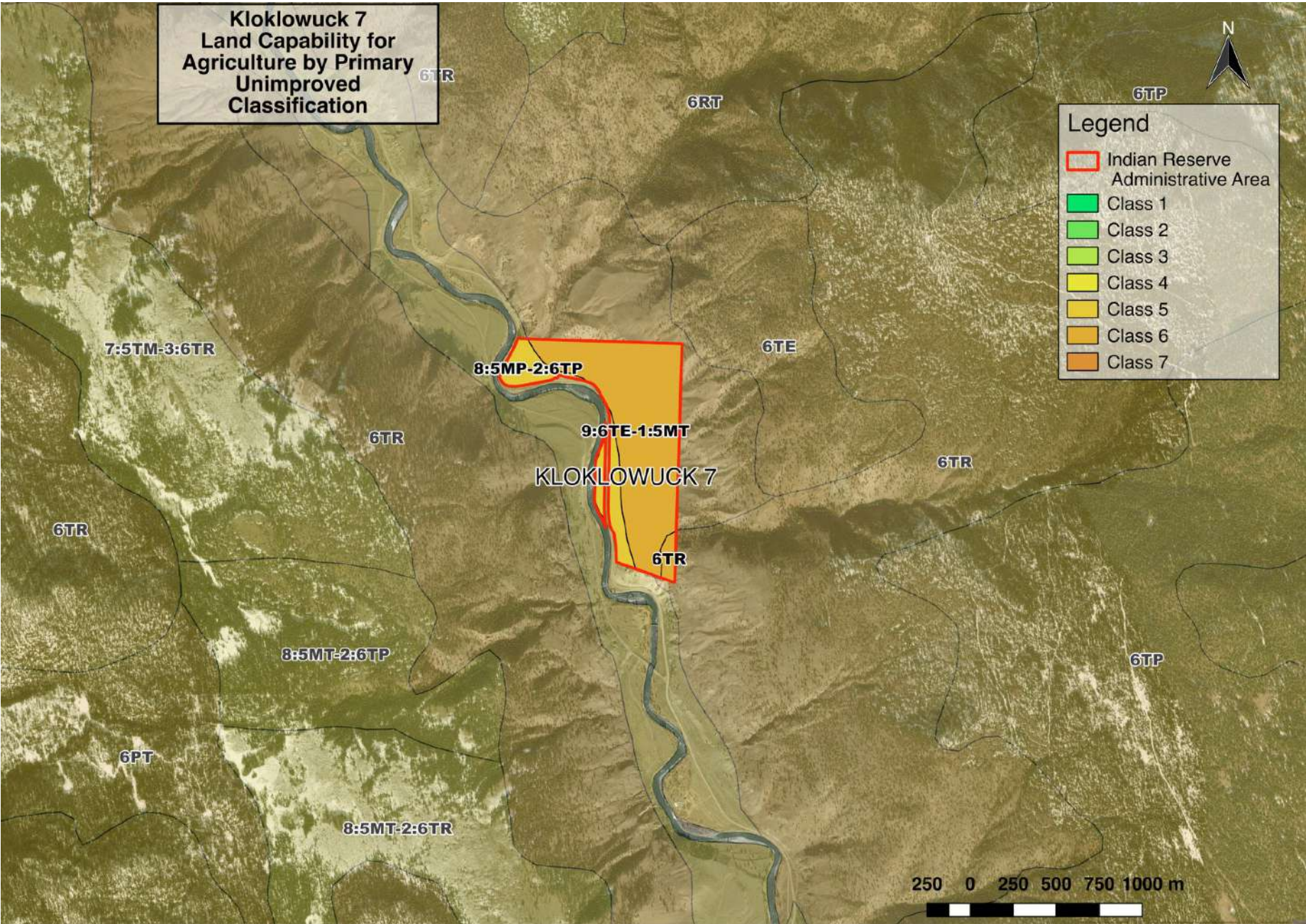


With 61% Class 2 and 15% Class 3 lands, this IR contains approximately 50 ha of high capability lands for agriculture for CFIB, when improved. This means under good management it is moderately high to high in productivity for a fairly wide range of climatically adapted crops.

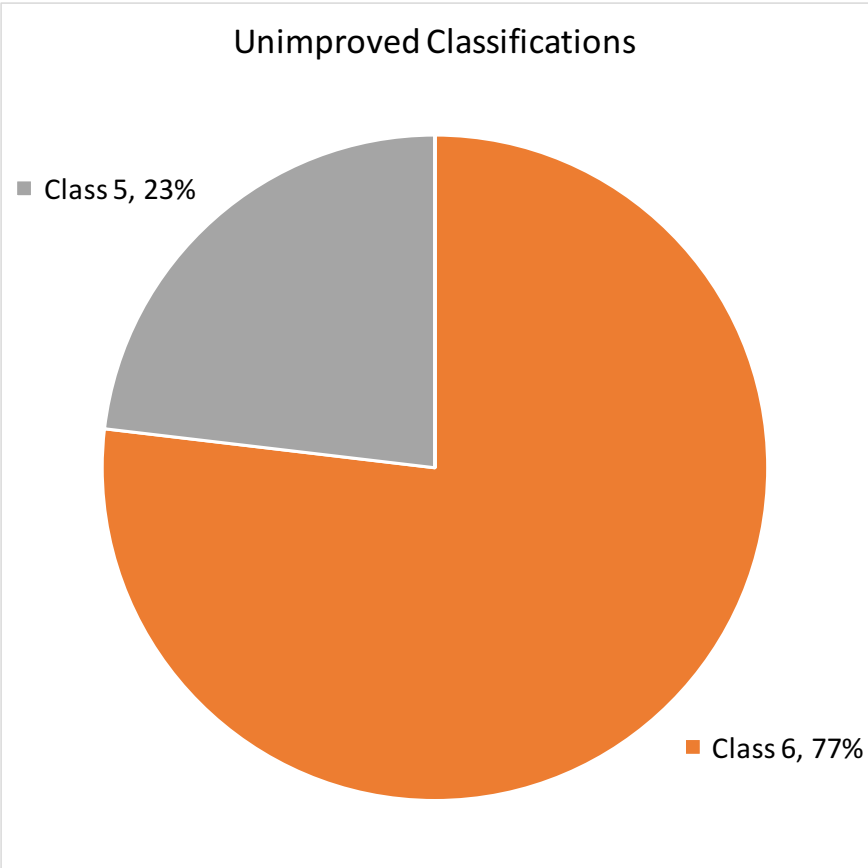
On the Entlqwekkinh 19 IR, the most significant limitation following improvements are terrain, bedrock, and stoniness. Once irrigated, 76% of the land improves significantly. Terrain is a limitation that may not be improved, and results in Class 6 ratings at this site.



Improved	Percentage	Hectares
Primary Limitation		
Terrain	100%	65
Secondary Limitation		
Bedrock	24%	15
Stoniness	15%	10
None	61%	40
Rating		
Class 7	0%	0
Class 6	24%	15
Class 5	0%	0
Class 4	0%	0
Class 3	15%	10
Class 2	61%	40
Class 1	0%	0

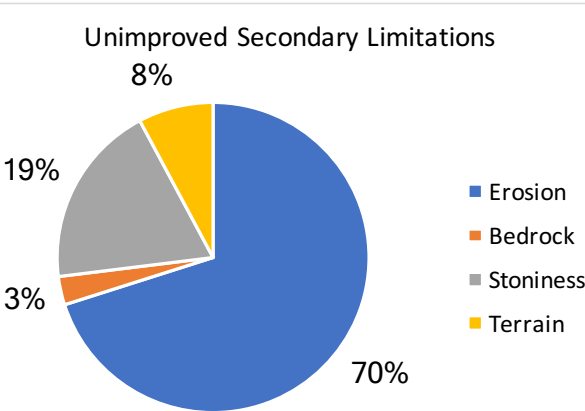
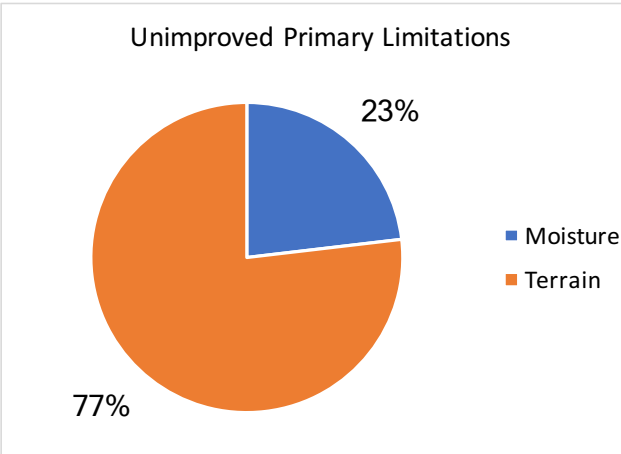


Unimproved Classifications and Limitations



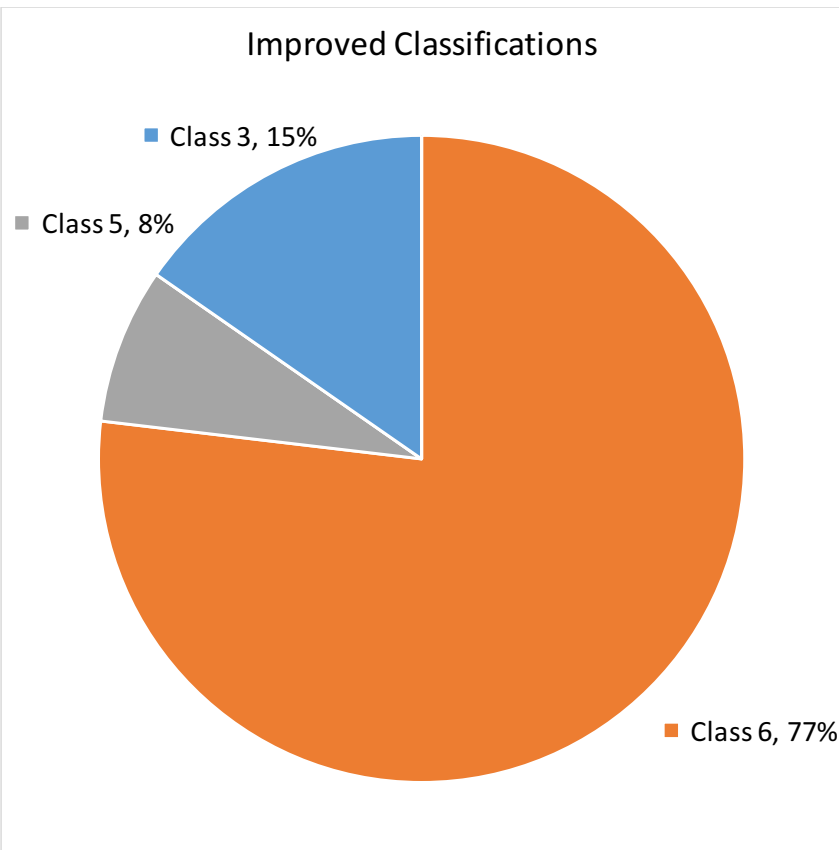
With 23% Class 5 and 77% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Kloklowuck 7 IR, the most significant limitation is terrain, followed by moisture and erosion. About 13% or 11 ha of the land can be improved through the use of irrigation. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



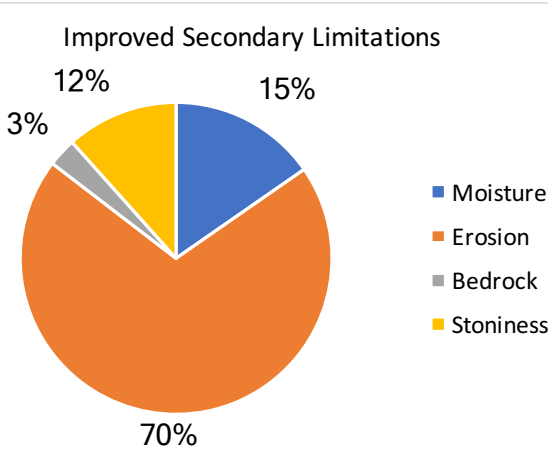
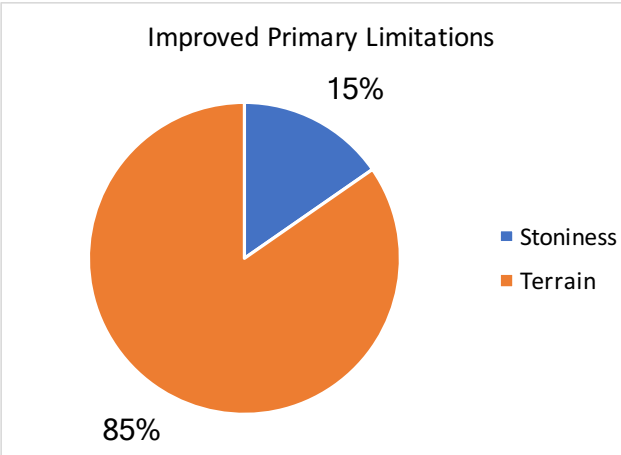
Unimproved	Percentage	Hectares
Primary Limitation		0
Moisture	23%	16
Terrain	77%	54
Secondary Limitation		0
Erosion	70%	49
Bedrock	3%	2
Stoniness	19%	14
Terrain	8%	5
Rating		0
Class 7	0%	0
Class 6	77%	54
Class 5	23%	16
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

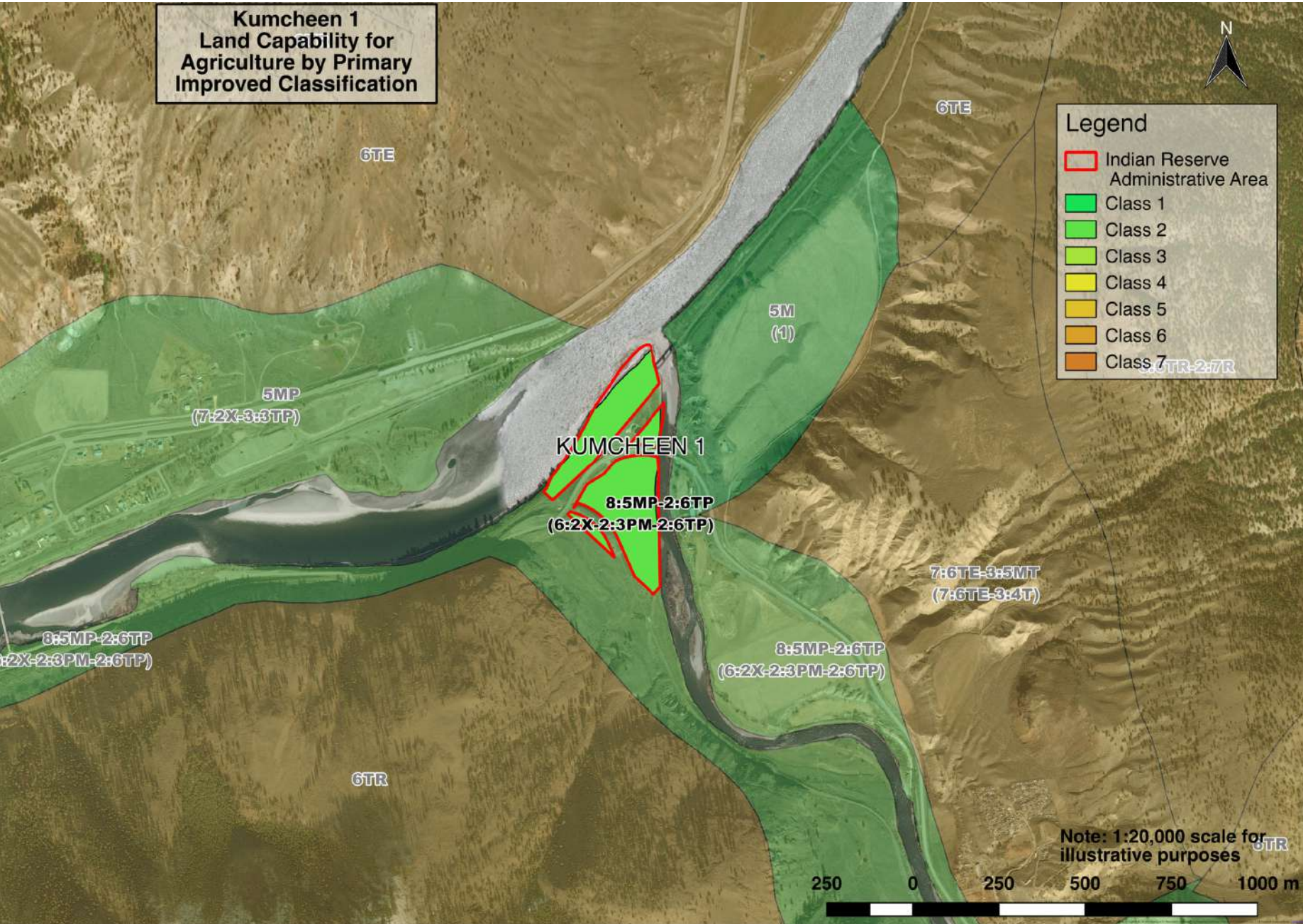
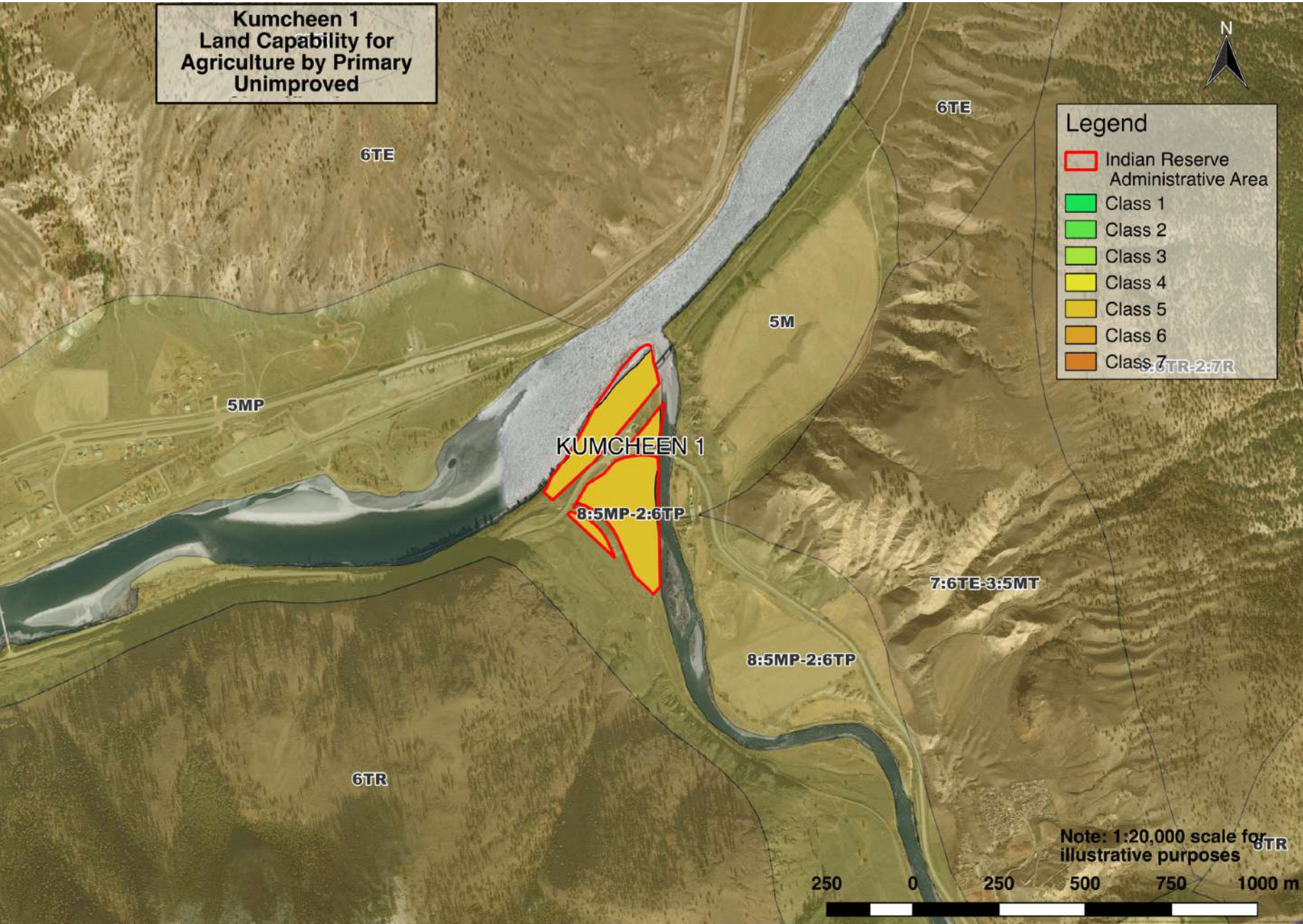


With 15% Class 3, this IR contains small amounts (11 ha) of moderately capable lands for agriculture, when improved. Under good management, approximately 11 hectares may be considered fair to moderately high in productivity for a fair range of climatically adapted crops.

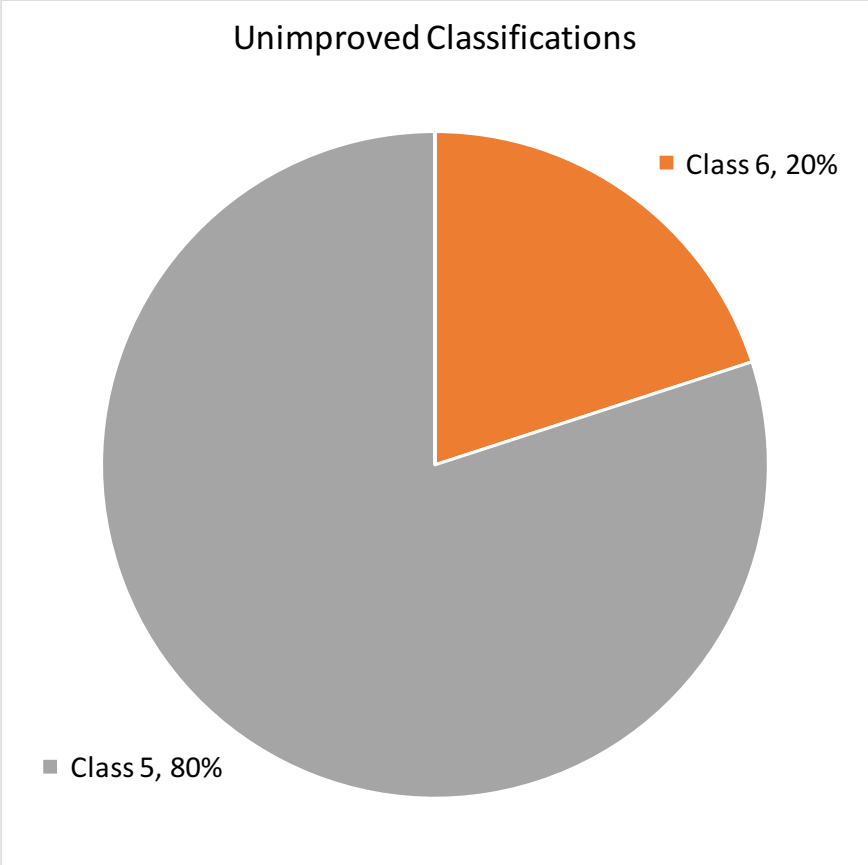
On the Kloklowuck 7 IR, the most significant remaining limitations after improvement is terrain and erosion. Terrain is a limitation that may not be improved, and results in a Class 6 rating at this site.



