

A COMMUNITY-BASED APPROACH TO END LAND USE PLANNING AT HIGHLAND VALLEY COPPER

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ABSTRACT

The 2016 Highland Valley Copper (HVC) End Land Use Plan was developed as a collaboration between HVC and Nlaka’pamux communities. The two main goals of the plan were: 1) to incorporate input from Nlaka’pamux people about landscape reclamation goals, and 2) to identify potential land uses that the post-closure landscape is capable of providing and that are important to the Nlaka’pamux community.

Nlaka’pamux communities were involved in the planning process through a number of collaborative workshops. The information shared was incorporated into a technical mapping process to identify possible post-closure ecosystems. This mapping involved first creating a map from aerial photographs from the 1950s to determine the biogeoclimatic ecosystems that existed prior to mining. Post-closure ecosystem maps were then created based on Nlaka’pamux input and constrained by the range of potential ecosystems that can exist on the mine site after closure. Projected post-closure ecosystems were estimated based on (i) necessary depths and available volumes of reclamation-cover materials, and (ii) altered topography and changes to the ability of surficial materials to store water due to mining activity. Potential land uses were then identified.

A plain-language photobook was completed in addition to a technical report to communicate project results to participating communities.

Key Words:

mine reclamation, community engagement

INTRODUCTION

The Highland Valley lies within the traditional territory of the Nlaka’pamux Nation. The Nlaka’pamux people have been stewards of and connected to the area since time immemorial and have a deep knowledge of its ecosystems, including those that existed prior to mining. Many traditional activities have been - and continue to be - carried out here, such as hunting, fishing, trapping, gathering, and growing and cutting of swamp hay for livestock.

Teck Highland Valley Copper (HVC) is working with Nlaka’pamux communities to define a long-term plan to return land uses identified by Nlaka’pamux communities once mining is complete. HVC’s 2016

End Land Use Plan was developed with Nlaka’pamux communities and is meant to be a “living document” updated periodically through discussion with Nlaka’pamux communities on end-of-mine planning. During the engagement process community members suggested renaming the End Land Use Plan to the Returning Land Use Plan. HVC has adopted this name for the project.

The Returning Land Use Plan was developed collaboratively by HVC staff, Nlaka’pamux community members, and Nlaka’pamux technical representatives. Technical guidance and support was provided by the Integral Ecology Group (IEG). The plan provides information on intended post-closure end land uses for the HVC site, and a conceptual reclamation plan to guide detailed reclamation planning and implementation to achieve these land uses.

The primary goal of this work was to create a Returning Land Use Plan that is guided by the Nlaka’pamux people to identify the desired post-mining landscape and the end land uses it will provide. The plan:

1. incorporates Nlaka’pamux input into projected post-closure ecosystems mapping; and
2. identifies broad end land-use objectives for the HVC mine site that are important to Nlaka’pamux community groups.

The plan is designed to incorporate Nlaka’pamux input and meet internal (Teck) and external (e.g., B.C. Ministry of Energy, Mines and Petroleum Resources) reclamation and closure-planning commitments.

COMMUNITY ENGAGEMENT

The following Nlaka’pamux communities, encompassing three distinct political groupings, were invited to participate in the project:

1. Citxw Nlaka’pamux Assembly (CNA),
2. Lower Nicola Indian Band (LNIB), and
3. Nlaka’pamux Nation Tribal Council (NNTC).

Community engagement involved meetings between Nlaka’pamux communities and HVC, with consulting support, provided by IEG, to facilitate discussions. Meetings were held with both a Nlaka’pamux Technical Working Group and Community Working Groups.

Technical Working Group

The Technical Working Group consisted of representatives from the three Nlaka’pamux political groupings and their role was to support the Community Working Group. To do so, the Technical Working Group met two weeks prior to each Community Working Group meeting with the main purpose of reviewing meeting

materials and providing engagement advice, as well as helping to integrate community interests and future traditional land-use objectives into the planning process.

