Achieving biodiversity conservation goals in mine development, operation and closure

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Abstract

In 2011, Teck adopted an aspirational, long-term (2030) vision to achieve a net positive impact (NPI) on biodiversity by maintaining or re-establishing self-sustaining landscapes and ecosystems that lead to an agreed set of viable, appropriate and diverse long-term land uses in the areas where Teck operates. In the same year, Teck completed a high-level internal guidance manual, which described emerging trends in biodiversity management and provided a tool kit to help sites with initial stages of biodiversity planning.

In 2012, Teck conducted a company-wide scan to prioritise biodiversity issues at its operating and advance project sites. This exercise helped the company select two sites for pilot testing its biodiversity planning workbook and aided in prioritising the remaining sites for corporate and technical support.

Teck next engaged its personnel from operating sites and other corporate functional units to develop a draft NPI strategy to direct the scope of Teck’s NPI vision and to explain how sites should use the mitigation hierarchy to pursue NPI and which biodiversity targets a site should seek to achieve. A key aspect of Teck’s strategy is the use of quantitative metrics to demonstrate NPI on beneficial, valued and sustaining ecosystem and biodiversity elements that are relevant to the company’s operations and activities. These elements include natural habitats and ecosystems; critical landscape functions (e.g., connectivity); highly threatened and/or vulnerable populations and species of plants and animals; and ecosystem services.

A draft biodiversity management planning workbook was piloted in 2013 at the two sites selected in 2012. In 2014, the spreadsheet-based workbook and a guidance document for developing site-specific biodiversity management plans were rolled out to all sites. By the end of 2015, Teck is committed to developing biodiversity management plans that set out how NPI may be achieved on the basis of information that has been gathered and assessed to date.

Experience with applying Teck’s biodiversity management vision, targets and tools has produced several key learnings:

- Teck’s NPI-based approach is often more in line with the expectations of communities of interest than other approaches prescribed by environmental assessment agency policies.
- The NPI-based approach can motivate improved efforts at the avoidance, minimisation and rehabilitation steps of the mitigation hierarchy.
- Carefully selected and managed offsets will often be required to replace ecosystem and biodiversity elements that cannot be restored on site in a meaningful time frame.

This same experience has revealed some challenges, including developing metrics for NPI planning and performance monitoring that achieve credibility and comparability, demonstrating additionality of conservation actions, ensuring the longevity of offsets and identifying available offset opportunities.

1 Introduction

Biodiversity conservation is the practice of sustaining the abundance and variety of living organisms on our planet through actions ranging from protecting animal or plant populations and habitats to rehabilitating impacted ecosystems. Biodiversity is also the basis of many ecosystem services that sustain people and the
natural environment — from providing clean water to recycling nutrients and pollinating. Increasingly common pressures on and related losses of biodiversity threaten many of the ecosystem services on which people and nature depend. In recent decades, conservation scientists, advocates, governments and industries have become aware of the need to assess and address potential impacts on plants, wildlife, fish and their habitats on multiple scales and, in many cases, with a greater sense of urgency.

Mining can impact plants, animals and their habitats both directly and indirectly. Direct impacts can result from any mining activity that involves land clearing (such as road construction, exploration drilling and overburden stripping or tailings impoundment construction) or discharges to water bodies or the air. Indirect impacts can result from social or environmental changes that are induced by mining operations, particularly when mining opens up an area for other economic activities and increased habitation by people. In cases where mines are developed in landscapes and other pressures on biodiversity are present, the potential for cumulative impacts must be considered.

Biodiversity is a key concern for many of Teck’s communities of interest such as investors, Indigenous peoples, governments, local communities and conservation organisations. Impacts to biodiversity judged unacceptable by communities of interest can potentially slow or even halt the approval process for mine-life extensions and new projects, while exemplary biodiversity stewardship has the potential to strengthen relations with and support from communities of interest.

In mid-2011, Teck published a Sustainability Review report (Teck Resources Limited, 2011), which shared our long-term (2030) vision and goals for performance in six focus areas: communities, water, energy, biodiversity, materials stewardship and our people. These focus areas and the strategies for each were developed by the company from late 2009 through mid-2011 and involved extensive research and dialogue with senior management of the company; identified emerging leaders of the company; and a cross-functional working group of Teck employees, sustainability consultants and external communities of interest.

Teck is committed to having a net positive impact (NPI) on biodiversity in the regions where we operate. The company’s intention is to achieve NPI on biodiversity by maintaining or re-establishing self-sustaining landscapes and ecosystems that lead to an agreed set of viable, appropriate and diverse long-term land uses in the areas where Teck operates. Our aim is to leave key biodiversity elements — consisting primarily of ecosystems and the species that depend on them — better off overall as a result of our presence in a region than they would be if we were never there. Teck’s portfolio of operating sites consists of six open-pit steelmaking coal mines in western Canada, three open-pit copper mines (two in Chile and one in western Canada), an underground copper mine in eastern Canada, an open-pit zinc mine in Alaska, U.S.A., an underground zinc mine in Washington, U.S.A. and an zinc refinery in western Canada.