Improved	Percentage	Hectares
Primary Limitation		
Stoniness	15%	11
Terrain	85%	60
Secondary Limitation		0
Moisture	15%	11
Erosion	70%	49
Bedrock	3%	2
Stoniness	12%	8
Rating		0
Class 7	0%	0
Class 6	77%	54
Class 5	8%	5
Class 4	0%	0
Class 3	15%	11
Class 2	0%	0
Class 1	0%	0



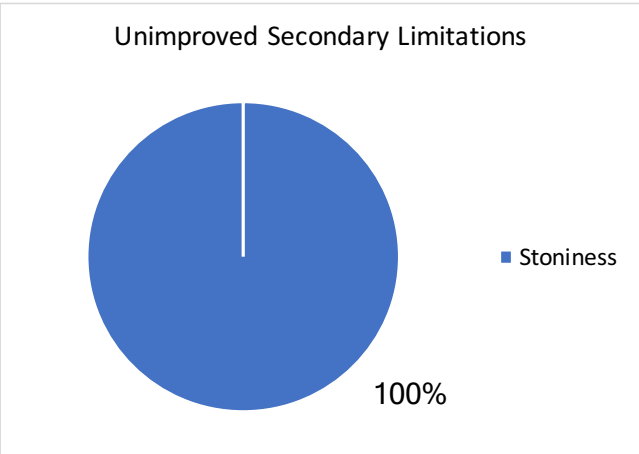
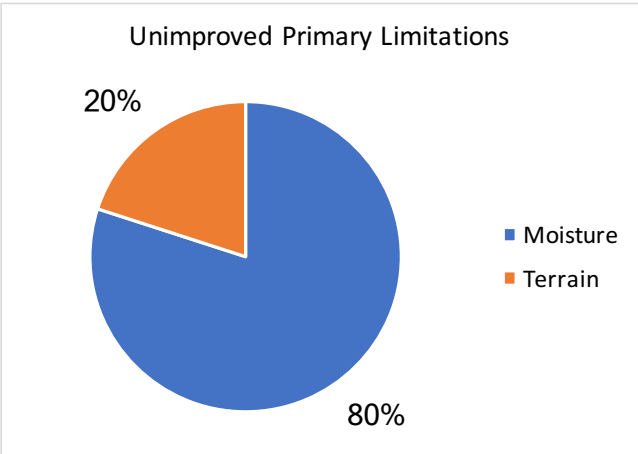
Unimproved Classifications and Limitations



With 80% Class 5 and 20% Class 6, this land is restricted to producing native or tame species of perennial forage plants. A relatively significant portion of this land 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

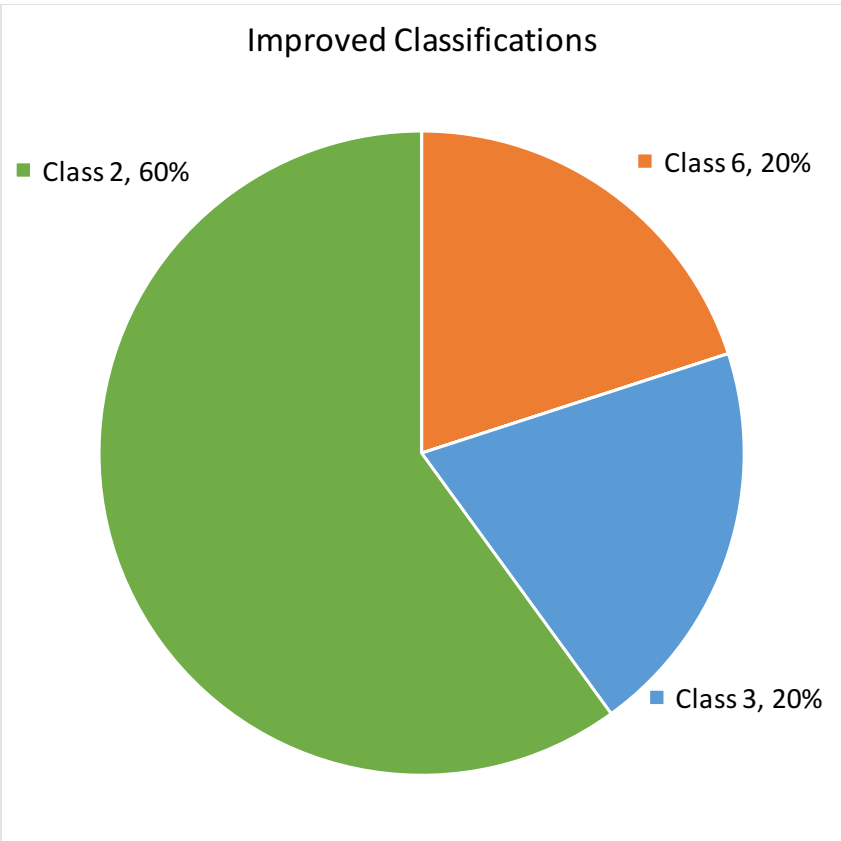
On the Kumcheen 1 IR, the most significant limitation is moisture, followed by terrain and stoniness. About 80% or 8 ha of the land can be improved through the use of irrigation. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.

The relatively small size of this IR make accurate interpretation and measurement of 1:50,000 capability mapping difficult.



Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	80%	8
Terrain	20%	2
Secondary Limitation		
Stoniness	100%	10
Rating		
Class 7	0%	0
Class 6	20%	2
Class 5	80%	8
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

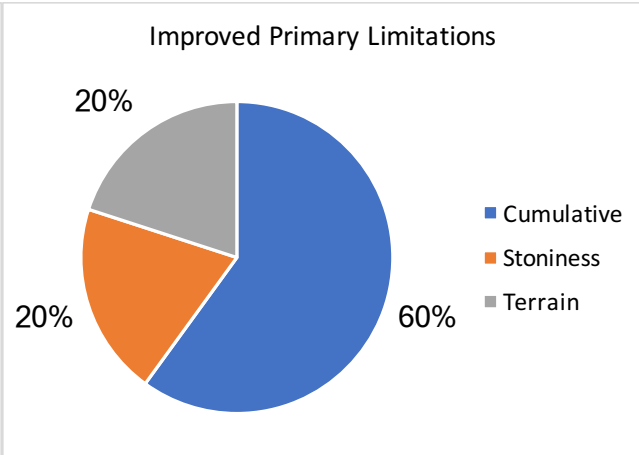
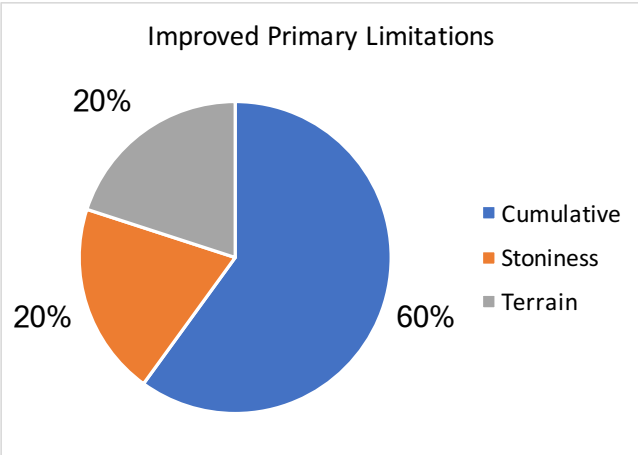
Improved Classifications and Limitations



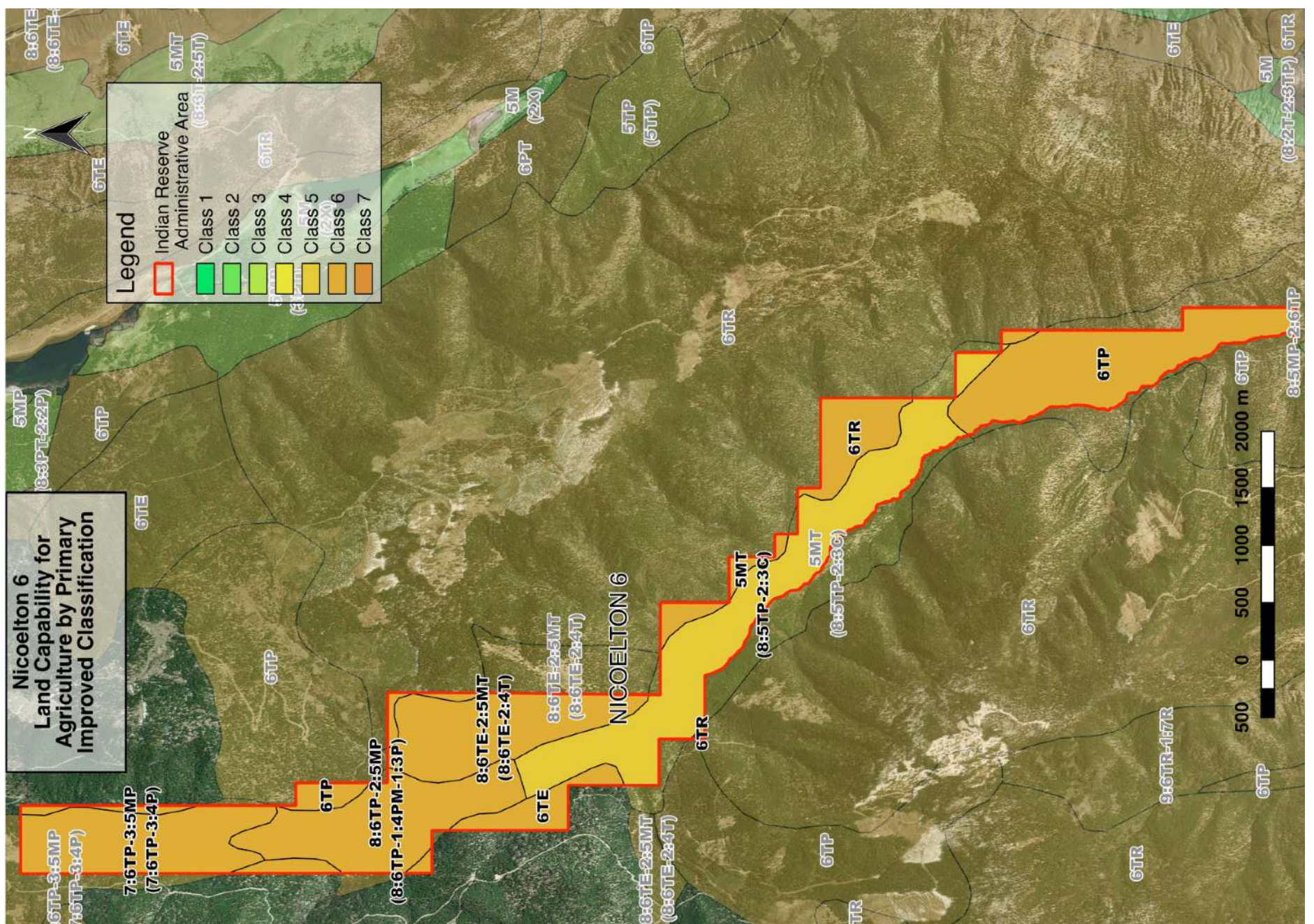
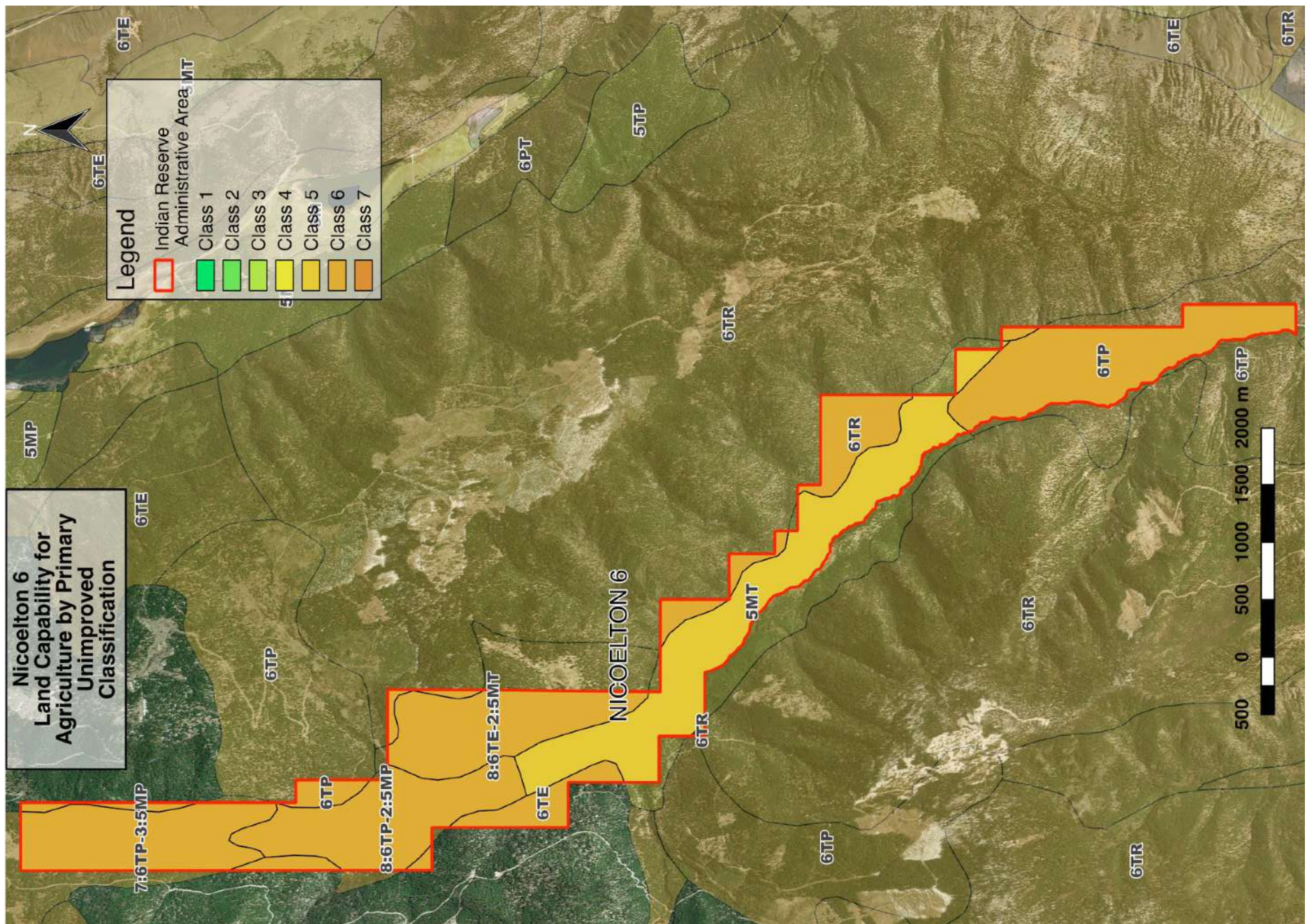
With 60% Class 2 and 20% Class 3 lands, this IR contains 8 hectares of high to moderately capable lands for agriculture, when improved. Under good management, approximately 8 hectares may be considered fair to moderately high in productivity for a fair range of climatically adapted crops.

On the Kumcheen 1 IR, the most significant remaining limitations after improvement are cumulative limitations, terrain and erosion. Terrain is a limitation that may not be improved, and results in a Class 6 rating at this site. Cumulative limitations are two or more adverse characteristics which individually would not affect the class rating.

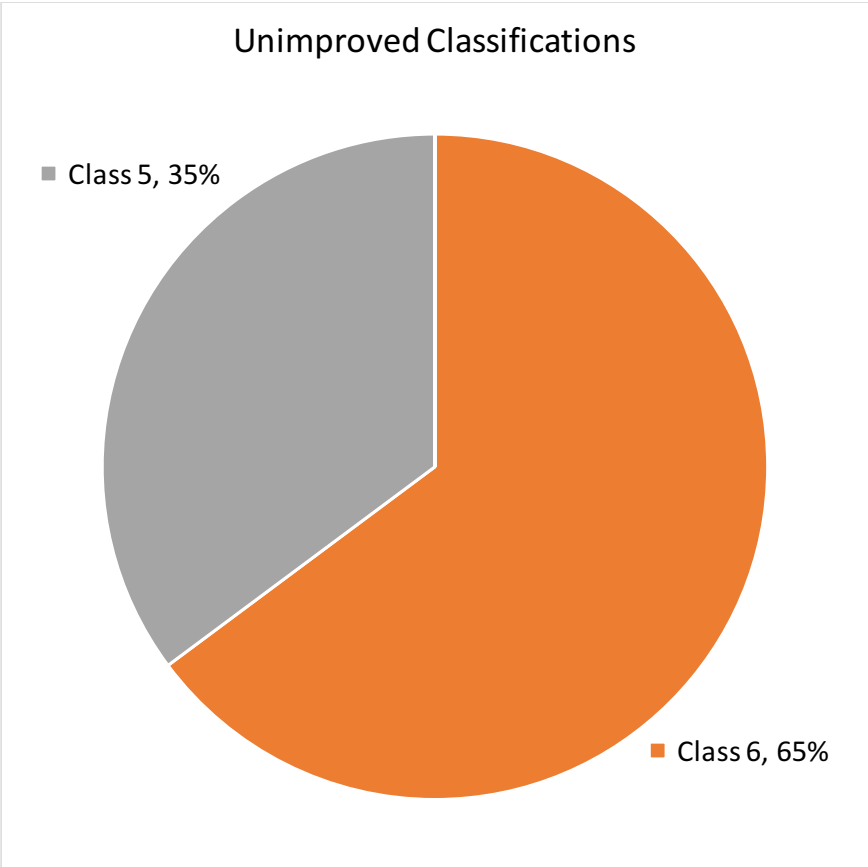
The relatively small size of this IR make accurate interpretation and measurement of 1:50,000 capability mapping difficult.



Improved	Percentage	Hectares
Primary Limitation		
Cumulative	60%	6
Stoniness	20%	2
Terrain	20%	2
Secondary Limitation		
Moisture	20%	2
Stoniness	20%	2
None	60%	6
Rating		
Class 7	0%	0
Class 6	20%	2
Class 5	0%	0
Class 4	0%	0
Class 3	20%	2
Class 2	60%	6
Class 1	0%	0

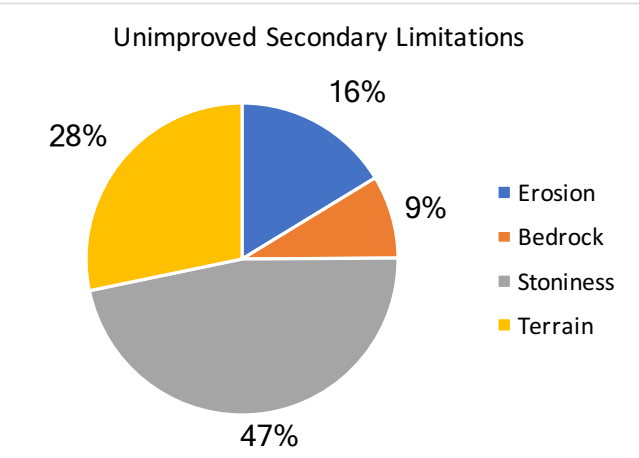
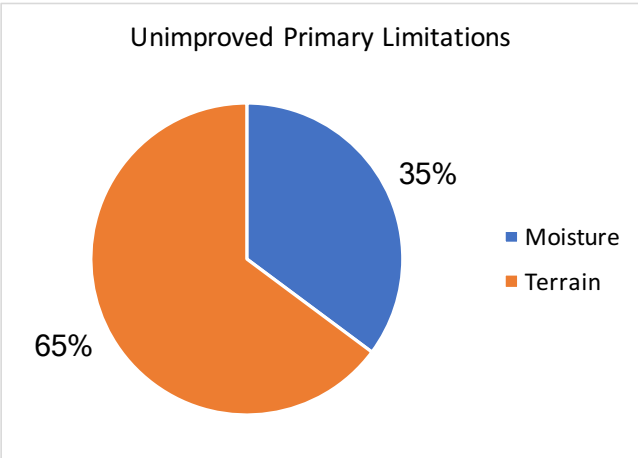


Unimproved Classifications and Limitations



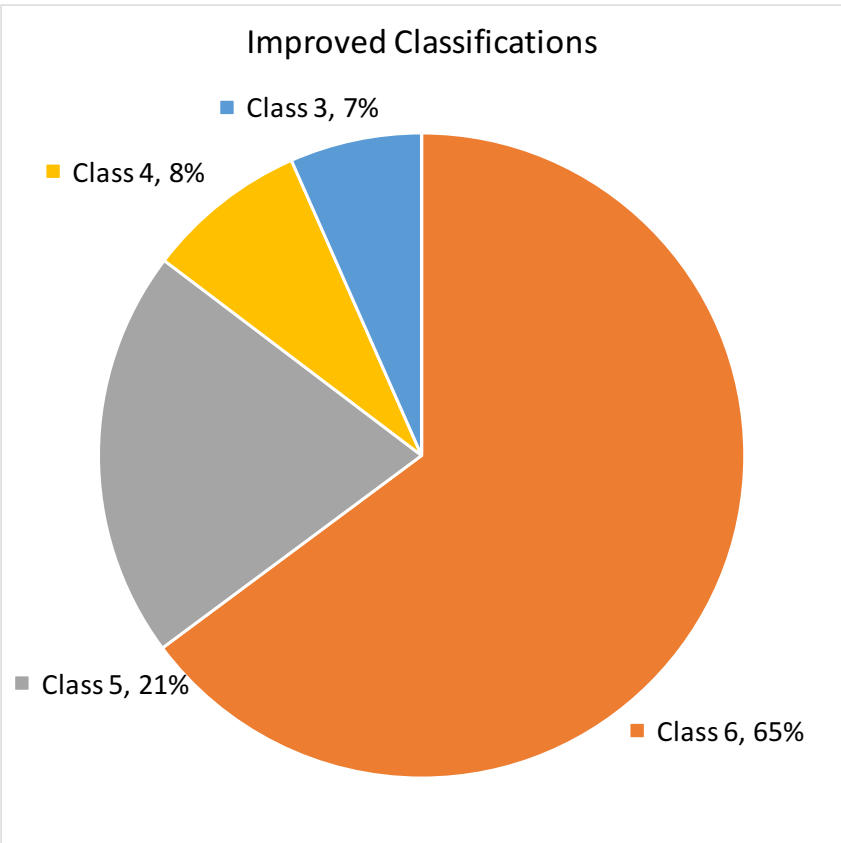
With 35% Class 5 and 65% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Nicoelton 6 IR, the most significant limitation is terrain, followed by moisture and stoniness. Much of the land that is limited by moisture has other associated limitations, such as terrain and stoniness. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 and 7 lands are generally not considered improvable.