Community Working Groups

There were three Community Working Groups comprised of Nlaka'pamux community members from each political grouping. The key roles of the groups were (i) to discuss community interests and traditional land-use objectives related to reclamation and closure planning, and (ii) to share information and address concerns about the mine. Each of the Community Working Groups met four times, including one tour of the HVC mine site. There was an open invitation to the Nlaka'pamux communities to attend the meetings and the tour, and participating members represented a range of ages and interest groups. Some of the key questions that formed the basis of discussion at the meetings included:

1. What types of land uses would you like the landscape to provide after closure?
2. Would you like to see the types of ecosystems that existed in the valley prior to mining returned through reclamation, to the extent that this is possible?
3. What balance would you like to see between a focus on the return of pre-development ecosystems versus a more economic focus, such as creation of agricultural opportunities?

Meetings also included considerable conversations related to the unique potential post-closure opportunities provided by mine infrastructure (e.g. power supply, buildings); however, the focus remained on the more biophysical aspects of planning. The important discussions related to infrastructure will continue to develop as the mine moves towards eventual closure.

In addition, a survey was conducted to elicit specific information about land-use objectives. Survey questions were developed to address key points of input for the Returning Land Use Plan, based on the first two sets of workshops. The surveys were used as the basis of the third Community Working Group meeting, and were also distributed more broadly in a number of Nlaka'pamux communities by HVC staff, interns, and community participants to increase participation and reach demographics unlikely to attend daytime meetings. A total of 180 surveys were completed. Data from the surveys were examined to identify trends in desired land-use objectives and these trends were compared to input from the Community Working Group. As general land-use objectives were identified, the information was incorporated into the post-closure mapping exercise, and a single draft Returning Land Use Plan was produced. The draft plan was then presented to the Community and Technical Working Groups for additional input prior to finalization.

BIOPHYSICAL ECOSYSTEM MAPPING

Due to mining activities, both the topography and hydrology of the mine area have changed over time, and these changes constrain what can be accomplished on the post-closure landscape. In order to support the discussion that occurred during the community and technical workshops, a series of ecosystem modeling

and mapping tasks were completed to project likely soil conditions, plant communities, and land uses after mining ends.

The following is a list of technical tasks that were completed to map potential post-mine ecosystems for the HVC mine site:

- i. map of ecosystems present on the HVC site prior to mining (using aerial photographs);
- ii. post-mine map based on the objective of replacing pre-mining ecosystems to the extent possible given biophysical constraints imposed by mining;
- iii. estimate of the volume of reclamation-cover materials needed to do so; and
- iv. incorporation of input from Nlaka’pamux participants by altering the post-mine map to reflect traditional land-use objectives.

Soil moisture regime was assigned to proposed post-reclamation polygons based on calculations of available water storage capacity from particle-size distributions of rooting-zone (upper 1 m) materials (i.e., mine wastes such as tailings and waste rock and cover materials such as overburden) (Arya and Paris, 1981; Clothier et al., 1977; Saxton and Rawls, 2006). The soil-moisture-regime modelling accounted for the presence of organic matter, layering of materials and topography (Straker et al., 2015). Biogeoclimatic zone, sub-zone and variant were assigned to post-mining landforms based on elevation and pre-mine mapping (Lloyd et al., 1990). Soil-moisture-regime estimates were crossed with biogeoclimatic mapping to estimate edaphic position and projected biogeoclimatic site units.

RESULTS OF COMMUNITY ENGAGEMENT

Two key themes emerged when reviewing Nlaka’pamux meeting and survey feedback, which were incorporated into the technical mapping process:

1. Desire for the return of natural ecosystems—The majority of community participants wanted to see a return of natural ecosystems to the post-mine landscape to the extent that is possible, so that the future landscape could support traditional Nlaka’pamux land uses, including hunting, gathering, fishing, and trapping.
2. Support for agricultural pasturelands—There was relatively broad support among participants to allow for some reclamation of pasturelands on the post-mine landscape for haying and grazing, in addition to restoration of natural ecosystems.