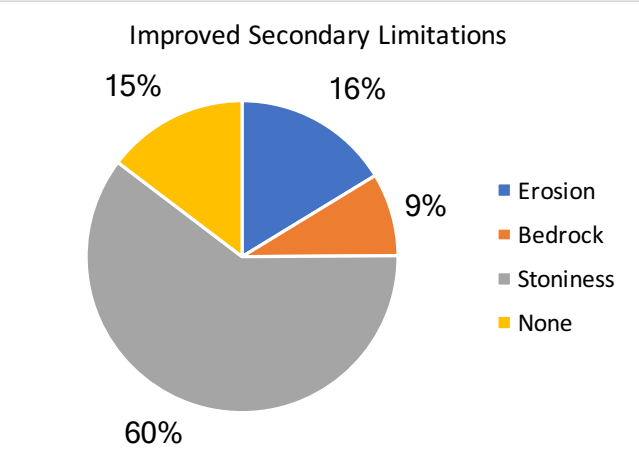
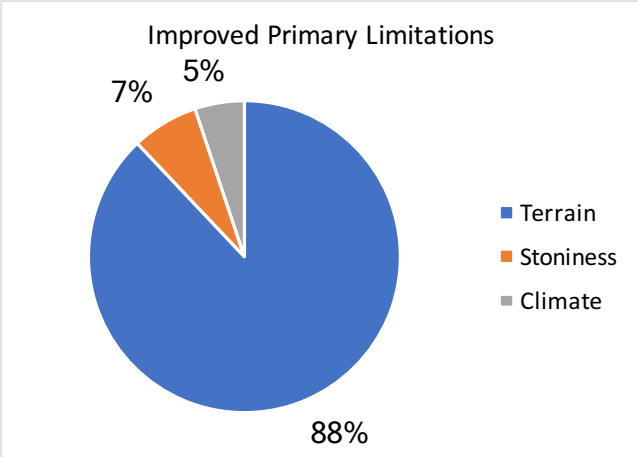
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	35%	295
Terrain	65%	543
Secondary Limitation		
Erosion	16%	136
Bedrock	9%	72
Stoniness	47%	392
Terrain	28%	237
Rating		
Class 7	0%	0
Class 6	65%	543
Class 5	35%	295
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

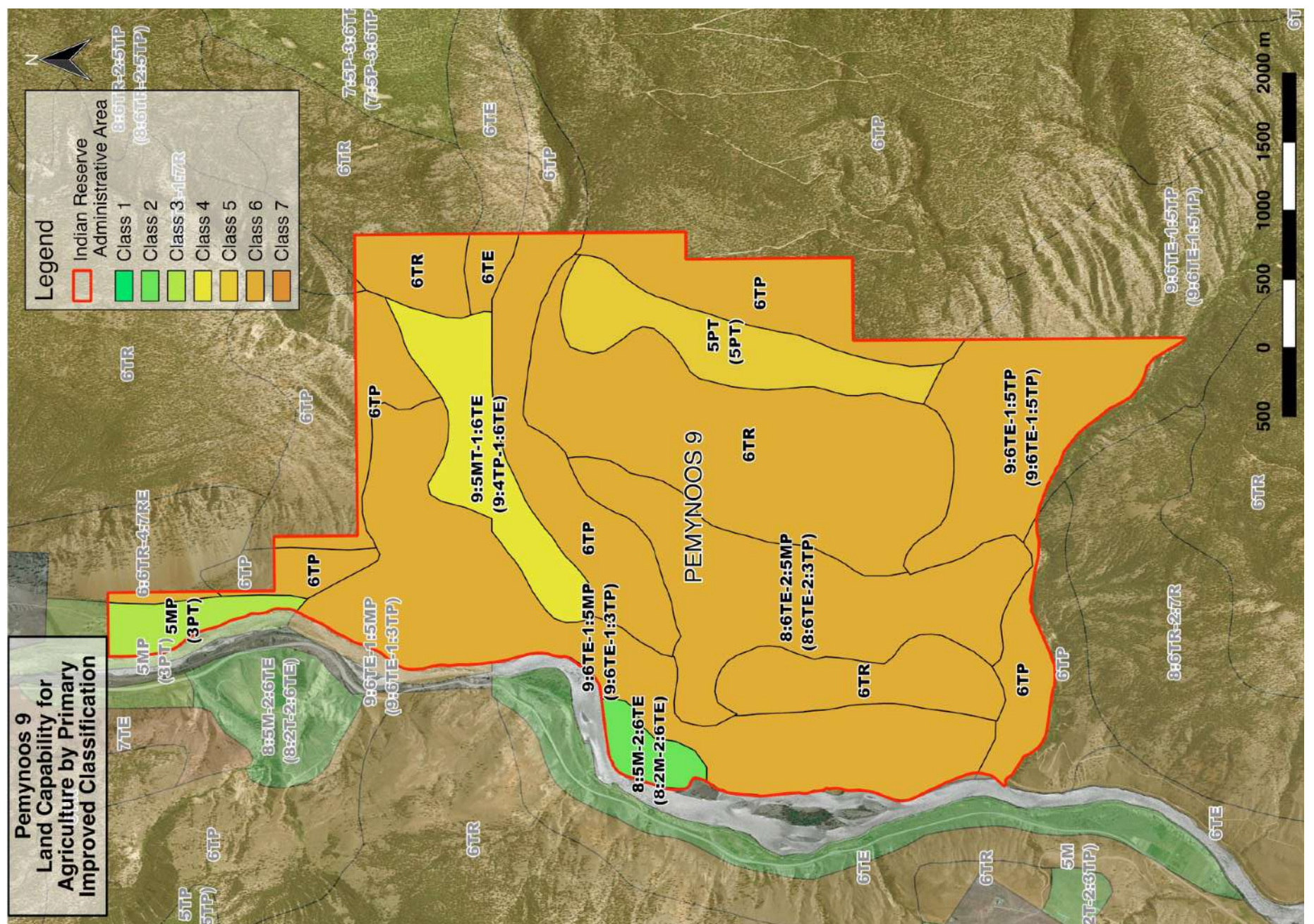
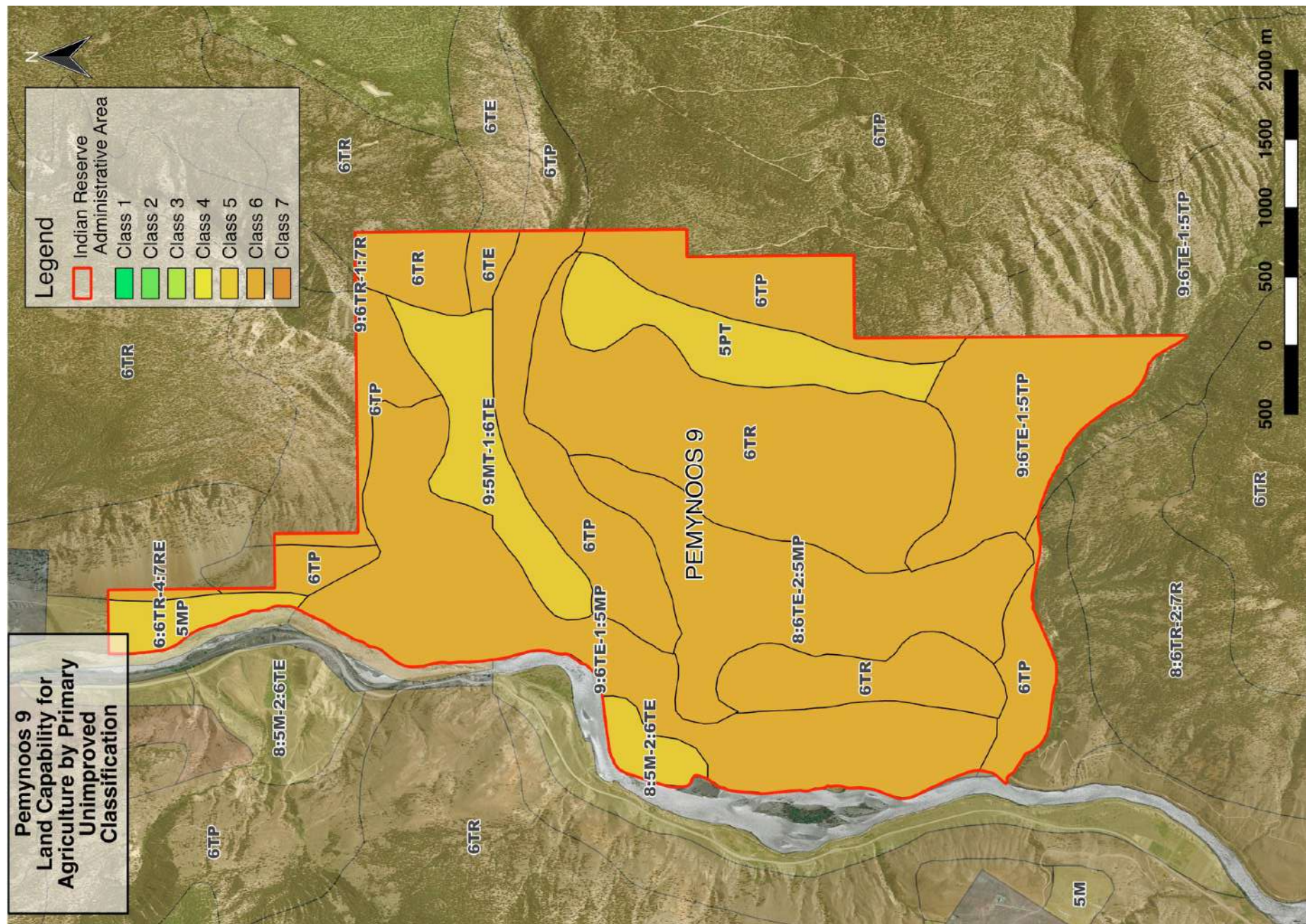


With 7% Class 3 and 8% Class 4 lands, this IR contains a relatively small percentage of lands capable for agricultural production. However, it is a relatively large IR in terms of area, therefore under good management approximately 113 hectares may have low to moderately high productivity for a fair range of crops.

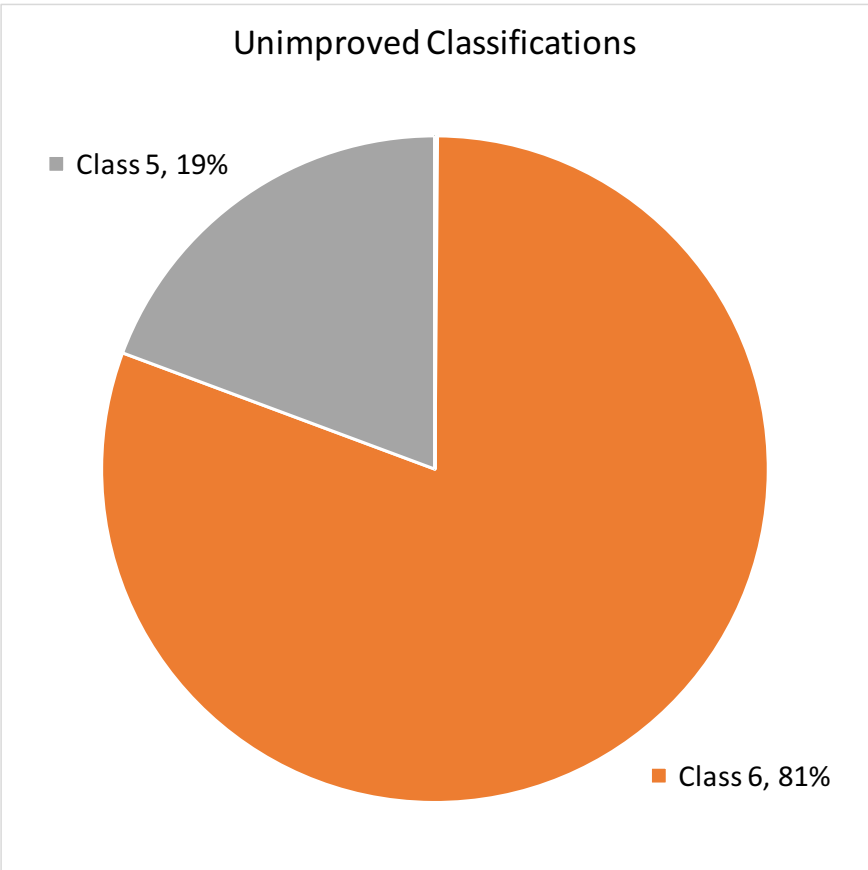
On the Nicoleton 6 IR, the most significant limitation is terrain, followed by stoniness. Improvements through irrigation and de-stoning improve Class 5 lands to Class 3 and 4. Terrain is a limitation that may not be improved, and results in Class 5 and 6 ratings at this site.



Improved	Percentage	Hectares
Primary Limitation		
Terrain	88%	737
Stoniness	7%	58
Climate	5%	43
Secondary Limitation		
Erosion	16%	136
Bedrock	9%	72
Stoniness	60%	506
None	15%	123
Rating		
Class 7	0%	0
Class 6	65%	543
Class 5	21%	172
Class 4	8%	68
Class 3	7%	55
Class 2	0%	0
Class 1	0%	0

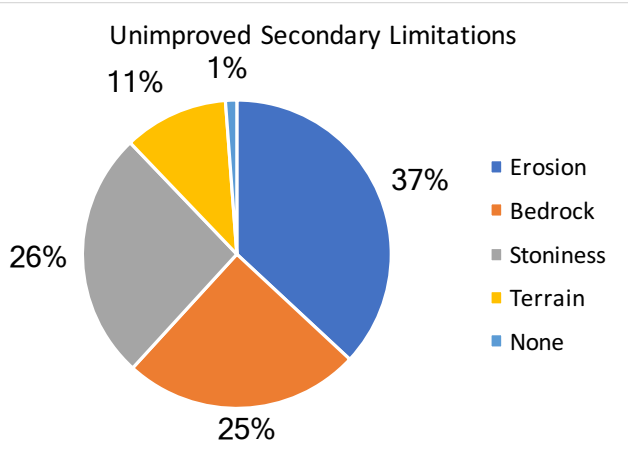
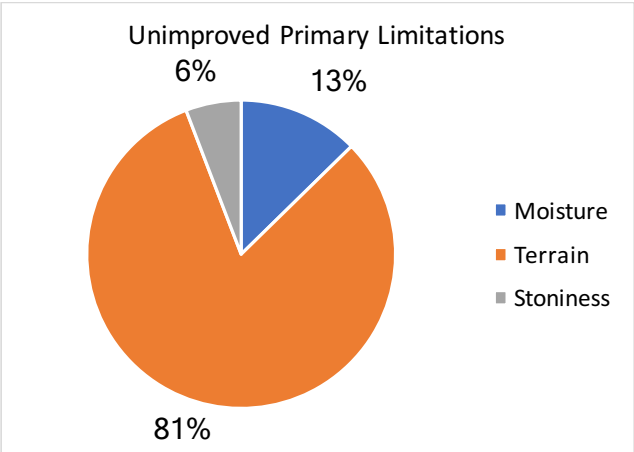


Unimproved Classifications and Limitations



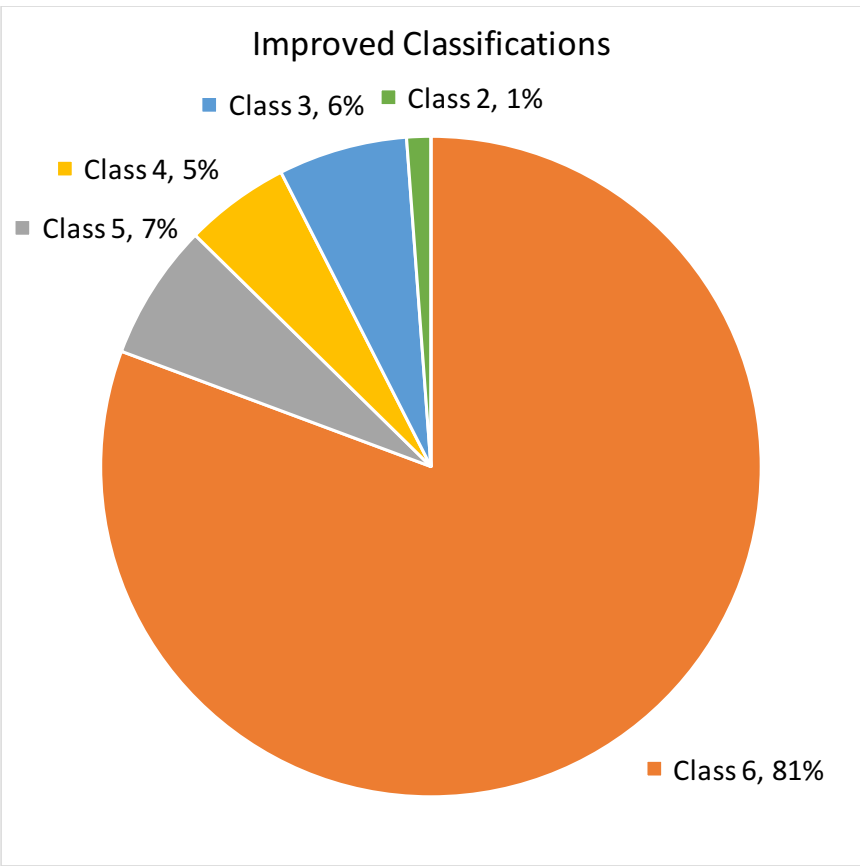
With 19% Class 5 and 81% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Pemnyoos 9 IR, the most significant limitation is terrain. Moisture and stoniness are the next most important limitations. Significant improvements can be made through irrigation on Class 5 lands. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



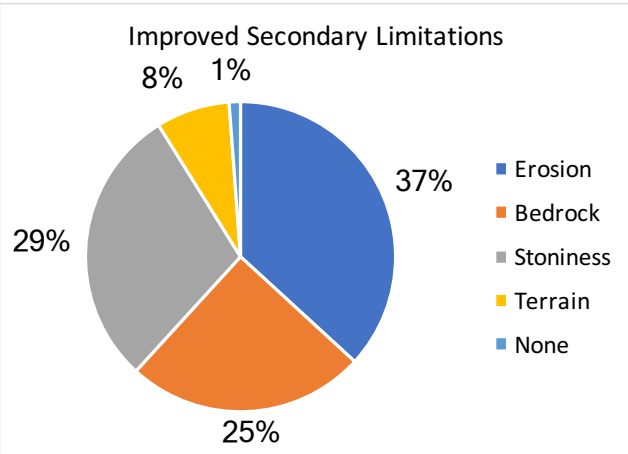
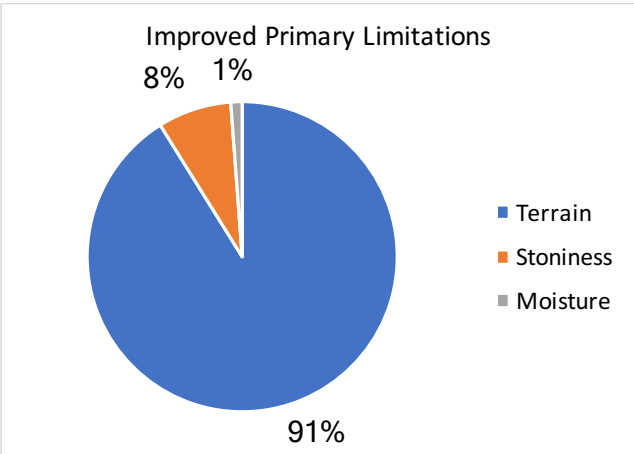
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	13%	233
Terrain	81%	1497
Stoniness	6%	107
Bedrock	0%	2
Secondary Limitation		
Erosion	37%	679
Bedrock	25%	457
Stoniness	26%	480
Terrain	11%	201
None	1%	22
Rating		
Class 7	0%	2
Class 6	81%	1481
Class 5	19%	355
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

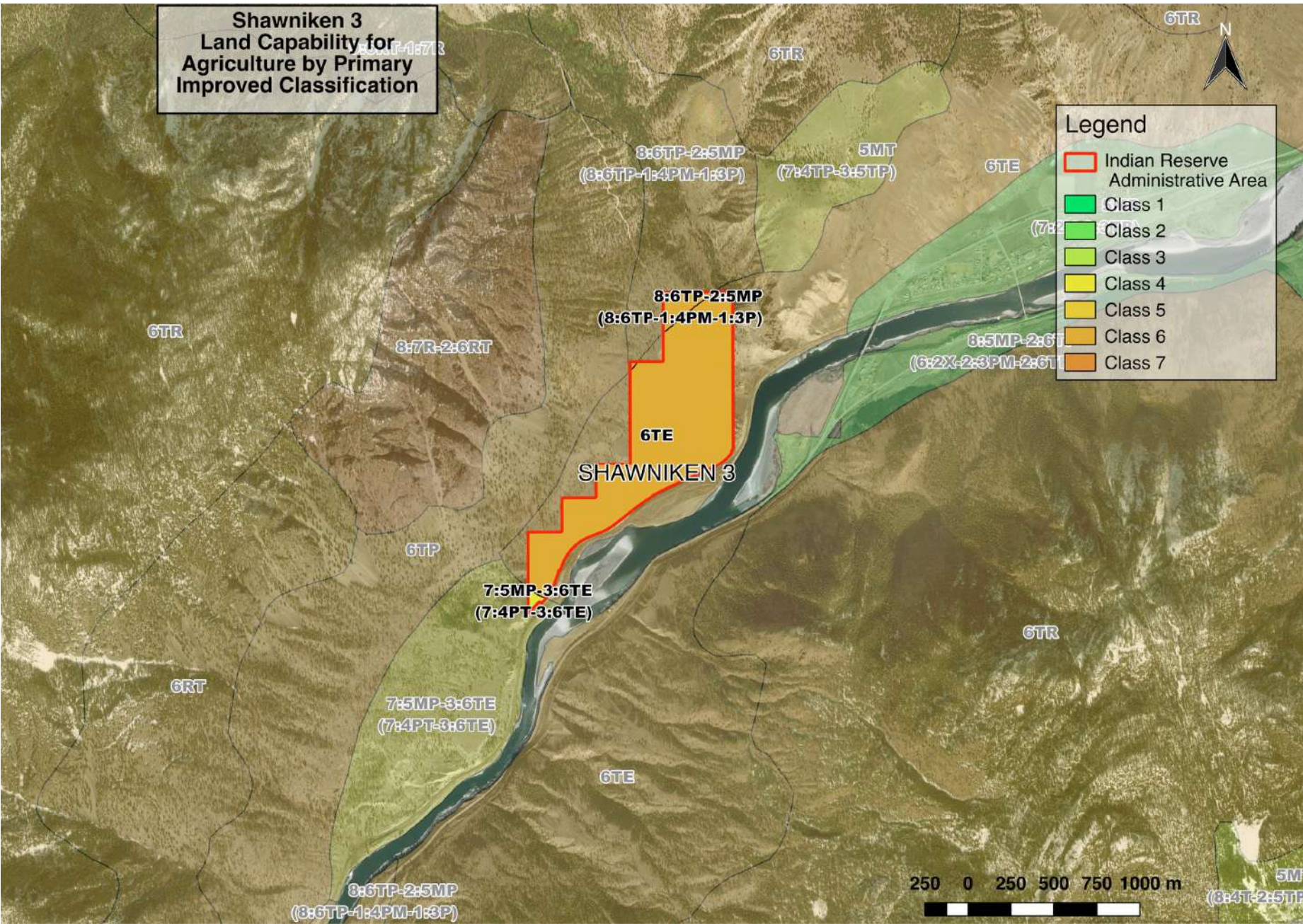
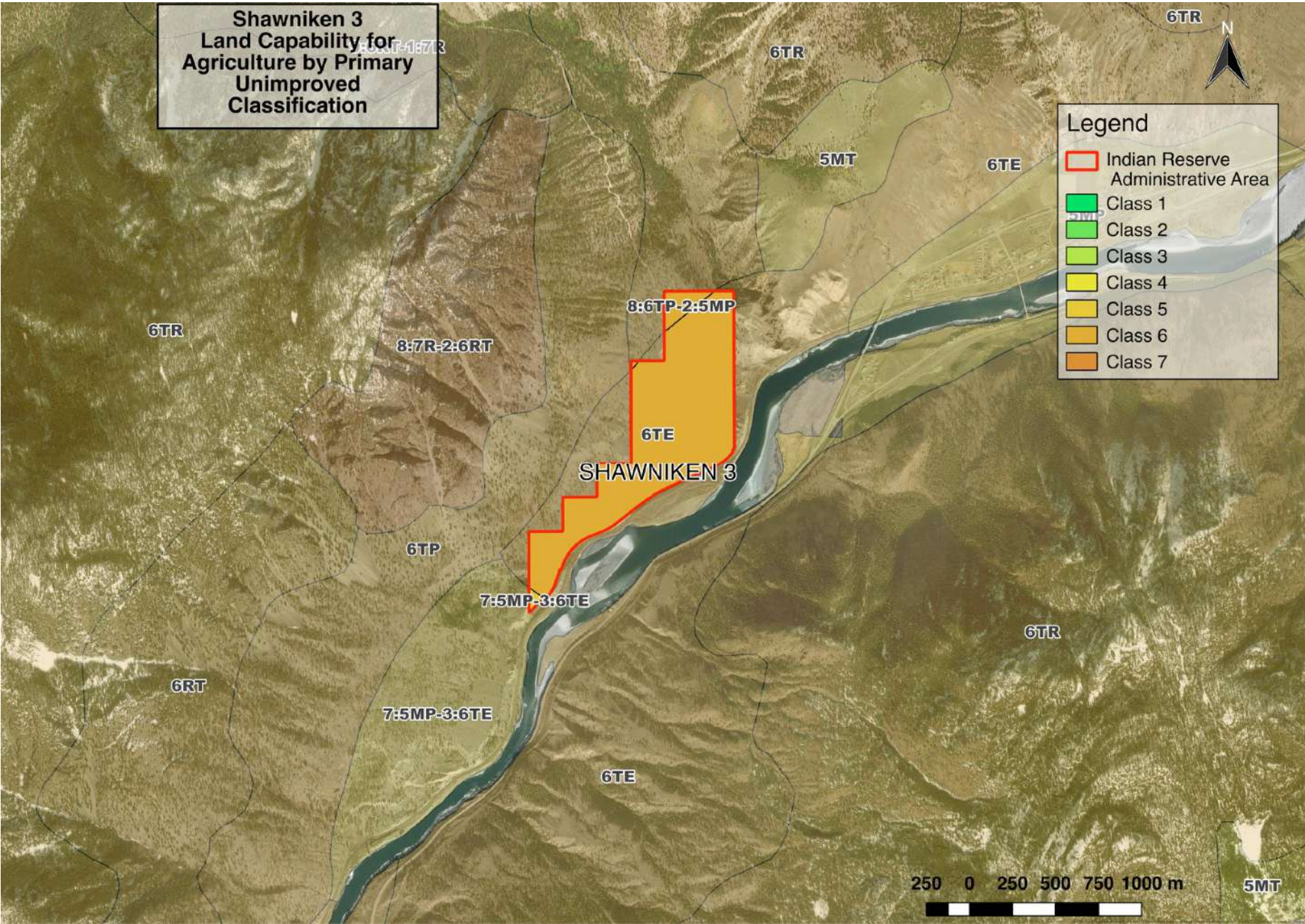


With 1% Class 2, 6% Class 3, and 5% Class 4 lands, this IR contains a relatively large land area (233 ha) of the high capability lands for agriculture for CFIB, when improved, due to the relatively large total area of the IR. This means under good management it contains lands with a range of productivities for a fair to wide range of climatically adapted crops.

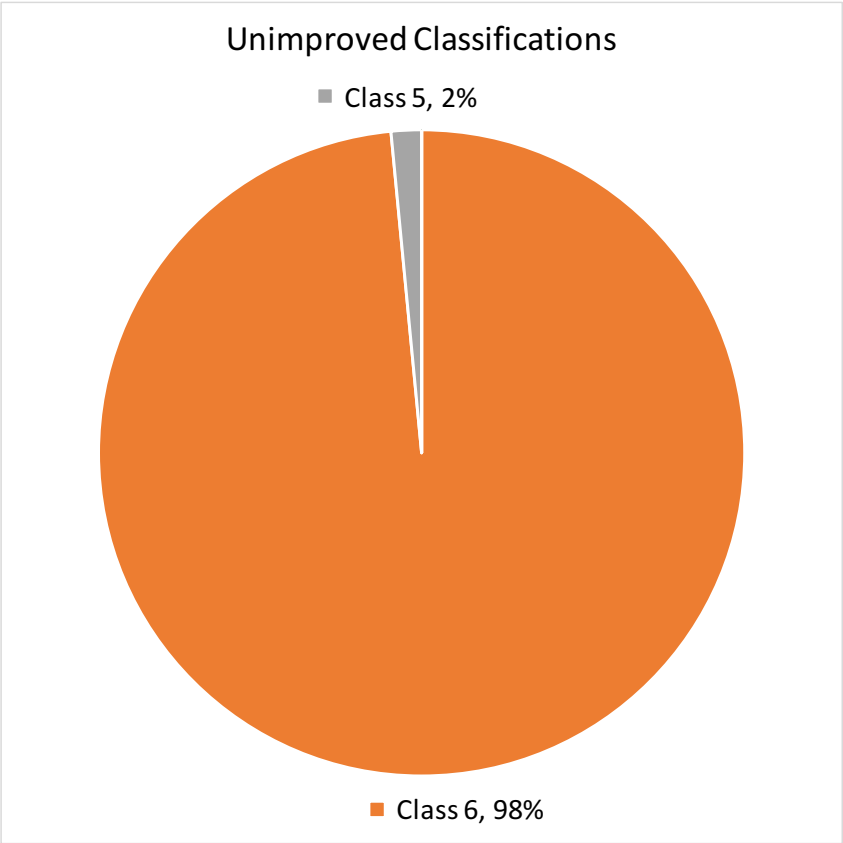
On the Pemynoss 9 IR, the most significant limitations following improvements, are terrain, stoniness, erosion, and depth to bedrock. Terrain is a limitation that may not be improved, and results in Class 6 ratings at this site, generally in the upland areas of the IR. The lower benches of this IR contain fewer limitations and better capability classification ratings. The upland areas are limited by terrain.



Improved	Percentage	Hectares
Primary Limitation		
Terrain	91%	1676
Stoniness	8%	141
Moisture	1%	22
Secondary Limitation		
Erosion	37%	677
Bedrock	25%	459
Stoniness	29%	540
Terrain	8%	141
None	1%	22
Rating		
Class 7	0%	0
Class 6	81%	1483
Class 5	7%	123
Class 4	5%	95
Class 3	6%	116
Class 2	1%	22
Class 1	0%	0

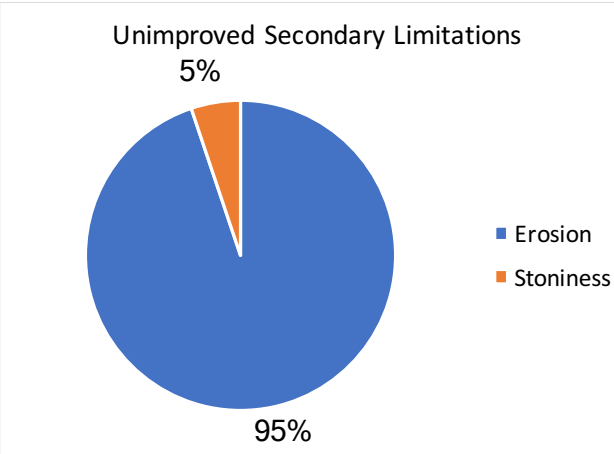
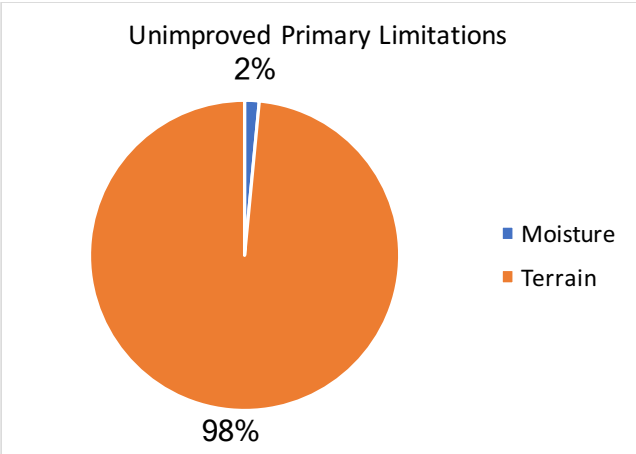


Unimproved Classifications and Limitations



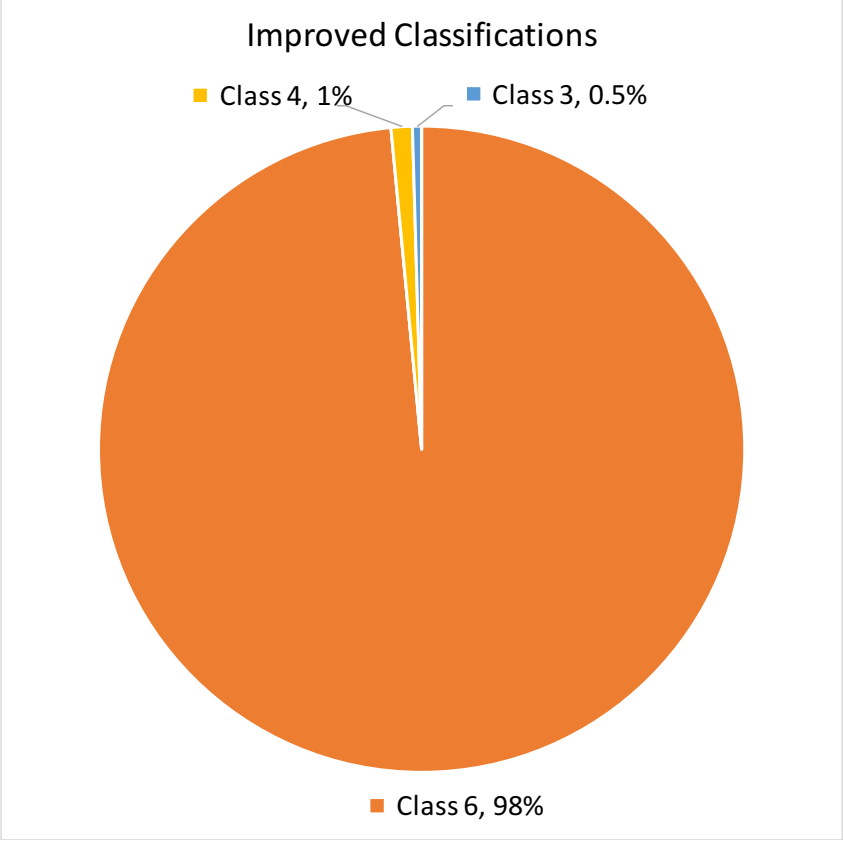
With 2% Class 5 and 98% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Shawniken 3 IR, the most significant limitation is terrain. Erosion and stoniness are the next most important limitations. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



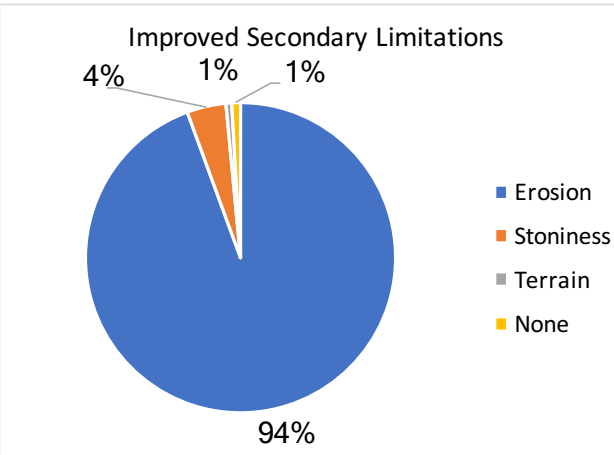
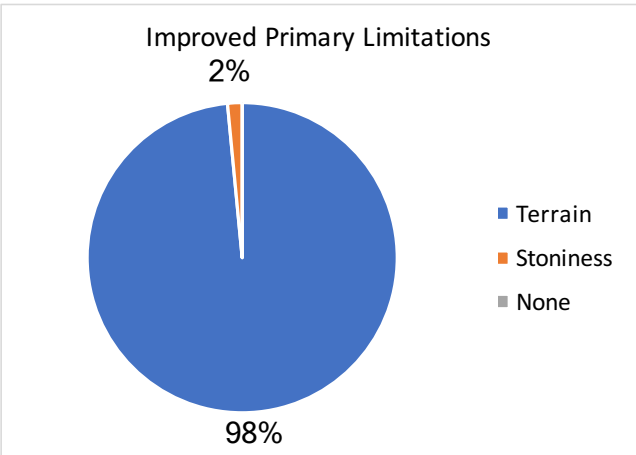
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	2%	1
Terrain	98%	77
Secondary Limitation		
Erosion	95%	74
Stoniness	5%	4
Rating		
Class 7	0%	0
Class 6	98%	77
Class 5	2%	1
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

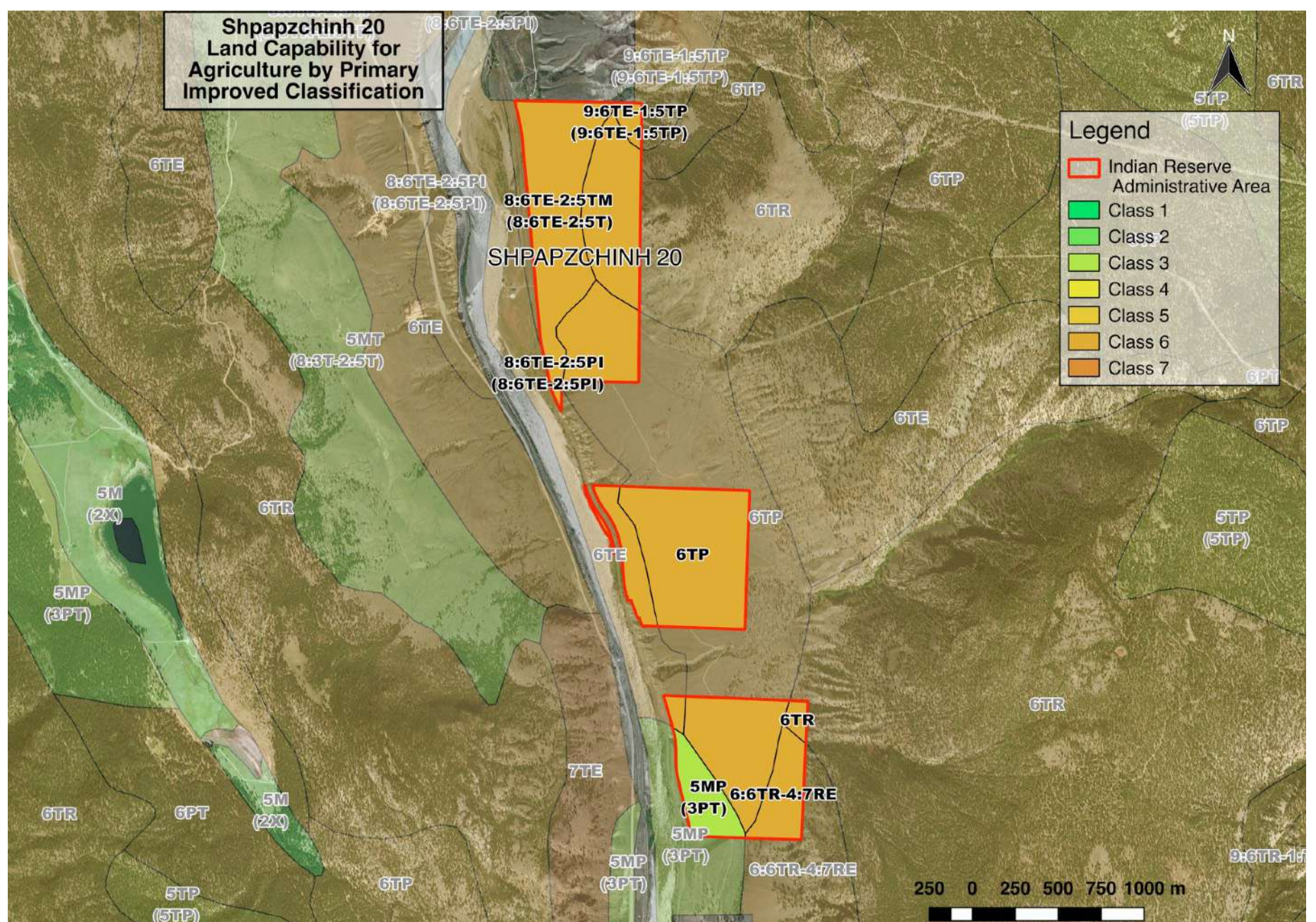
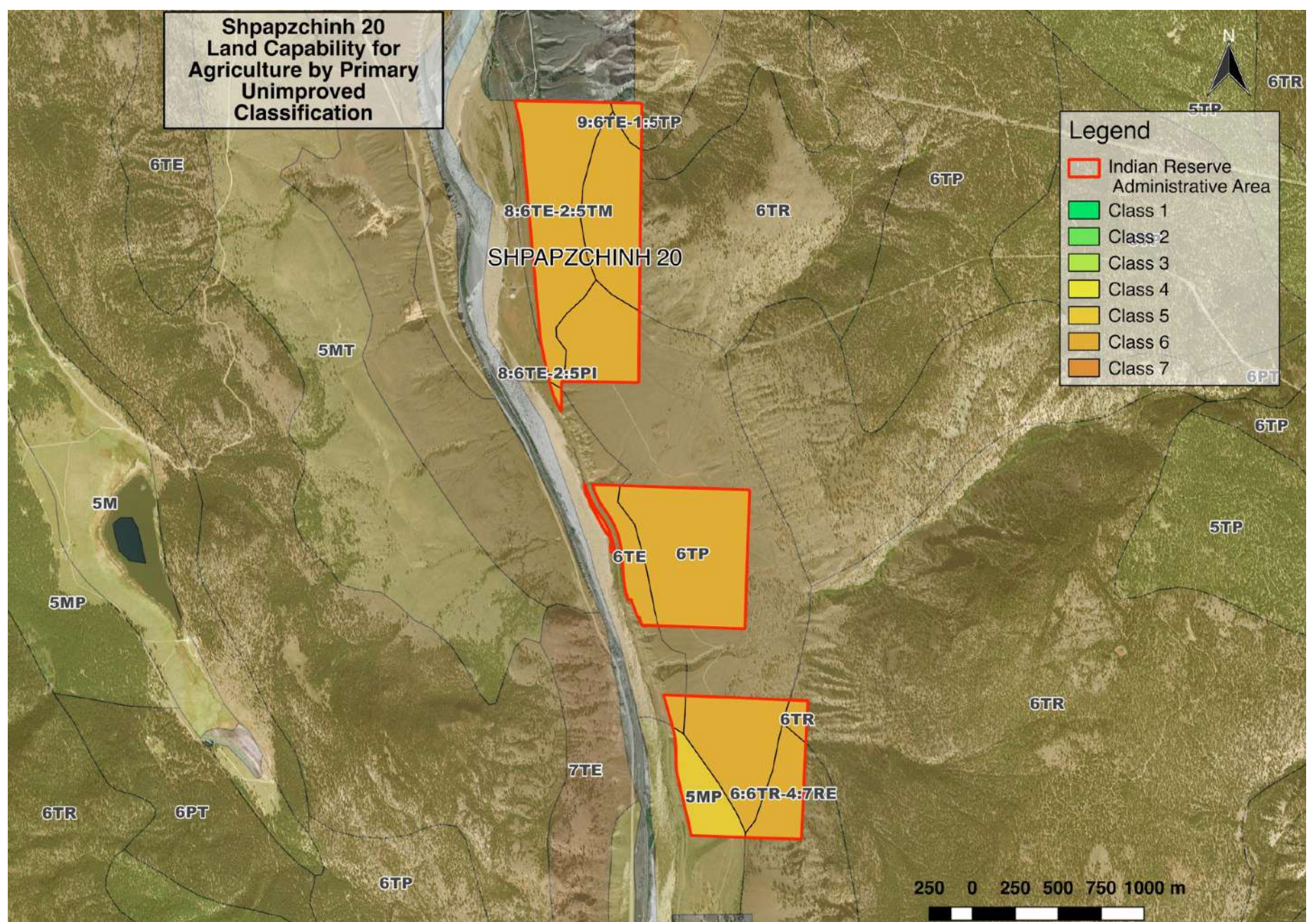


With 0.5% Class 3, and 1% Class 4, this IR contains low amounts of lands capable for agriculture, when improved. This means under good management approximately 1.5 ha are fair in productivity for a fair range of climatically adapted field crops.