The key results are reflected in responses to the survey question, “What types of land uses would you like the future landscape to provide?” The results indicate that there is widespread support among Nlaka’pamux participants for a return of ecosystems capable of supporting traditional land uses: most participants indicated they would like to see hunting and gathering land uses, and around half of the respondents would like the future landscape to provide trapping opportunities (Figure 1). However, results also demonstrated

broad support for agricultural uses, with many people indicating an interest in grazing and haying on the post-closure landscape.

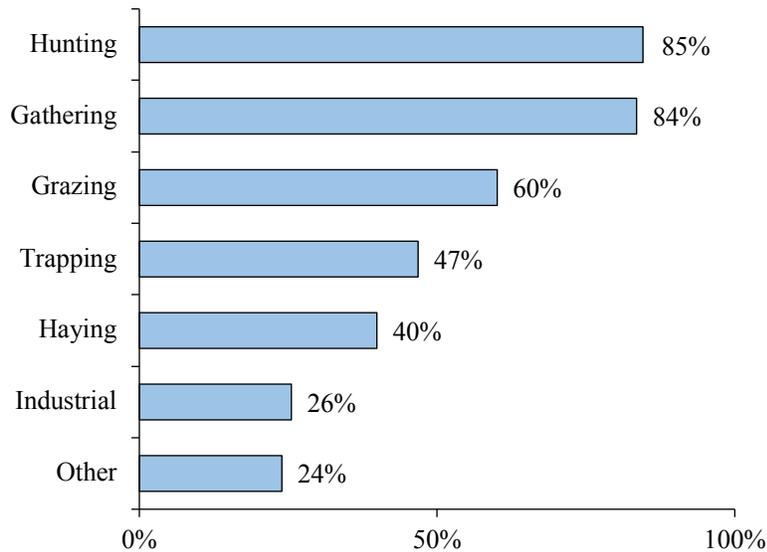


Figure 1. Results of survey question one showing percentages of positive participant responses to a range of traditional land uses (i.e., hunting, gathering, trapping) and economic land uses (grazing, haying, industrial/commercial) for the post-mine landscape. The ‘Other’ category includes classes of land uses that were suggested by respondents but not included in the question itself. These include recreation, fishing, spiritual/ceremonial, tourism/historical, community facilities, and residential uses.

For the purpose of post-closure mapping, these results were used to determine the proportion of the post-mine landscape to return to native ecosystems or reclaim to agricultural pastureland. To do this, land uses were grouped into the following two categories: agricultural uses (grazing, haying) and traditional land uses (hunting, gathering, trapping).¹

The corresponding proportions of participants who selected each land use were summed to determine the ratio of restoration to reclamation. For instance, reclamation of native ecosystems that existed prior to mining is necessary to return most traditional land uses, including hunting, gathering, trapping, fishing and spiritual uses. Conversely, haying and grazing potential is provided if the land is reclaimed to agricultural pastureland. Summing the corresponding percentages results in a ratio of 69% native ecosystems to 31% agricultural ecosystems. This ratio was mirrored by the results from another survey question, which showed that 68% of people want to see an increase in forestland, though there is also some support (32%) for pastureland. Based on the survey results, two post-closure maps were created that will form the basis of ongoing consultation. The first prioritized re-establishment of ecosystems that existed prior to the start of mining to the degree possible given the biophysical constraints imposed by the mining process (Figure 2), and the second, in addition to emphasizing the return of pre-mine ecosystems, also increased opportunities for agricultural activities such as grazing and haying (Figure 3). Per the survey results, approximately one third of the post-closure landscape in the second map is pastureland (Figure 3). Components of the mine

¹ These are not mutually exclusive categories, as grazing and haying may be traditional uses of land in the Highland Valley, and other traditional uses such as hunting may take place on landscapes designed primarily for agriculture.