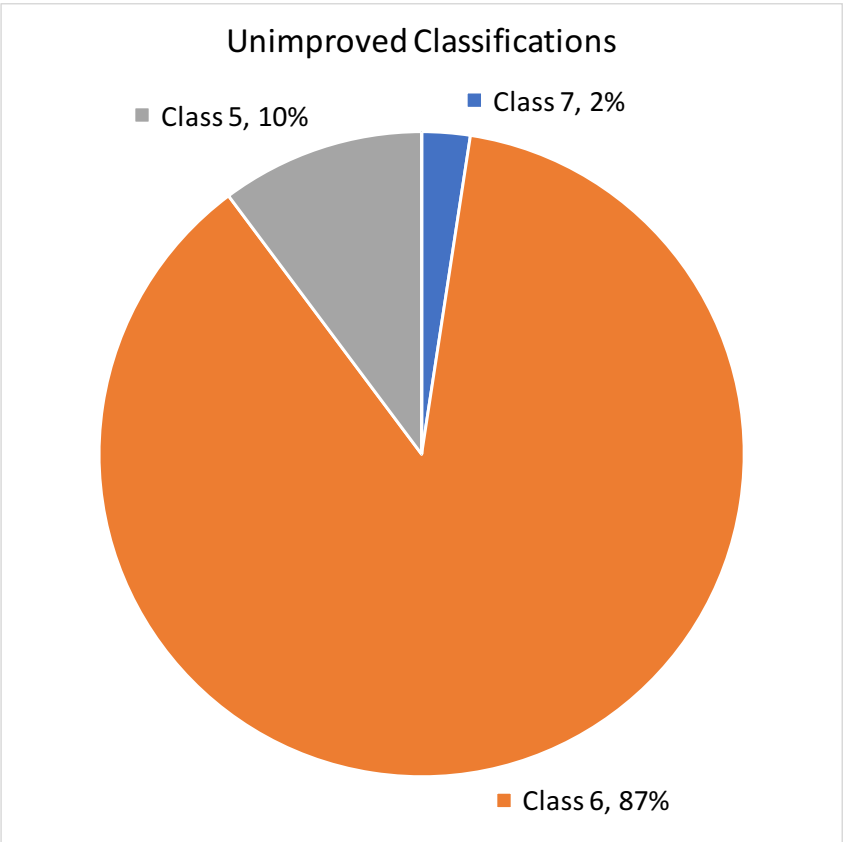
On the Shawniken 3 IR, the most significant limitation is terrain. Terrain is a limitation that may not be improved, and results in mostly Class 6 ratings at this site.



Improved	Percentage	Area
Primary Limitation		
Terrain	98%	77
Stoniness	2%	1
None	0%	0
Secondary Limitation		
Erosion	95%	74
Stoniness	4%	3
Terrain	1%	0
None	1%	1
Rating		
Class 7	0%	0
Class 6	98%	77
Class 5	0%	0
Class 4	1%	1
Class 3	0.5%	0.4
Class 2	0%	0
Class 1	0%	0



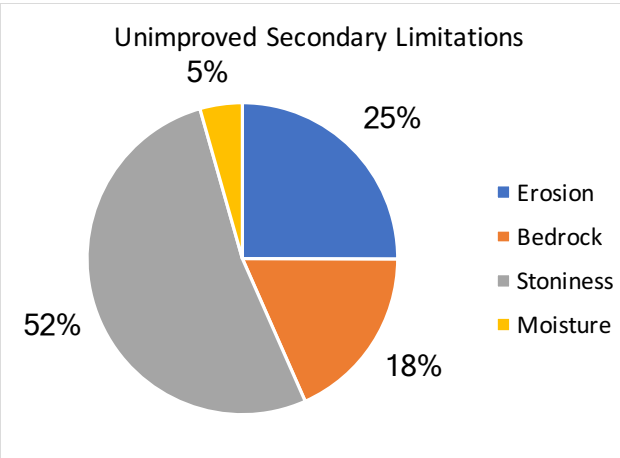
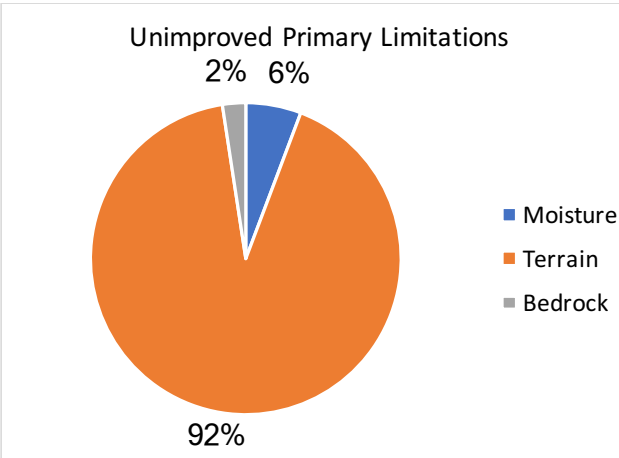
Unimproved Classifications and Limitations



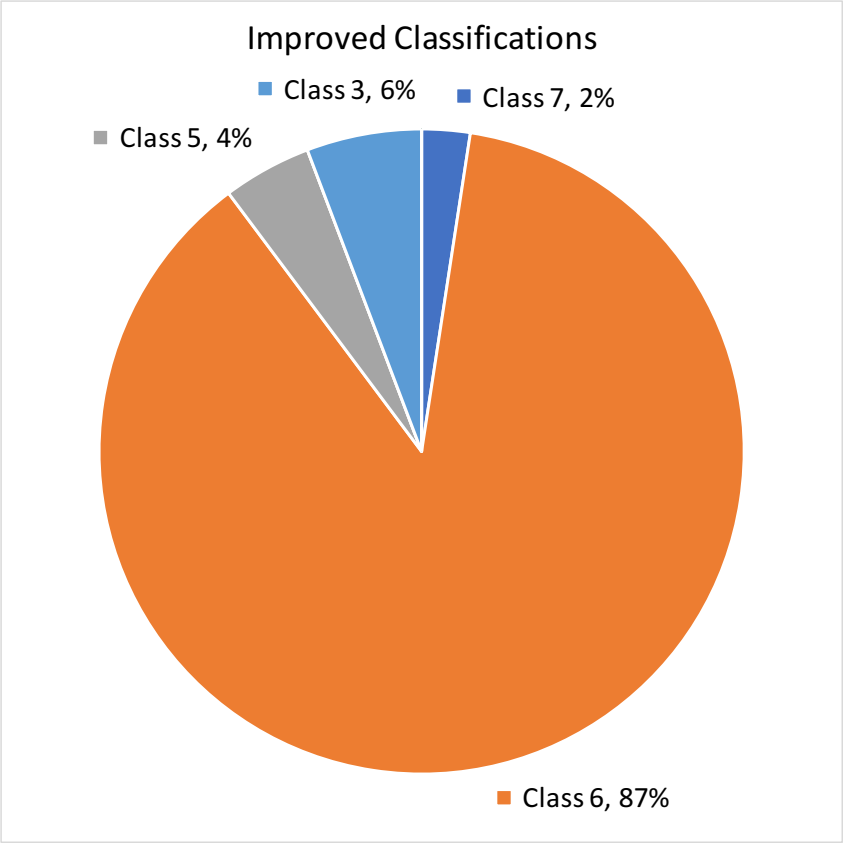
With 10% Class 5, 87% Class 6, and 2% Class 7 this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical, and Class 7 has no capability for agricultural production.

On the Shpapzchinh 20 IR, the most significant limitation is terrain. Stoniness, erosion, and bedrock are the next most important limitations. Small improvements can be made through the use of irrigation. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 and 7 lands are generally not considered improvable.

Unimproved	Percentage	Area
Primary Limitation		
Moisture	6%	13
Terrain	92%	205
Bedrock	2%	5
Stoniness	0%	0
Secondary Limitation		
Erosion	24%	55
Bedrock	18%	40
Stoniness	51%	114
Moisture	4%	10
Inundation	0%	0
None	0%	0
Rating		
Class 7	2%	5
Class 6	87%	195
Class 5	10%	23
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0



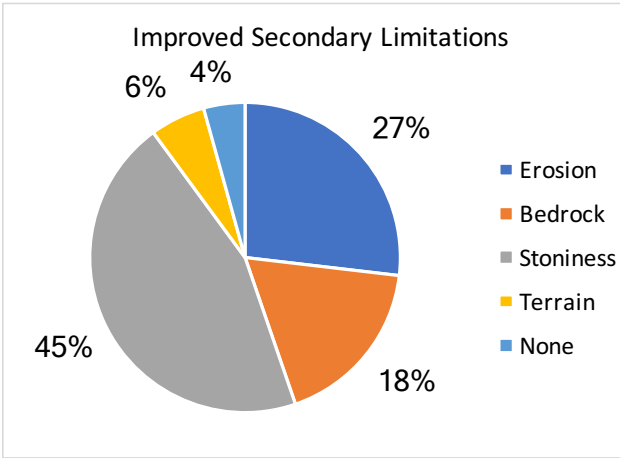
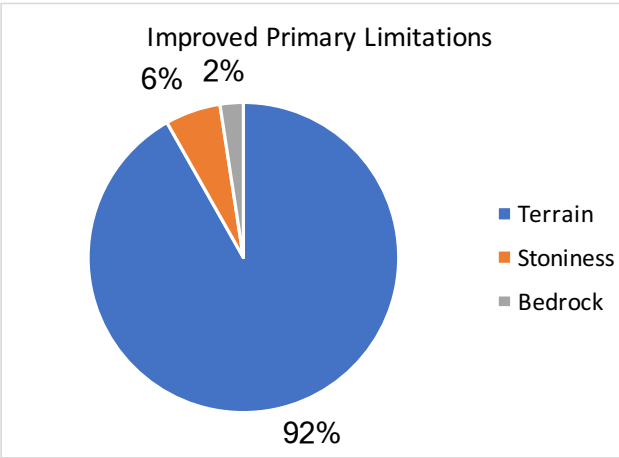
Improved Classifications and Limitations

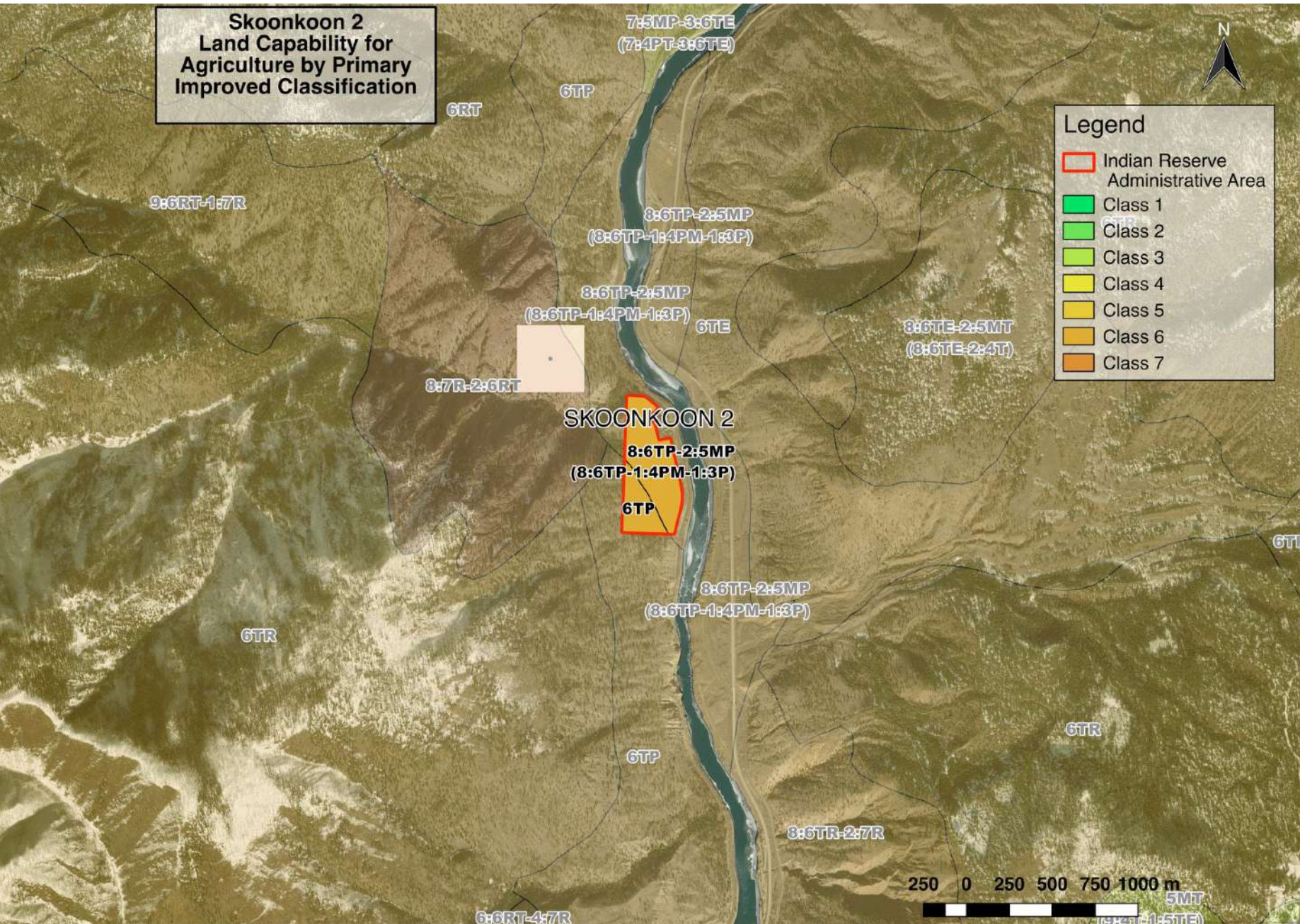
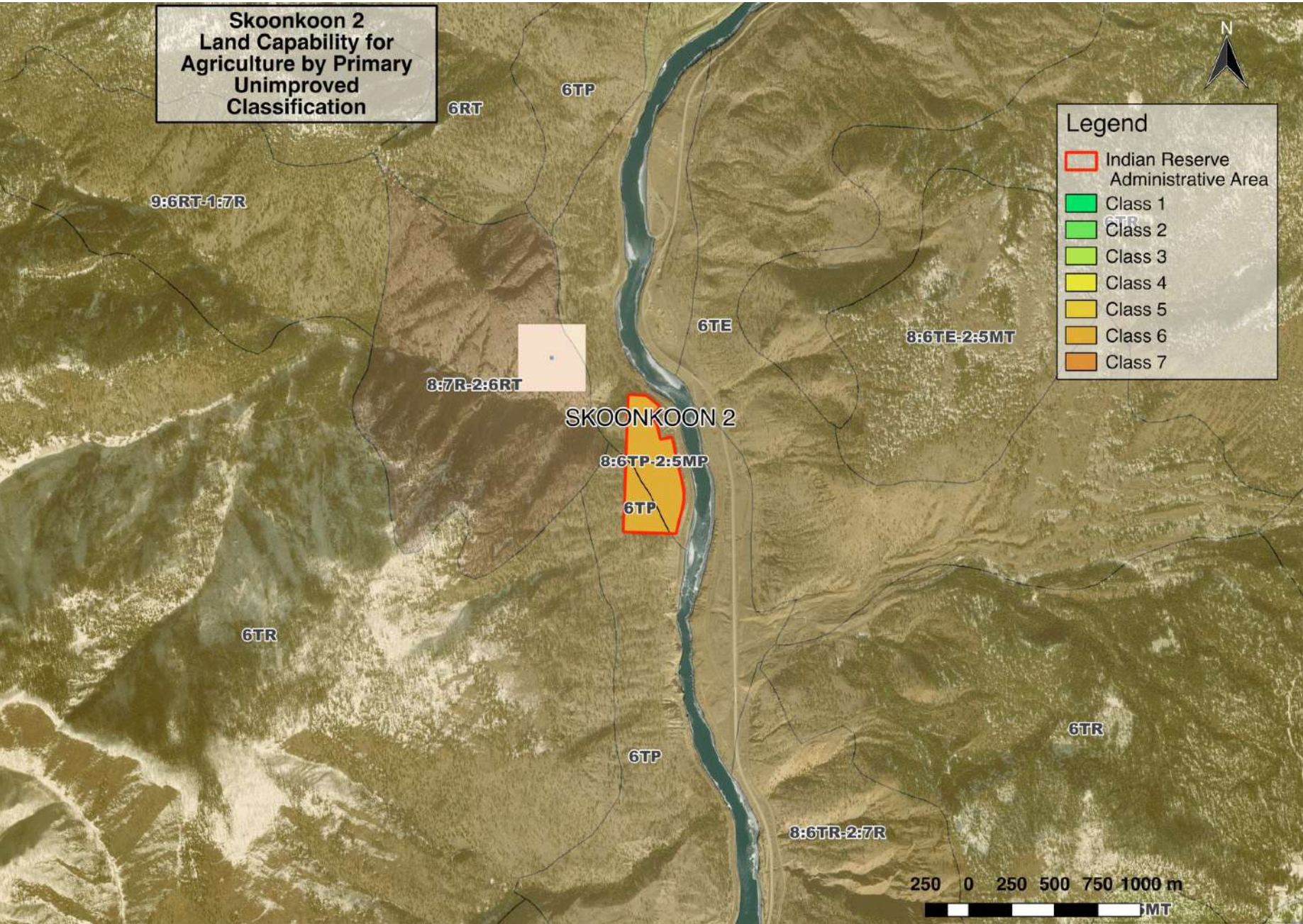


With 6% Class 3, the southernmost parcel of this IR contains approximately 13 ha of moderate capability lands for agriculture for CFIB, when improved. This means under good management it is fair to moderately high in productivity for a fair range of climatically adapted crops.

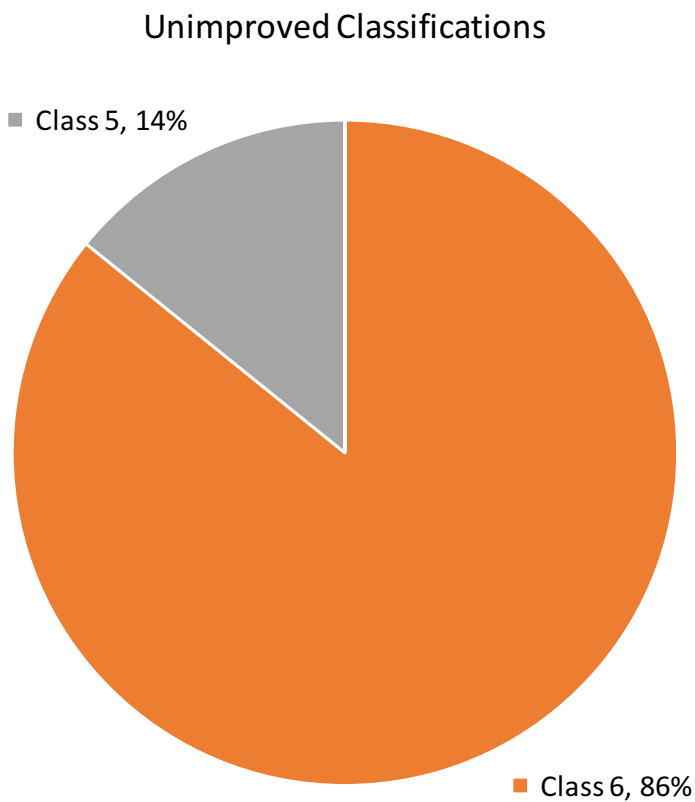
On the Shpapzchinh 20 IR, the most significant limitation following improvements is terrain, stoniness, and depth to bedrock. Stoniness at this site can be improved to increase 13 ha to Class 3 lands. Terrain and bedrock is a limitation that may not be improved, and results in Class 6 and 7 ratings at this site.