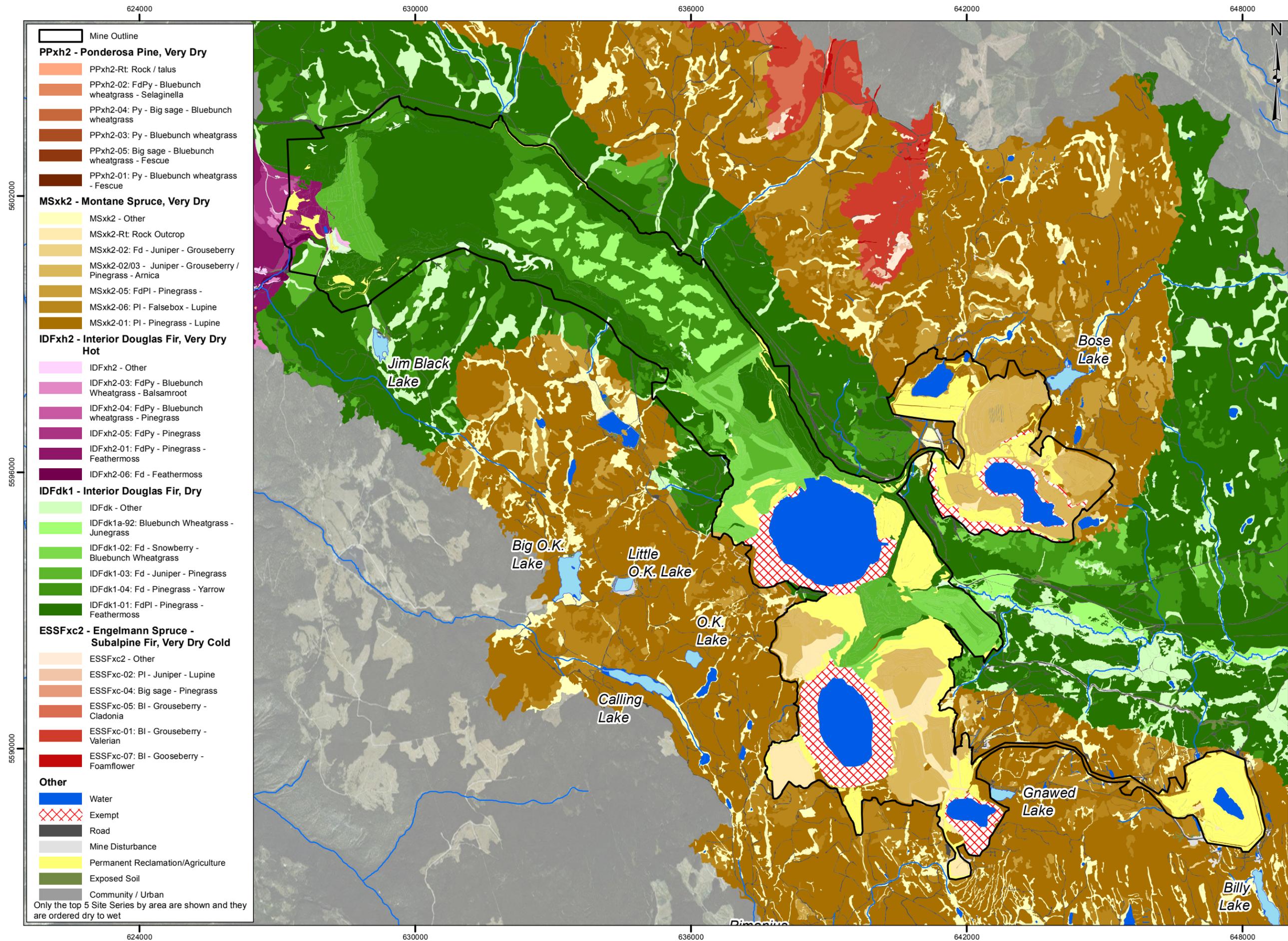
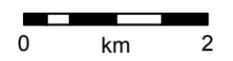


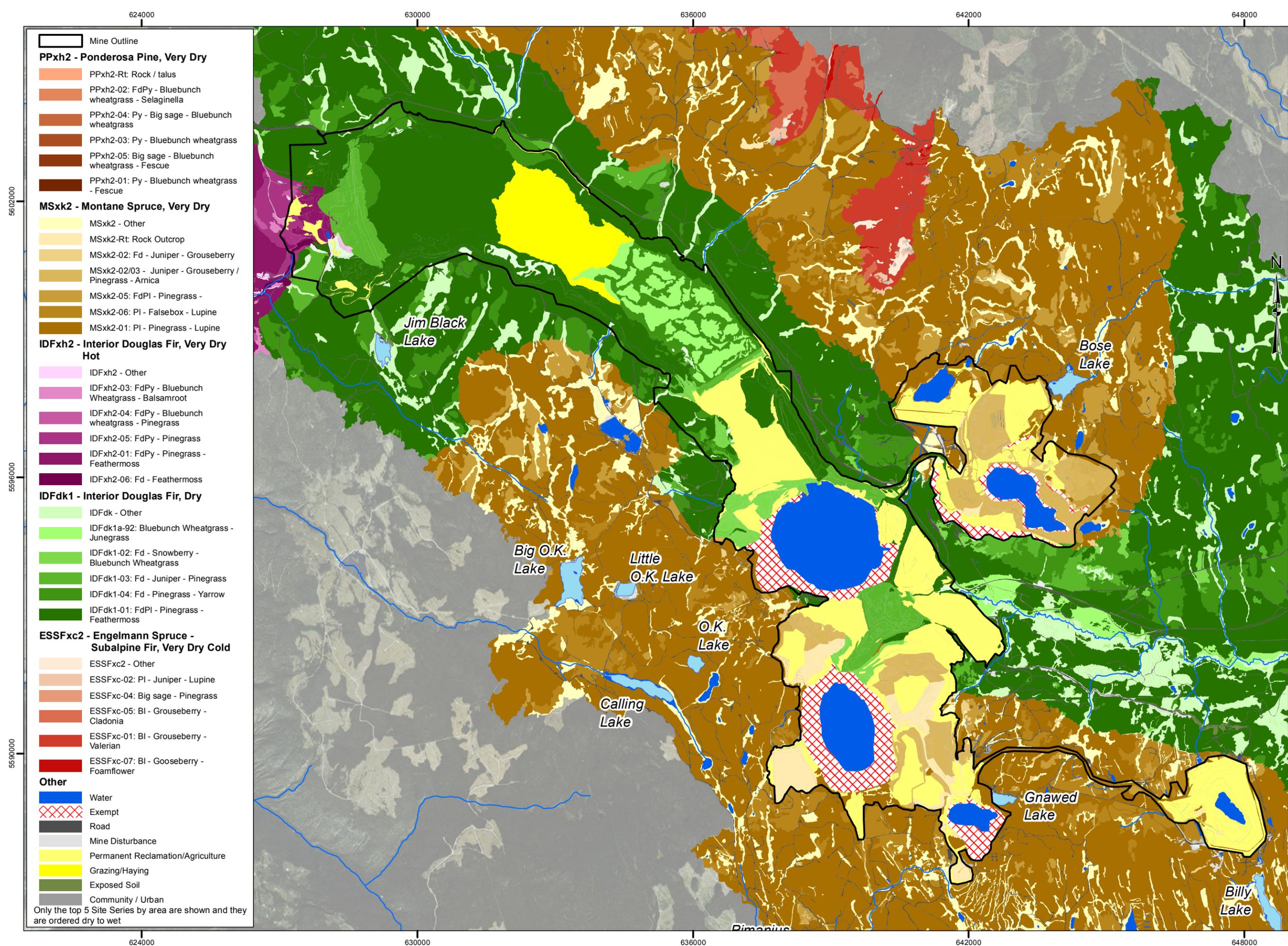
Figure 2: HVC post-closure landscape: focus on re-establishment of pre-mine ecosystems*.