Improved	Percentage	Area
Primary Limitation		
Terrain	92%	205
Stoniness	6%	13
Bedrock	2%	5
None	0%	0
Secondary Limitation		
Erosion	27%	60
Bedrock	18%	40
Stoniness	45%	101
Terrain	6%	13
None	4%	10
Rating		
Class 7	2%	5
Class 6	87%	195
Class 5	4%	10
Class 4	0%	0
Class 3	6%	13
Class 2	0%	0
Class 1	0%	0



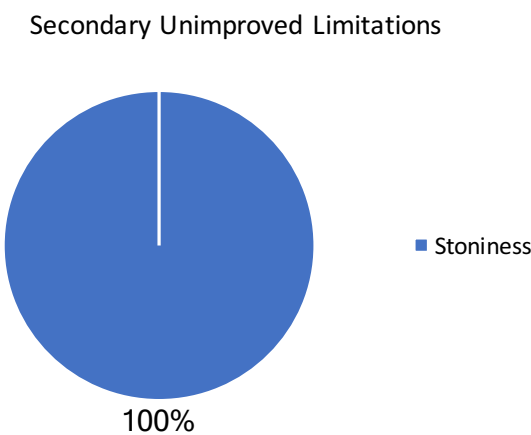
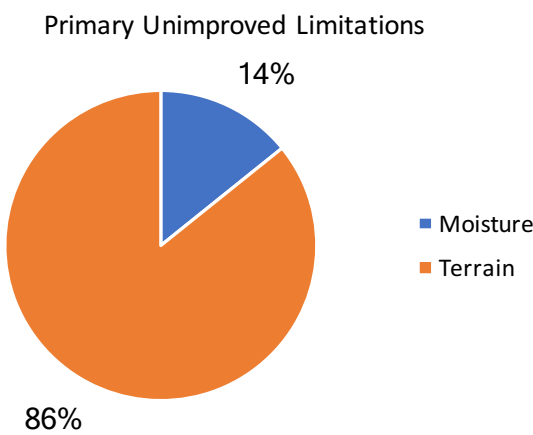


Unimproved Classifications and Limitations



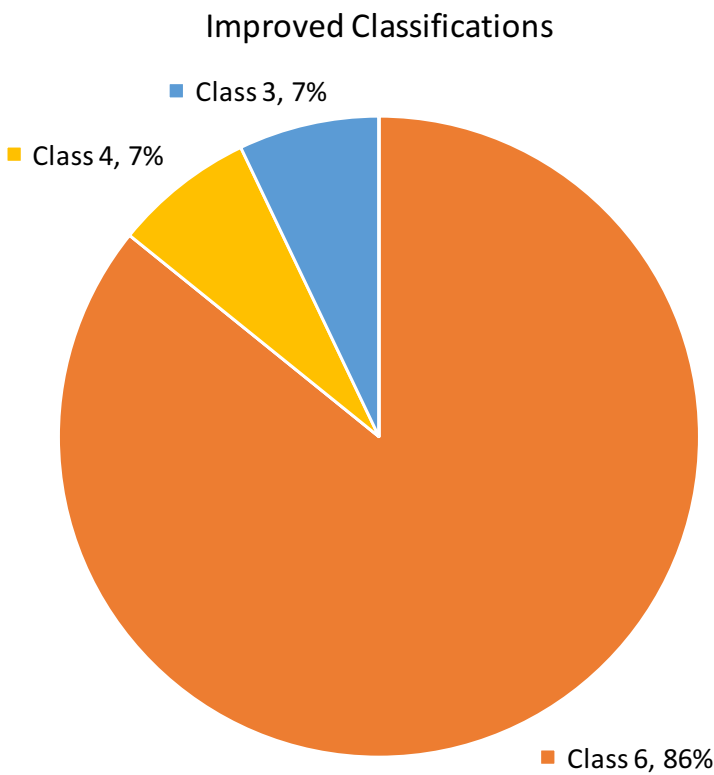
With 14% Class 5 and 86% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Skoonkoon 2 IR, the most significant limitation is terrain, followed by moisture and stoniness. About 1% or 11 ha of the land can be improved through the use of irrigation. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



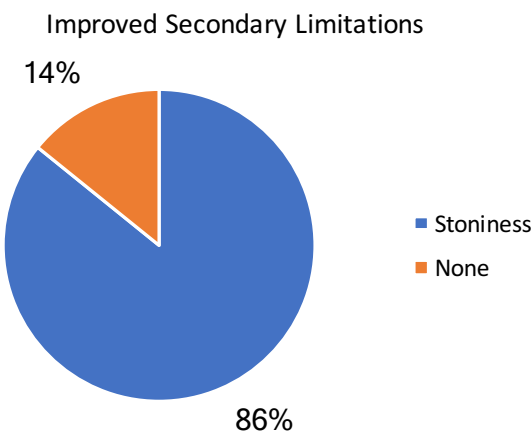
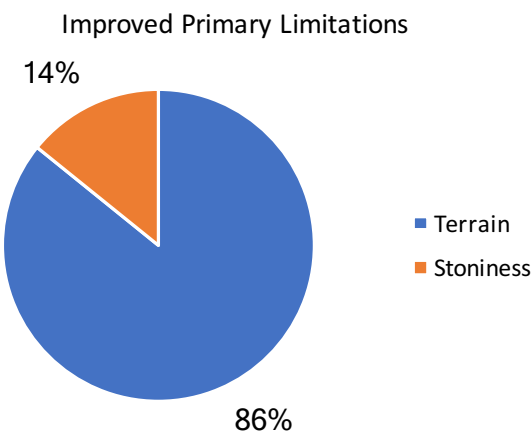
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	14%	3
Terrain	86%	19
Secondary Limitation		
Stoniness	100%	22
Rating		0
Class 7	0%	
Class 6	86%	19
Class 5	14%	3
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

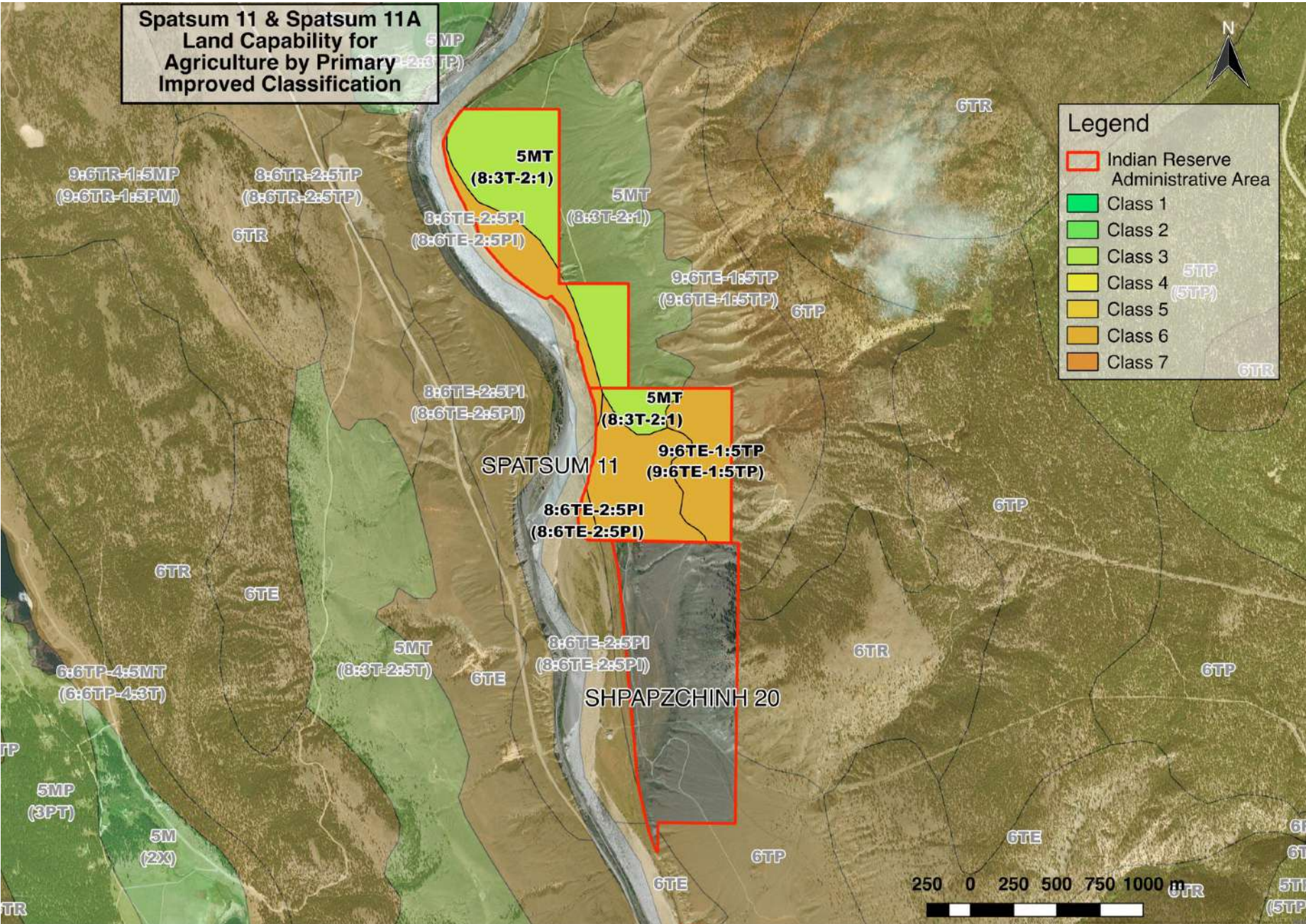
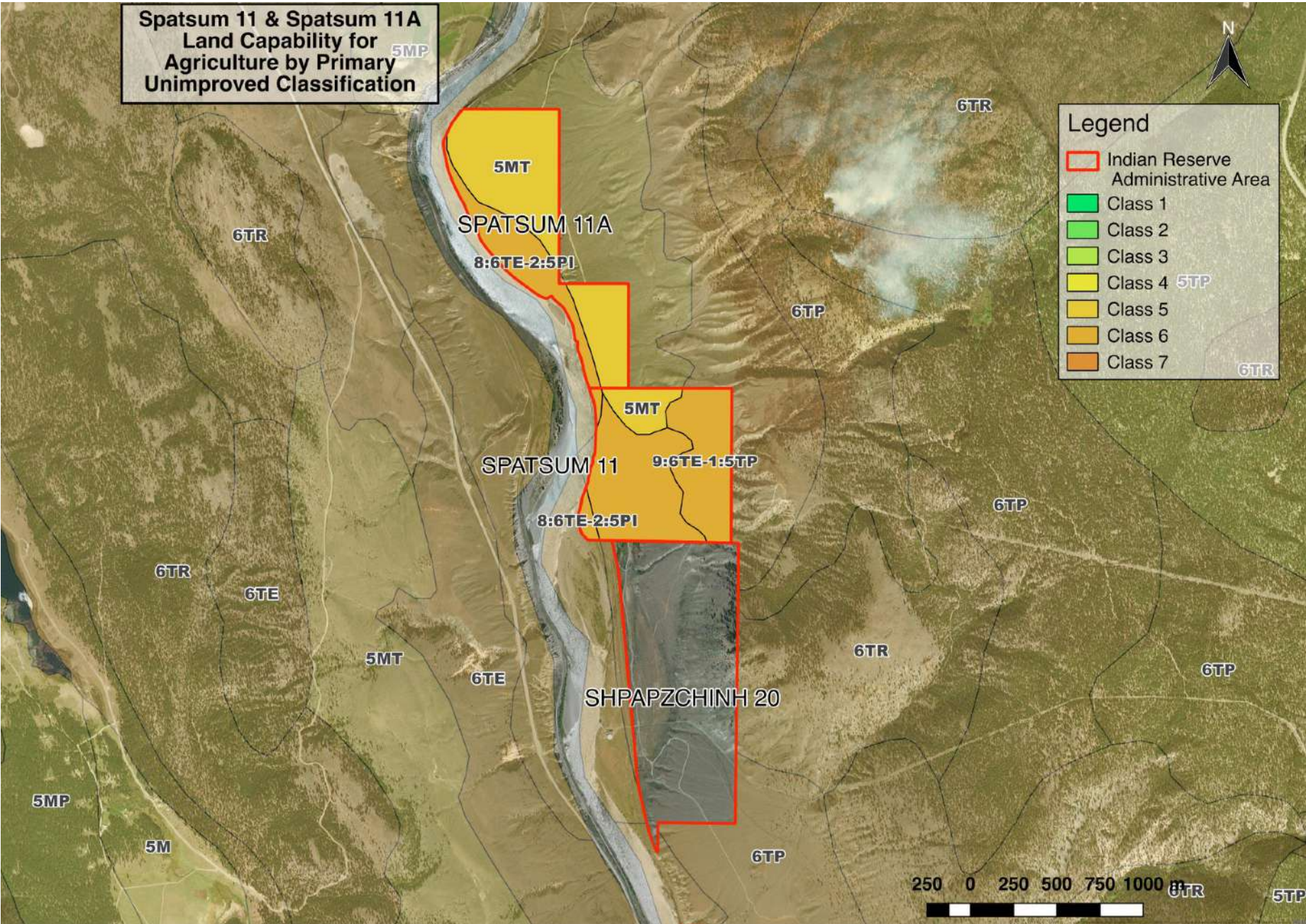


With 7% Class 3 and 7% Class 4 lands, this IR contains small amounts (4 ha) of moderately capable lands for agriculture, when improved. Under good management, those lands are considered fair to moderately high in productivity for a fair range of climatically adapted crops.

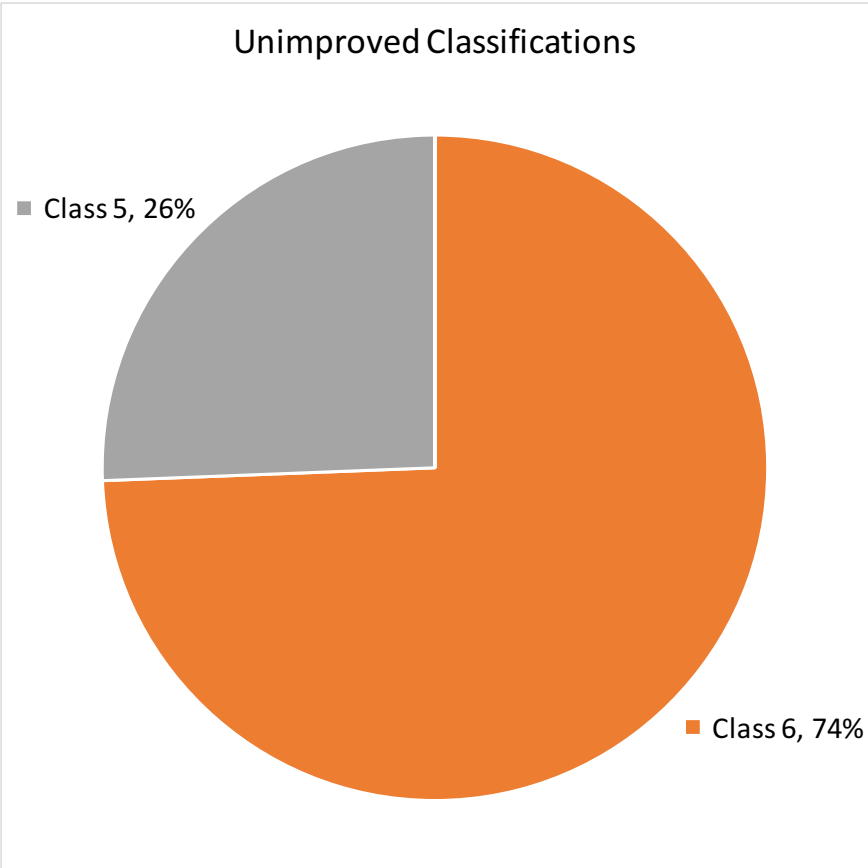
On the Skoonkoon 2 IR, the most significant remaining limitations after improvement is terrain and stoniness. Terrain is a limitation that may not be improved, and results in a Class 6 rating at this site.



Improved	Percentage	Hectares
Primary Limitation		
Terrain	86%	19
Stoniness	14%	3
Secondary Limitation		
Stoniness	86%	19
None	14%	3
Rating		
Class 7	0%	0
Class 6	86%	19
Class 5	0%	0
Class 4	7%	2
Class 3	7%	2
Class 2	0%	0
Class 1	0%	0

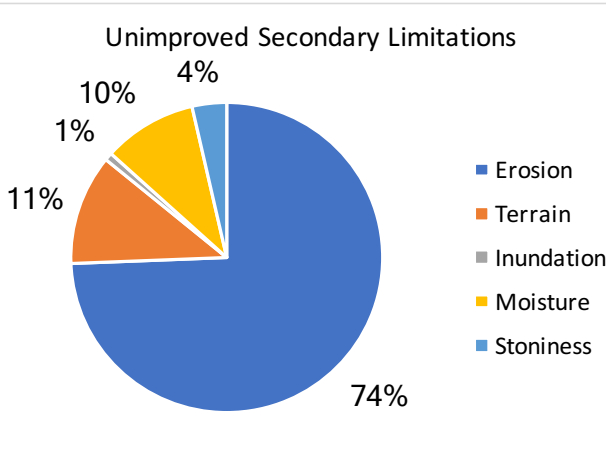
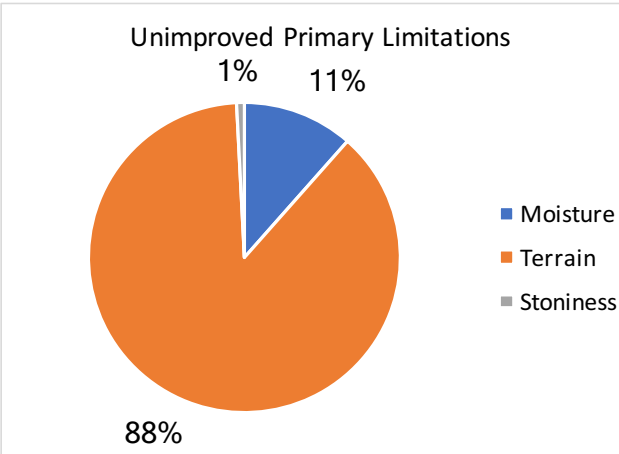


Unimproved Classifications and Limitations



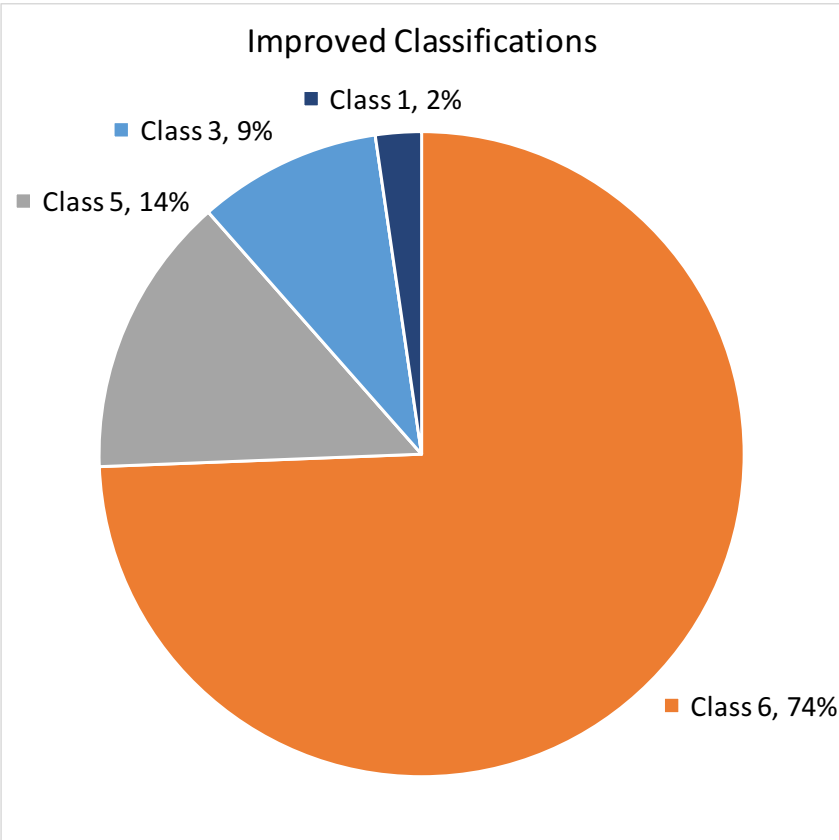
With 26% Class 5 and 74% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Spatsum 11 IR, the most significant limitation is terrain, followed by moisture and erosion. About 11% or 8 ha of the land can be improved through the use of irrigation. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



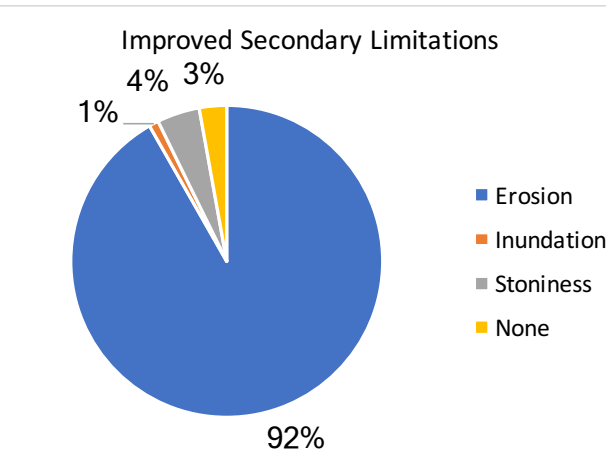
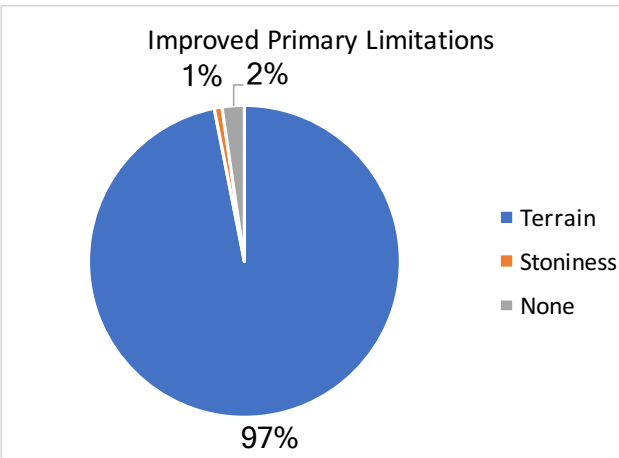
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	11%	8
Terrain	88%	65
Stoniness	1%	1
Secondary Limitation		
Erosion	74%	55
Terrain	11%	8
Inundation	1%	1
Moisture	10%	7
Stoniness	4%	3
Rating		
Class 7	0%	0
Class 6	74%	55
Class 5	26%	19
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0