*Site series within the mine footprint are target site series while those outside are existing



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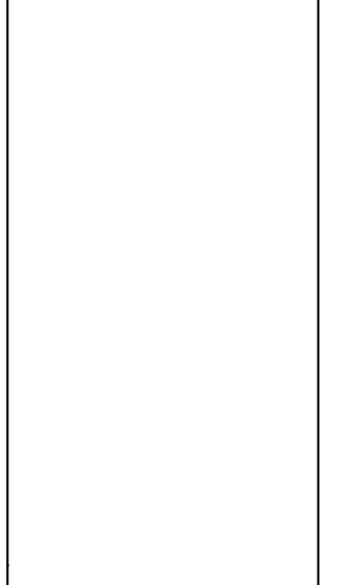




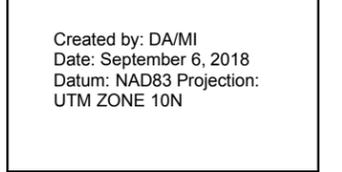
- Mine Outline
 - PPxh2 - Ponderosa Pine, Very Dry**
 - PPxh2-Rt: Rock / talus
 - PPxh2-02: FdPy - Bluebunch wheatgrass - Selaginella
 - PPxh2-04: Py - Big sage - Bluebunch wheatgrass
 - PPxh2-03: Py - Bluebunch wheatgrass
 - PPxh2-05: Big sage - Bluebunch wheatgrass - Fescue
 - PPxh2-01: Py - Bluebunch wheatgrass - Fescue
 - MSxk2 - Montane Spruce, Very Dry**
 - MSxk2 - Other
 - MSxk2-Rt: Rock Outcrop
 - MSxk2-02: Fd - Juniper - Grouseberry
 - MSxk2-02/03 - Juniper - Grouseberry / Pinegrass - Arnica
 - MSxk2-05: FdPI - Pinegrass -
 - MSxk2-06: PI - Falsebox - Lupine
 - MSxk2-01: PI - Pinegrass - Lupine
 - IDFxh2 - Interior Douglas Fir, Very Dry Hot**
 - IDFxh2 - Other
 - IDFxh2-03: FdPy - Bluebunch Wheatgrass - Balsamroot
 - IDFxh2-04: FdPy - Bluebunch wheatgrass - Pinegrass
 - IDFxh2-05: FdPy - Pinegrass
 - IDFxh2-01: FdPy - Pinegrass - Feathermoss
 - IDFxh2-06: Fd - Feathermoss
 - IDFdk1 - Interior Douglas Fir, Dry**
 - IDFdk - Other
 - IDFdk1a-92: Bluebunch Wheatgrass - Junegrass
 - IDFdk1-02: Fd - Snowberry - Bluebunch Wheatgrass
 - IDFdk1-03: Fd - Juniper - Pinegrass
 - IDFdk1-04: Fd - Pinegrass - Yarrow
 - IDFdk1-01: FdPI - Pinegrass - Feathermoss
 - ESSFxc2 - Engelmann Spruce - Subalpine Fir, Very Dry Cold**
 - ESSFxc2 - Other
 - ESSFxc-02: PI - Juniper - Lupine
 - ESSFxc-04: Big sage - Pinegrass
 - ESSFxc-05: BI - Grouseberry - Cladonia
 - ESSFxc-01: BI - Grouseberry - Valerian
 - ESSFxc-07: BI - Gooseberry - Foamflower
 - Other**
 - Water
 - Exempt
 - Road
 - Mine Disturbance
 - Permanent Reclamation/Agriculture
 - Grazing/Haying
 - Exposed Soil
 - Community / Urban
- Only the top 5 Site Series by area are shown and they are ordered dry to wet

Figure 3: HVC post-closure landscape: focus on agriculture and re-establishment of pre-mine ecosystems*.

*Site series within the mine footprint are target site series while those outside are existing



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infrastructure associated with the movement of tailings and water can likely be adapted to support irrigated agriculture and this notion was incorporated into the mapping process. For each projected post-closure ecosystem, potential traditional end land uses and wildlife habitat were identified.

One benefit of creating multiple maps for this project is to emphasize that the Returning Land Use Plan is a “living document” - an initial interpretation of ideas to be further developed through ongoing collaboration as the mine moves towards eventual closure.

PHOTOBOOK

A final report was written to document the Returning Land Use Plan process. Although the report included an artist’s illustrations of the post-closure landscape, it was written primarily for a technical audience. The draft report was reviewed and read only by HVC staff and the Technical Working Group and then finalized. The information therein did not reach the Nlaka’pamux community members who so generously invested their time, energy and knowledge into development of the plan, nor did it reach the broader Nlaka’pamux community who HVC wants to involve more deeply in the Returning Land Use process, with continued engagement, and with the revision of the “living document” planned for 2020.

HVC therefore decided to develop an additional report, in the form of a plain-language, coffee-table-style photobook to be printed and distributed to Nlaka’pamux communities. The book was written and designed with two main purposes in mind:

1. Create a sense of ownership—Nlaka’pamux community members, through workshops and surveys, were integral to the development of the Returning Land Use Plan. This was highlighted during the design process by incorporating participant photographs taken during the engagement process and including quotations from audio transcripts from the Community Working Group workshops. Community members were also gracious enough to translate the book title and a section of text into Nlaka’pamuxin.
2. Engage the community—In order to continue a productive discussion in 2020, when the Returning Land Use Plan will be revised with continued Nlaka’pamux input, community members need to have a firm understanding of the plan developed in 2016. It is therefore important for the photobook to be engaging enough for people to read the material. Technical components of the work were made more interesting, understandable and accessible by having an artist illustrate maps, modelling concepts, timelines and figures. These were each accompanied by text callouts to further explain the salient message of the illustrations. A professional photographer captured relevant images of the mine site and vegetation in order to bring context to the text and ensure the book was visually appealing. Additionally, one of the representatives from the Technical Working Group modeled potential occurrence of traditional-use plants on the projected post-closure landscape. The goal of the modeling exercise was to provide community members with a more relatable post-closure map

given their deep understanding of traditional plants and associated ecosystems compared to the biogeoclimatic site units mapped in the technical report.

REFLECTIONS ON COMMUNITY ENGAGEMENT

Completion of HVC's 2016 Returning Land Use Plan provided an opportunity to reflect on the work that was accomplished and to determine what may be useful to incorporate into the next iteration of the plan. While visual presentation materials (e.g. Microsoft PowerPoint) are standard in science-based technical meetings, we found that they detracted from the community meetings. Conducting these meetings in the absence of projected presentations allowed for more informal discussion and created an environment where community members felt comfortable speaking. When technical mapping and reclamation content was discussed, poster boards and handouts were printed. Individuals could therefore look at large scale maps during breaks, learning about the materials at their own pace instead of being limited to the length of time that any particular content element was projected on screen. More deeply technical portions of the project, particularly estimation of post-closure ecosystems, were difficult to convey to participants, and it will be important to focus on innovative methods of presenting the material when the plan is next revisited. The mine tour was an important component of the engagement process as it broadened participants' understanding of reclamation and the mine site and provided context for the subsequent working group meetings. Field-based meetings appear to increase participant enjoyment, engagement and participation in discussions.

The photobook, in the future, could benefit from having sections written directly by participants to more collaboratively create a product with the communities involved in the plan. It was truly an honor to have Nlaka'pamux community members translate a section of the book and the title into Nlaka'pamxcin. We hope to see the development of the collaboration between HVC and Nlaka'pamux grow through future iterations of the plan with increasing Nlaka'pamux direction and input.

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