Improved Classifications and Limitations

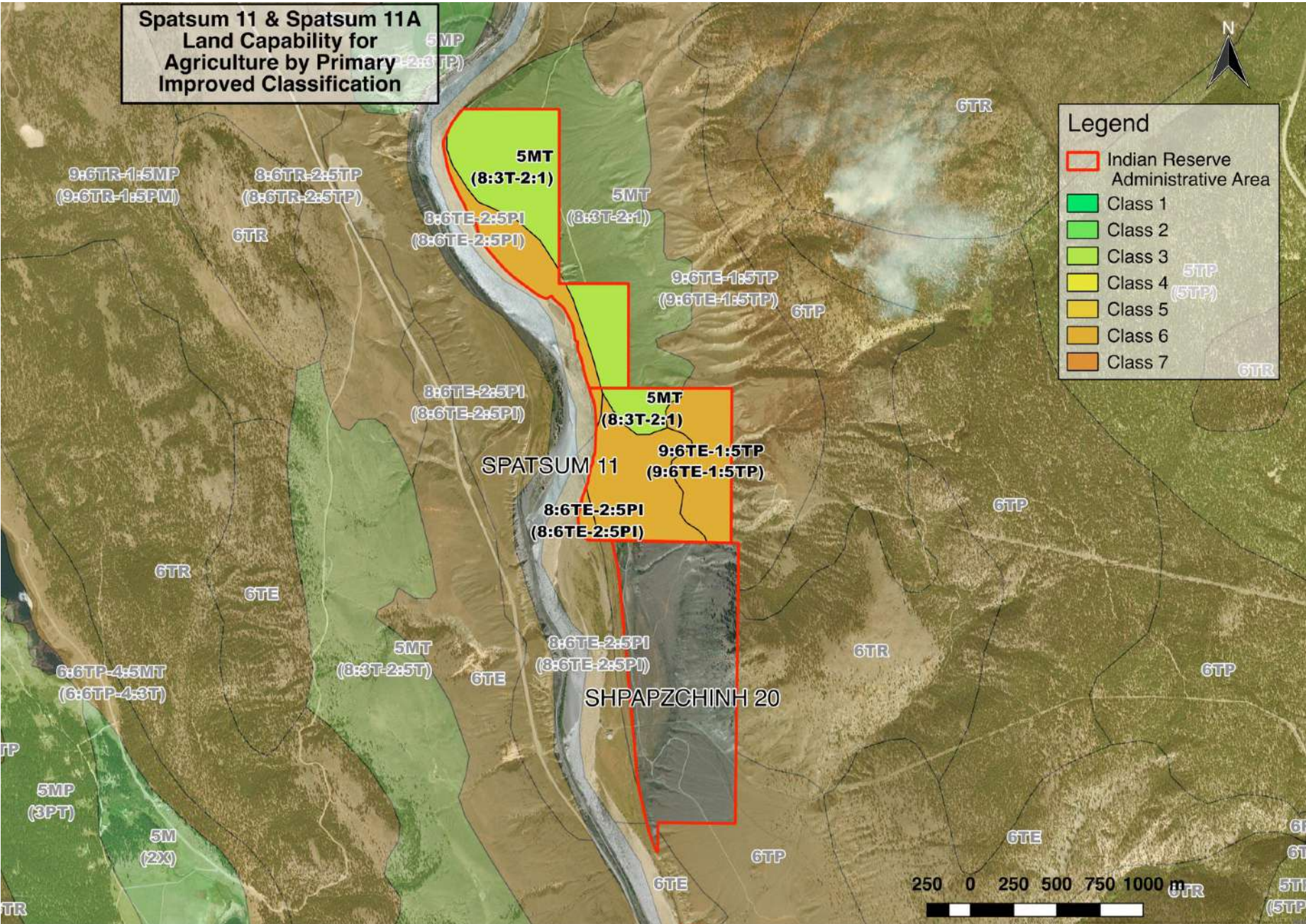
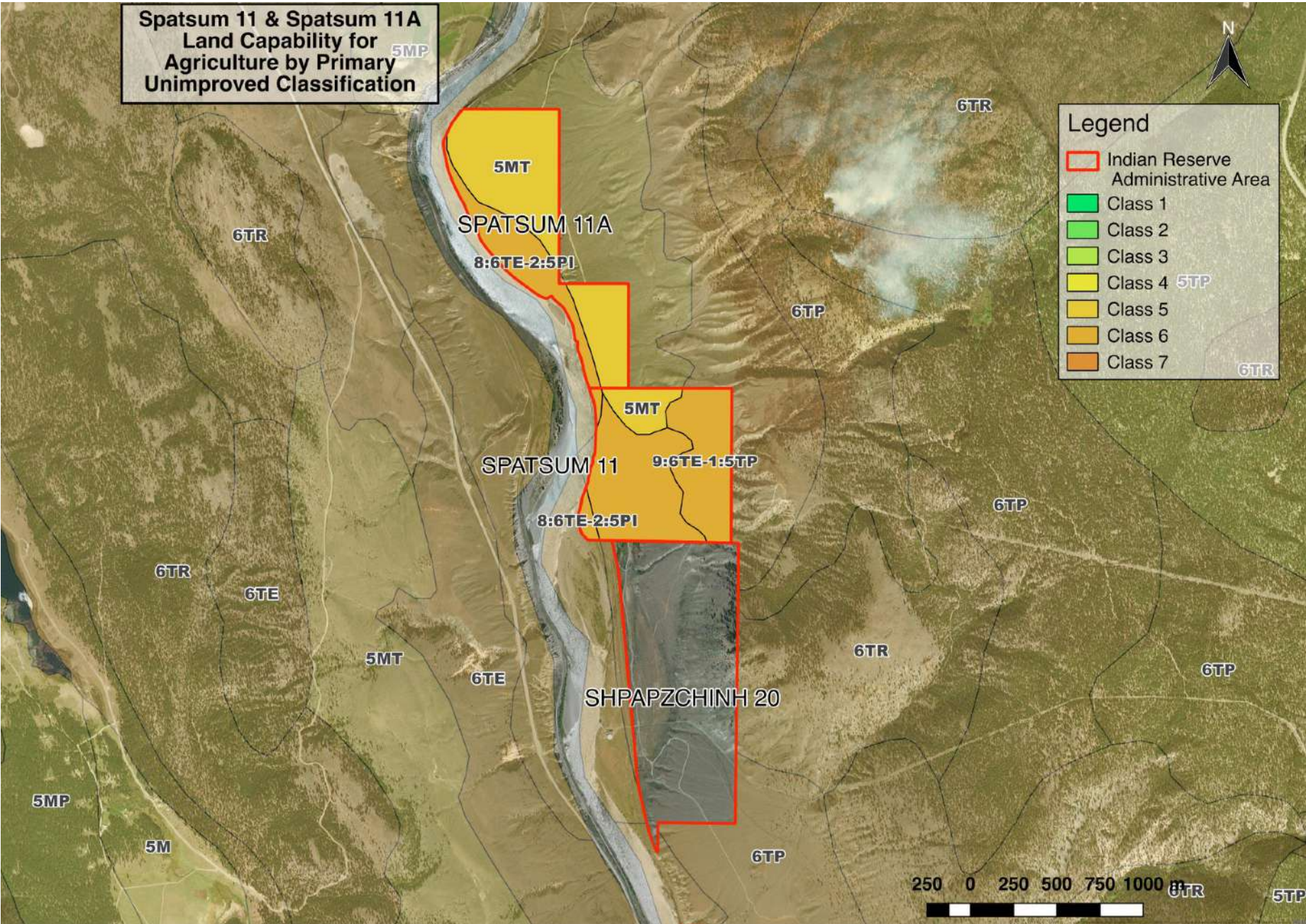


With 2% Class 1 and 9% Class 3, this IR contains small amounts (2 ha) of high capability lands for agriculture, when improved. Under good management, approximately 7 hectares may be considered fair to moderately high in productivity for a fair range of climatically adapted crops.

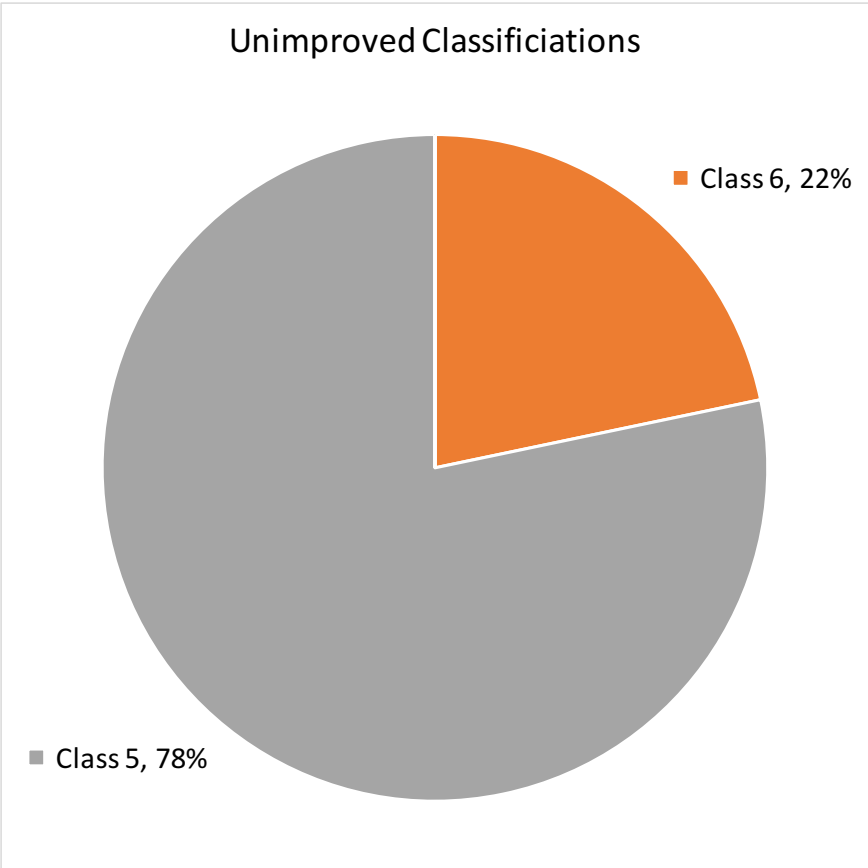
On the Spatsum 11 IR, the most significant remaining limitations after improvement are terrain and erosion. Terrain is a limitation that may not be improved, and results in a Class 6 rating at this site.



Improved	Percentage	Hectares
Primary Limitation		
Terrain	97%	71
Stoniness	1%	1
None	2%	2
Secondary Limitation		
Erosion	74%	55
Inundation	1%	1
Stoniness	4%	3
None	2%	2
Rating		
Class 7	0%	0
Class 6	74%	55
Class 5	14%	10
Class 4	0%	0
Class 3	9%	7
Class 2	0%	0
Class 1	2%	2

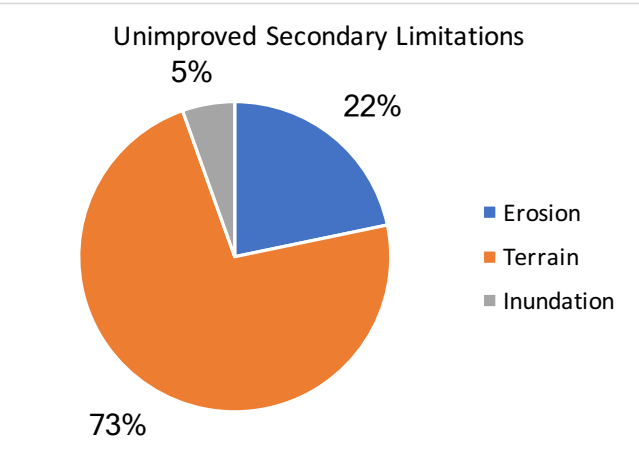
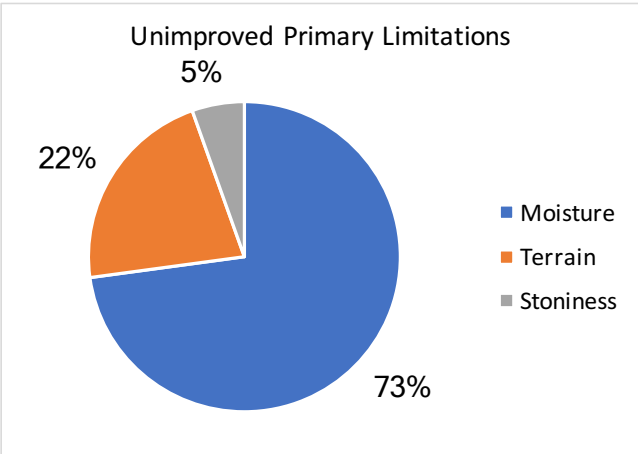


Unimproved Classifications and Limitations



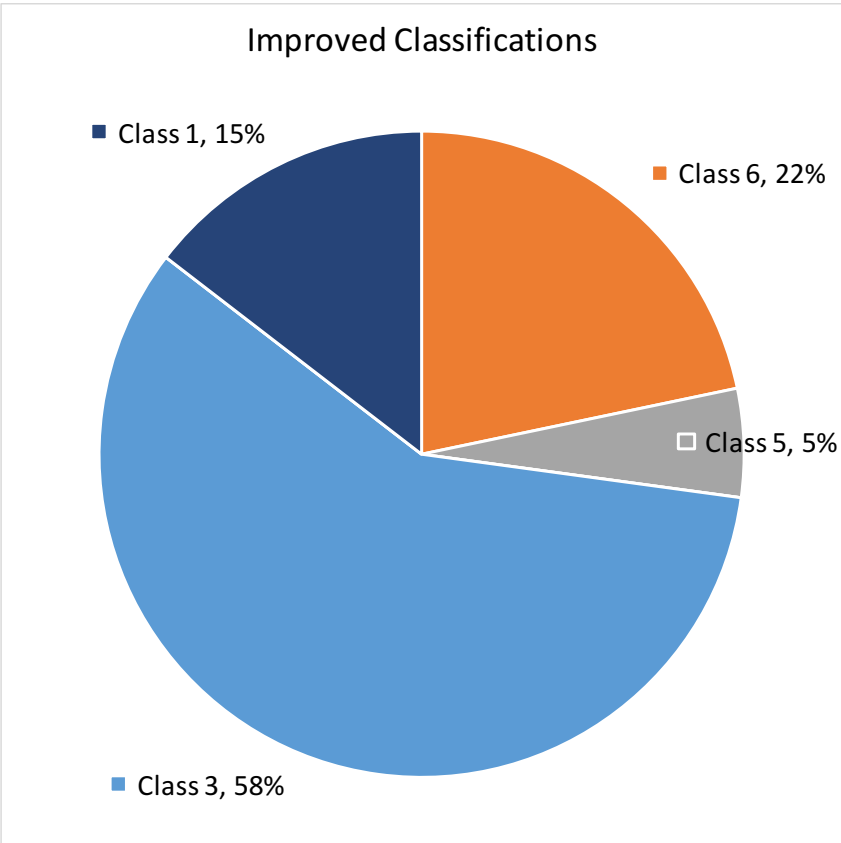
With 22% Class 5 and 78% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Spatsum 11A IR, the most significant limitation is moisture, followed by terrain and stoniness. A small portion of the land is limited by inundation. About 73% or 54 ha of the land can be improved through the use of irrigation. Class 6 lands are generally not considered improvable.



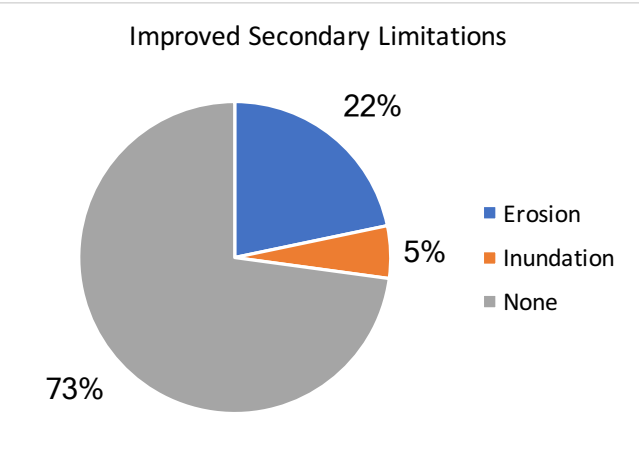
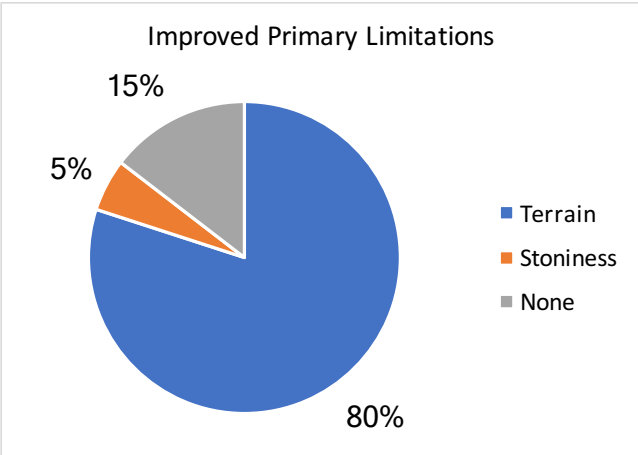
Unimproved	Percentage	Area
Primary Limitation		
Moisture	73%	54
Terrain	22%	16
Stoniness	5%	4
Secondary Limitation		
Erosion	22%	16
Terrain	73%	54
Inundation	5%	4
Rating		
Class 7	0%	0
Class 6	22%	16
Class 5	78%	58
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations

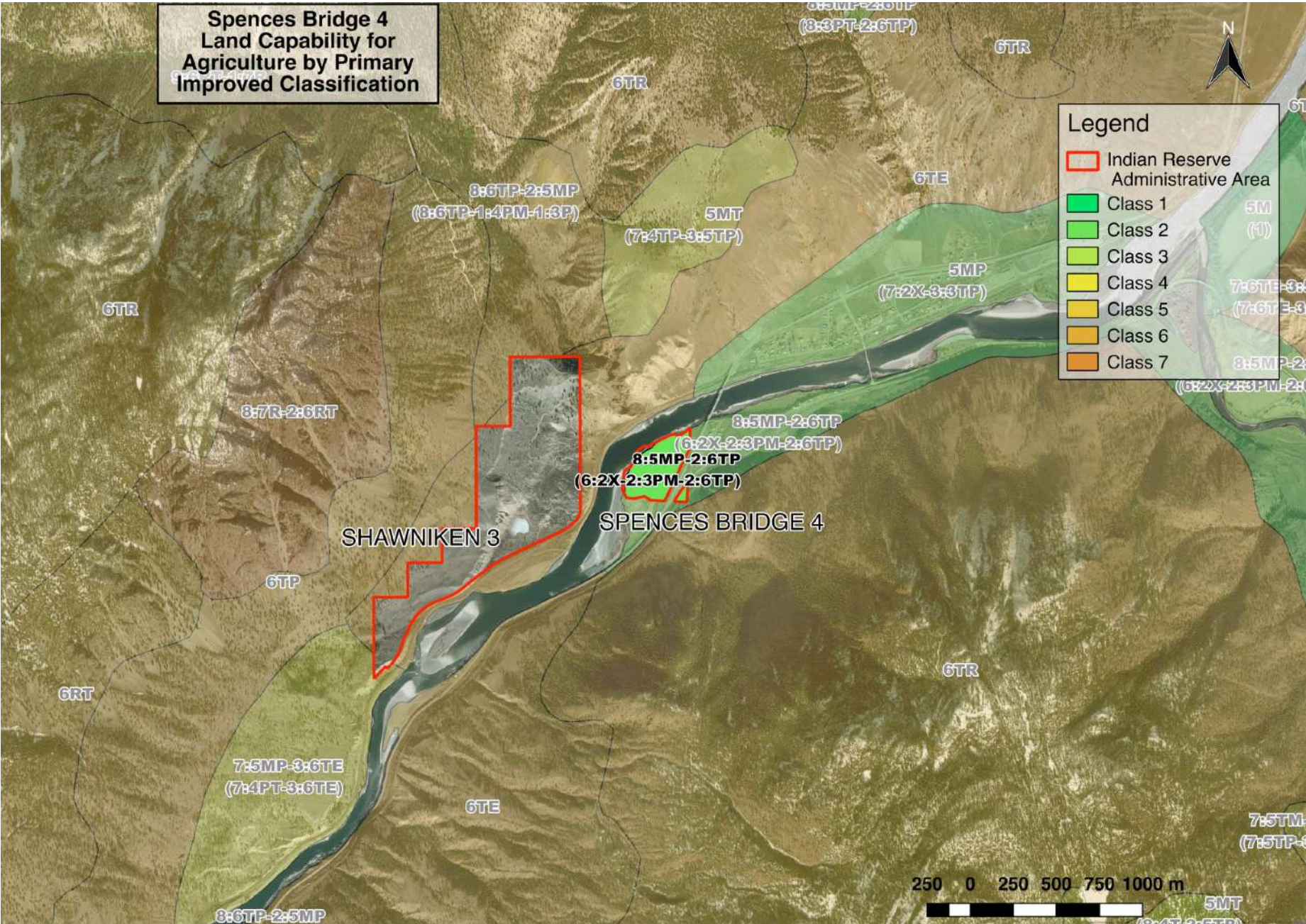
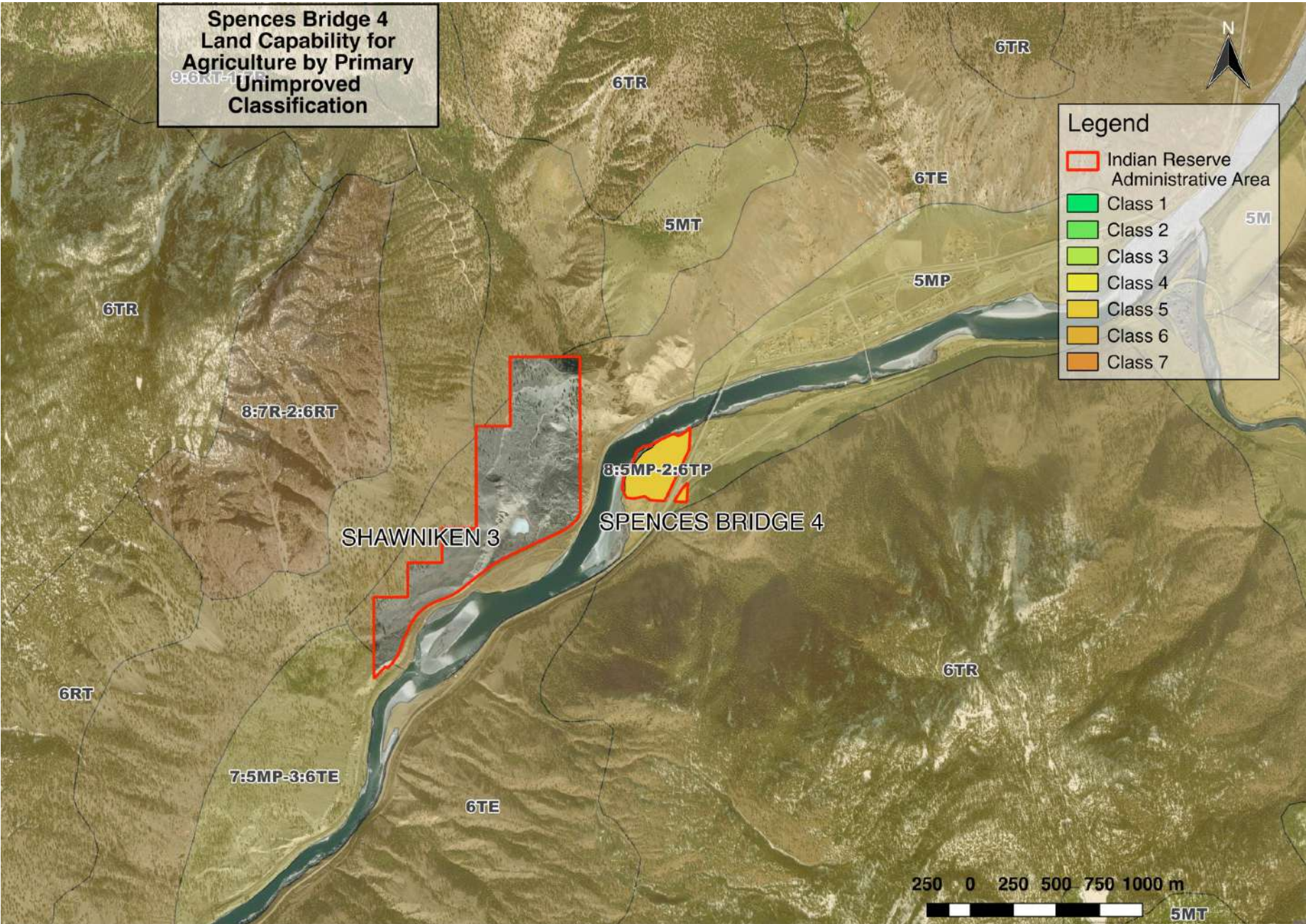


With 15% Class 1 and 58% Class 3, this IR contains 11 ha of high capability lands for agriculture, when improved. Under good management, approximately 43 hectares may be considered fair to moderately high in productivity for a fair range of climatically adapted crops when improved with irrigation.

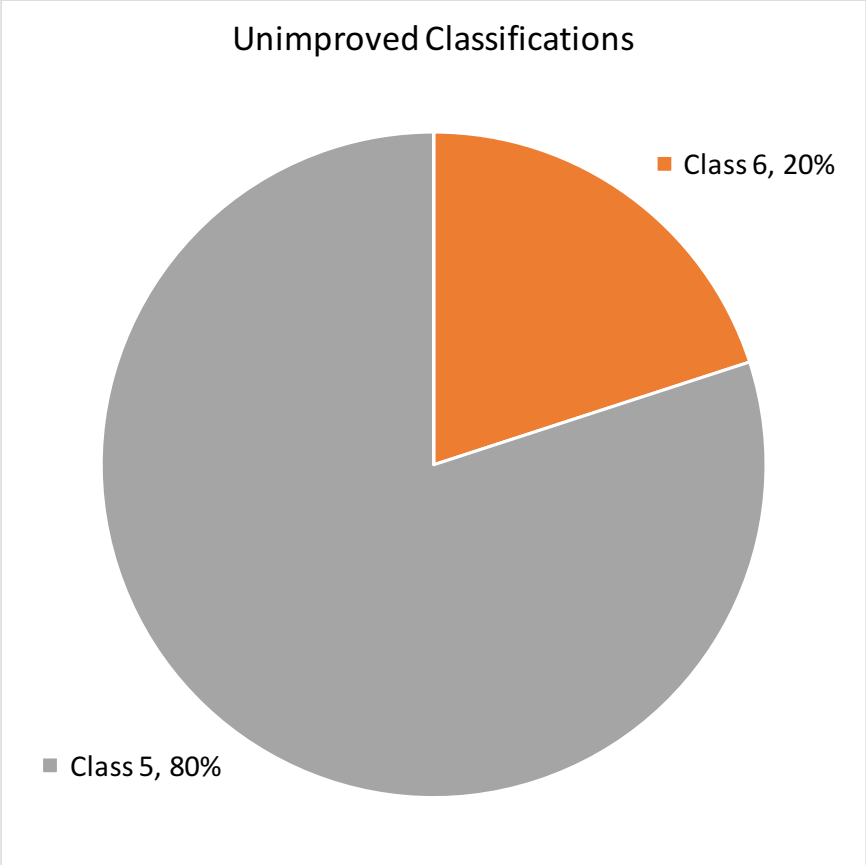
On the Spatsum 11A IR, the most significant remaining limitations after improvement are terrain, stoniness and erosion. Class 1 lands have no limitations once improved. Terrain is a limitation that may not be improved, and results in a Class 6 rating at this site.



Improved	Percentage	Area
Primary Limitation		
Terrain	80%	59
Stoniness	5%	4
None	15%	11
Secondary Limitation		
Erosion	22%	16
Inundation	5%	4
None	73%	54
Rating		
Class 7	0%	0
Class 6	22%	16
Class 5	5%	4
Class 4	0%	0
Class 3	58%	43
Class 2	0%	0
Class 1	15%	11

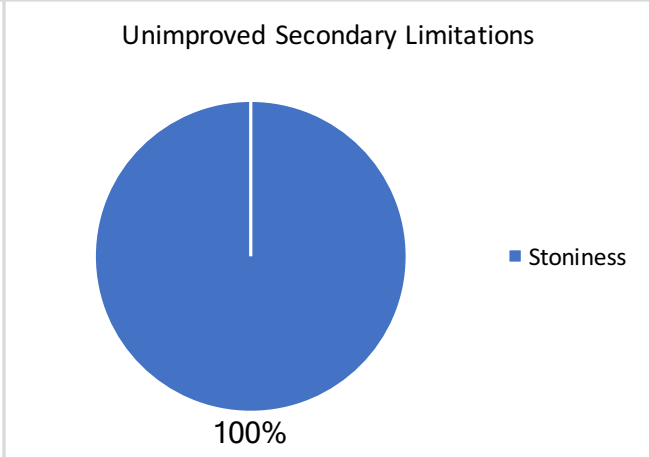
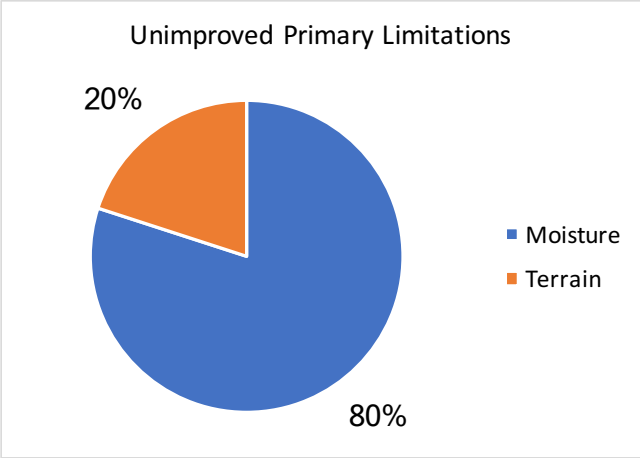


Unimproved Classifications and Limitations



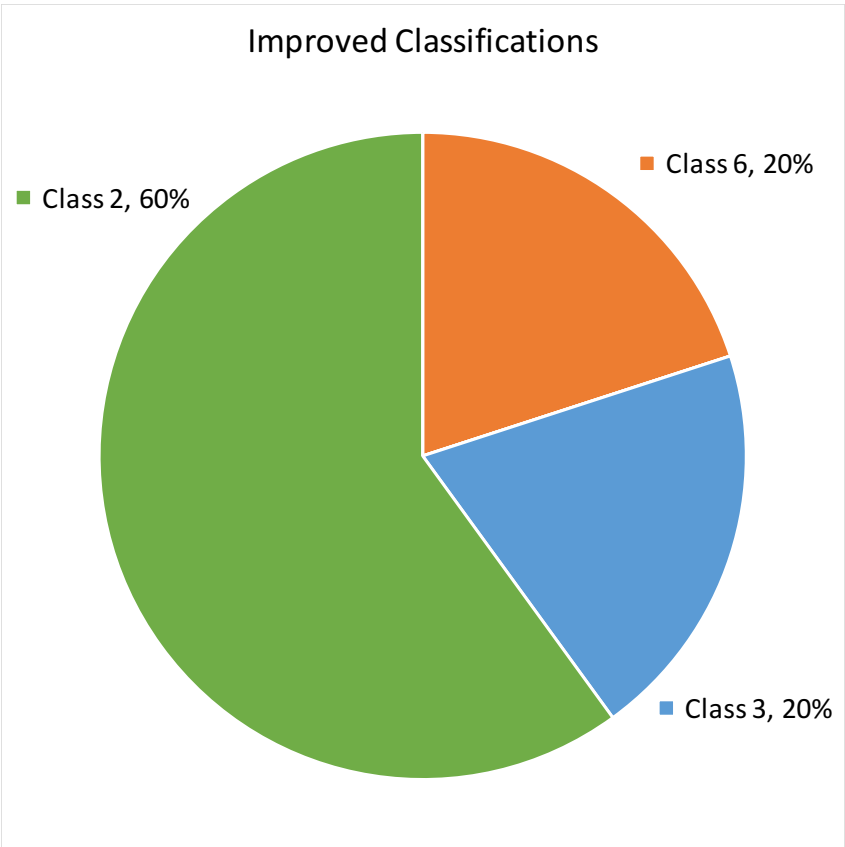
With 80% Class 5 and 20% Class 6, this land is restricted to producing native or tame species of perennial forage plants. Class 5 may be improved by use of machinery, whereas Class 6 machinery use is likely impractical.

On the Spences Bridge 4 IR, the most significant limitation is moisture, followed by terrain and stoniness. About 80% or 11 ha of the land can be improved through the use of irrigation. Stoniness can be improved when on land not limited by other unimprovable limitations, e.g. terrain. Class 6 lands are generally not considered improvable.



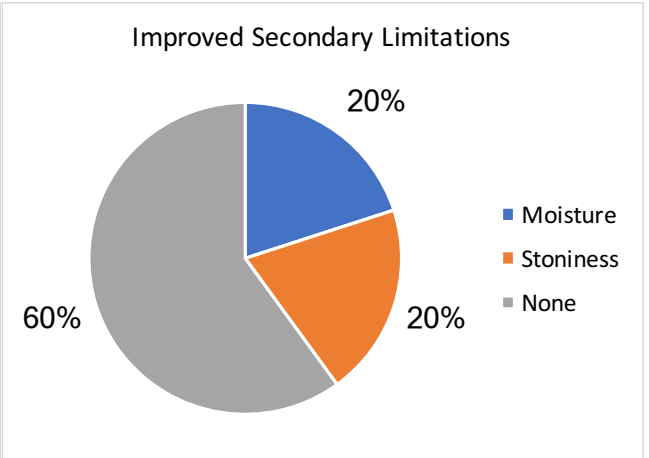
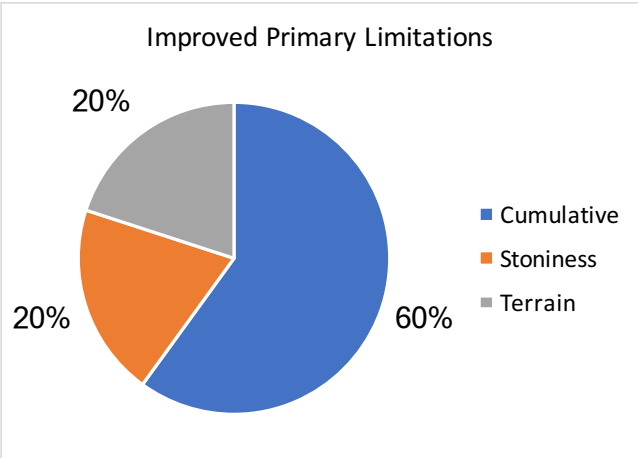
Unimproved	Percentage	Hectares
Primary Limitation		
Moisture	80%	8
Terrain	20%	2
Secondary Limitation		
Stoniness	100%	10
Rating		
Class 7	0%	0
Class 6	20%	2
Class 5	80%	8
Class 4	0%	0
Class 3	0%	0
Class 2	0%	0
Class 1	0%	0

Improved Classifications and Limitations



With 60% Class 2 and 20% Class 3, this small IR contains 6 ha of high capability lands for agriculture, when improved. Under good management, 2 hectares may be considered fair to moderately high in productivity for a fair range of climatically adapted crops.

On the Spences Bridge 4 IR, the most significant remaining limitations after improvement are cumulative, terrain and, and stoniness. Terrain is a limitation that may not be improved, and results in a Class 6 rating at this site. Cumulative limitations are due to the cumulative effects of two or more adverse characteristics which individually would not affect the class rating.



Improved	Percentage	Hectares
Primary Limitation		
Cumulative	60%	6
Stoniness	20%	2
Terrain	20%	2
Secondary Limitation		
Moisture	20%	2
Stoniness	20%	2
None	60%	6
Rating		
Class 7	0%	0
Class 6	20%	2
Class 5	0%	0
Class 4	0%	0
Class 3	20%	2
Class 2	60%	6
Class 1	0%	0

10.4 Canada Land Inventory Report No. 1 excerpt for Land Capability for Forestry

APPENDIX II

SUMMARY OF LAND CAPABILITY CLASSIFICATION FOR FORESTRY

In this classification all mineral and organic soils are grouped into one of seven classes based upon their inherent ability to grow commercial timber. The best lands of Canada for commercial tree growth will be found in Class 1; those in Class 7 cannot be expected to yield timber in commercial quantities; these classes represent the extremes. Because of unsuitable climate no Class 1 lands will be found in several regions of Canada, and in certain regions the Class 2 areas will be too small to show at the chosen scales of mapping.

Important factors on which classification is based are:

- All known or inferred information about the unit including subsoil, soil profile, depth, moisture, fertility, landform, climate and vegetation.
- A productivity range associated with each capability class based on the mean annual increment of the best species, or group of species, adapted to the site at, or near, rotation age. Productivity classes are expressed in gross merchantable cubic foot volume to a minimum diameter of four inches. Thinnings, bark, and branch wood are not included. The productivity as expressed is that of "normal", i.e., fully-stocked stands. It may be assumed that only good management would have produced stands of this nature.
- The following factors are not considered: location, access, distance to markets, size of units, ownership, present state or special crops such as Christmas trees.

The classes are based on the natural state of the land without improvements such as fertilization, drainage or amelioration practices. It is realized that in some instances productivity may change with improved forest management to the degree that limitations shown in the symbol may alter and/or class changes may take place. However, significant changes will only be achieved through costly and continuing practices.

CLASSES

1 - LANDS HAVING NO IMPORTANT LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils are deep, permeable, of medium texture, moderately well-drained to imperfectly drained. They have good water-holding capacity and are naturally high in fertility. Their topographic position is such that they frequently receive seepage and nutrients from adjacent areas. They are not subject to extremes of temperature or evapotranspiration. Productivity will usually be greater than 111 cubic feet per acre per year.

When required this class may be subdivided on the basis of productivity into Classes 1 (111 to 130), 1a (131 to 150), 1b (151 to 170), 1c (171 to 190), 1d (191 to 210), and by 20 cubic foot classes thereafter, as necessary.

2 - LANDS HAVING SLIGHT LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS.

Soils are deep, well-drained to moderately well-drained, of medium to fine texture and have good water-holding capacity.

The most common limitations (all of a relatively slight nature) are:

adverse climate, soil moisture deficiency, restricted rooting depth, somewhat low fertility, and the cumulative effects of several minor adverse soil characteristics. Productivity will usually be from 90 to 110 cubic feet per acre per year.

3 - LANDS HAVING MODERATE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils may be deep to somewhat shallow, well to imperfectly drained, of medium to fine texture with moderate to good water-holding capacity. They may be slightly low in fertility or suffer from periodic moisture imbalances.

The most common limitations are: adverse climate, restricted rooting depth, moderate deficiency or excess of soil moisture, somewhat low fertility, impeded soil drainage, exposure (in maritime areas) and occasional inundation.

Productivity will usually be from 71 to 90 cubic feet per acre per year.

4 - LANDS HAVING MODERATELY SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils may vary from deep to moderately shallow, from excessive through imperfect to poor drainage, from coarse to fine texture, from good to poor moisture holding capacity, from good to poor structure and from good to low natural fertility.

The most common limitations are: moisture deficiency or excess, adverse climate, restricted rooting depth, poor structure, excessive carbonates, exposure, or low fertility.

Productivity will usually be from 51 to 70 cubic feet per acre per year.

5 - LANDS HAVING SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils are frequently shallow to bedrock, stoney, excessively or poorly drained, of coarse or fine texture. They may have poor moisture holding capacity and be low in natural fertility.

The most common limitations (often in combination) are: moisture deficiency or excess, shallowness to bedrock, adverse regional or local climate, low

natural fertility, exposure particularly in maritime areas, excessive stoniness and high levels of carbonates.

Productivity will usually be from 31 to 50 cubic feet per acre per year.

6 - LANDS HAVING SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

The mineral soils are frequently shallow, stoney, excessively drained, of coarse texture and low in fertility. A large percentage of the land in this class is composed of poorly drained organic soils.

The most common limitations (frequently in combination) are: shallowness to bedrock, deficiency or excess of soil moisture, high levels of soluble salts, low natural fertility, exposure, inundation and stoniness.

Productivity will usually be from 11 to 30 cubic feet per acre per year.

7 - LANDS HAVING SEVERE LIMITATIONS WHICH PRECLUDE THE GROWTH OF COMMERCIAL FORESTS

Mineral soils are usually extremely shallow to bedrock, subject to regular flooding, or contain toxic levels of soluble salts. Actively eroding or extremely dry soils may also be placed in this class. A large percentage of the land is very poorly drained organic soils.

The most common limitations are: shallowness to bedrock, excessive soil moisture, frequent inundation, active erosion, toxic levels of soluble salts, and extremes of climate or exposure.

Productivity will usually be less than 10 cubic feet per acre per year.

SUBCLASSES

Except for Class 1, subclasses indicate the kind of limitation for each class. The subclasses are as follows:

Climate - Denotes a significant adverse departure from what is considered the median climate of the region, that is, a limitation as a result of local climate. Adverse regional climate is expressed by the class level.

10.5 GIS Analysis Methodology - Detailed

10.5.1 Map sieving for regional level analysis

The following is a description of the overlay filter process, or map sieving, that was performed on a regional scale for recreation, waterfowl, and ungulate land capabilities. The graphical modeler tool in QGIS was used to formulate the sequence of overlay processes. The objective is to assign all land surface an optimal land use type (e.g. waterfowl) based on the best capability rating. The completed map displays what the best-rated land use capability is, or where two land uses with the same capability classification overlap.

The following steps were performed:

- Ensure each land use capability layer file has an attribute table column for capability classification ratings and limitation codes;
- Create a new layer for each classification rating for each land use;
- Using the modeler to remove lower (better) classification ratings from each classification using the difference function, e.g. Class 3 – remove Class 1 and Class 2 polygons from Class 3, leaving Class 3 with no overlap with better classes. For each land use, apply the difference function for all other land uses, including within each land use if necessary (e.g. Ungulate Class A and Ungulate Class B);
- The result should ensure that each classification rating does not overlap with other classification ratings, regardless of land use, i.e. class 2 will not overlap with class 3, 4, or 5; class 3 will not overlap with class 2, 4, or 5; and repeat for classes 4 and 5;
- With the modeler, the intersect function was used to identify where different land uses within the same classification rating overlap;
- Using the difference function, the intersecting polygons were removed from the parent land uses;
- The map surface should have only one polygon at any location;
- Each land use type was merged and styled according to classification;
- Areas where land uses of the same classification rating intersect were styled with texture patterns with parent colours, e.g. a waterfowl class 3 and an ungulate class 3.

10.5.2 Forestry analysis

The CLI survey for land capability for forestry was not available for this area. An alternative methodology of classifying the lands was required. The CLI capability classification rating system uses mean annual increment (MAI) to rank land very good (1) to very poor (7). See Appendix 10.4 for a description of the forestry capability rating system and associated MAI values. Spatial MAI was not available at the time of the project at an acceptable scale. VRI data was available at a 1:20,000 scale, much larger than the 1:250,000 or 1:50,000 scale the other spatial data was available at. The Vegetation Resources Inventory (VRI) data includes dominant forest cover type, BEC information to the subzone level, and Site Index (SI).

The Variable Density Yield Projection model developed by the BC Ministry of Forests (<https://www.for.gov.bc.ca/hts/growth/vdyp/vdyp.html>) was utilized to interpolate the MAI using the dominant forest cover type, BEC zone, and SI. The model was run to get an MAI value

for each SI value in each BEC/forest cover variant, and then the tables were joined to update the spatial data. Once the attribute table included the capability classification for each polygon, a dissolve function was performed to eliminate borders between polygons that shared BEC zones and a capability classification rating. Although generalized, many polygons remained at a 1:20,000 scale, which made comparison with spatial data developed at the 1:250,000 and 1:50,000 scale inaccurate.

10.5.3 Agricultural analysis

The following steps were taken to perform an analysis for each IR identified as High Priority by CFIB:

- Cleaned and prepared by creating a new column for each value in agriculture capability data, such as percentage of polygon, classification rating, and subclassification (limitation) codes;
- Clipped agricultural capability against the Indian Reserves identified by CFIB as High Importance;
- Removed 2 small parts of Entlqwekkinh 19 in built up area within Spences Bridge and recalculated area;
- The river interfered with Kloklowuck 7 boundaries. The capability polygon along the river edge was increased in size to include more land adjacent to the river. This was done using Bing satellite imagery. A small area of the IR was not included in the assessment because it was not included in the original capability mapping, and appears to be within the high water mark of the river. Therefore the total area in the assessment is less than the total area of the IR;
- Recalculated areas for new clipped polygons and saved as spreadsheet. Data on spreadsheet tabulated and charted to communicate capability classification ratings and limitations and associated area measurements for each IR.
- Maps created and styled according to leading Improved and Unimproved capability classification ratings for each IR.