In late 2011, we completed a high-level internal guidance manual, which described emerging trends in corporate biodiversity management and provided a tool kit to help sites with initial stages of biodiversity planning. It reflects the general principles of the Good Practice Guidance for Mining and Biodiversity of the International Council on Mining and Metals (ICMM) (ICMM, 2006) and draws from many of the tools contained in this publication. The Teck guidance manual also describes key elements of relevant international frameworks for biodiversity management, particularly the International Finance Corporation’s Performance Standard 6 for Biodiversity (IFC, 2012) and the Business and Biodiversity Offsets Programme principles for offsets design (BBOP, 2012).

The Teck sustainability strategy includes long-term goals (for achievement by 2030) and short-term goals (for achievement by 2015). This paper describes our approach to achieve our key operational 2015 biodiversity goal:

*Develop comprehensive biodiversity management plans including targets and actions, to minimize impacts at all operations and advanced projects, in accordance with our Biodiversity Guidance Manual and corporate standards. (Teck Resources Limited, 2011)*

An overview of the steps we have taken to achieve our short-term goal is shown in Figure 1. The next section, describes our approach to (i) identifying pilot sites for developing biodiversity management plans, (ii) working
with our personnel and communities of interest to develop a strategy and targets for achieving NPI at our sites, (iii) developing and testing a biodiversity management plan workbook and guidance manual at two pilot sites and (iv) rolling out the development of biodiversity management plans to the remainder of our sites and developing additional guidance. Section 3 (Results and discussion) presents the results of our efforts including our detailed NPI strategy and goals and lessons from our pilot project and broader roll-out.

![Figure 1](image)

**Figure 1** Overview of steps taken to develop and implement Teck’s strategy for biodiversity management planning

### 2 Methodology

#### 2.1 Company-wide scan and prioritisation of sites

We conducted a high-level scan of biodiversity considerations across Teck’s portfolio of sites in order to select two pilot sites and prioritise the remaining sites for corporate and technical support once the pilots were complete. The two sites selected as pilot locations would receive corporate and technical expert support to develop the first iteration of a biodiversity management plan using a draft Microsoft Excel™-based workbook. This exercise included 13 operating sites (12 mines and one smelter/refinery), two development projects in the feasibility stage and one project in the pre-feasibility stage.

First, we developed criteria to support the prioritisation exercise (Table 1), which reflected factors such as biodiversity risks and opportunities and legal requirements.

The next step was to collect sufficient information to assess the 16 sites against the criteria that had been developed. The information sources consulted in the assessment are listed in Table 2. With a few exceptions, site managers had sufficient information to be well informed about the biodiversity issues that were relevant to their sites. Therefore, it was not necessary to rely heavily on desktop searches of online biodiversity databases (e.g., NatureServe). Each site received a score from 0 to 2 for each criterion, and then these individual scores were combined and normalised to create an overall site score that could range from 0% to 100%. Sites with the highest scores were the leading contenders to be selected as pilot sites.
Table 1  Criteria developed for company-wide prioritisation exercise

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Rationale for collection/inclusion</th>
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<tbody>
<tr>
<td>Risk to biodiversity posed by site</td>
<td>An expectation of risks to high-value biodiversity elements would suggest additional mitigation actions might be needed to achieve net positive impact.</td>
</tr>
<tr>
<td>Impacts to biodiversity created by site</td>
<td>Historical impacts to high-value biodiversity features would suggest additional work might be needed to achieve net positive impact.</td>
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<tr>
<td>Timing of biodiversity management plan requirement</td>
<td>Mines in the process of permitting might be required to have plans sooner than Teck’s own target date of 2015.</td>
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<tr>
<td>Stakeholder risks</td>
<td>Strong negative stakeholder positions concerning actual or perceived impacts or risks to biodiversity might create reputational or regulatory risk.</td>
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<tr>
<td>Stakeholder opportunities</td>
<td>Existence of compelling, time-sensitive opportunities to implement conservation projects with stakeholders might help build social license.</td>
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<tr>
<td>Maturity of current biodiversity management at site</td>
<td>Readiness at sites with respect to biodiversity stewardship would influence the amount of effort and resources required to support biodiversity planning.</td>
</tr>
<tr>
<td>Stage of mine</td>
<td>Certain stages of the mine life cycle may offer time-sensitive opportunities to implement biodiversity mitigation actions.</td>
</tr>
<tr>
<td>Representativeness</td>
<td>Sites that are representative of the conditions and challenges facing other sites may be more useful as pilots than sites that are unique.</td>
</tr>
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</table>

Table 2  Information sources for desktop-based biodiversity scan of Teck sites

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
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<tbody>
<tr>
<td>Media search</td>
<td>Google News archives were searched for articles on all Teck sites published from 2007 to 2012. These articles were then reviewed for mention of biodiversity issues. The issue and website link were recorded for each issue mentioned.</td>
</tr>
<tr>
<td>Non-governmental organisations (NGO) website search</td>
<td>Websites of 50–100 higher profile NGOs were searched for reference to biodiversity issues (either positive or negative) for each of the Teck sites over the last five years. Information on the biodiversity issue, year, NGO and its website were noted.</td>
</tr>
<tr>
<td>Site manager interviews</td>
<td>An interview template was designed that addressed most or all of the prioritisation criteria. Interviews were conducted with environmental/biodiversity managers at each site; these took from 1 to 1.5 hours to complete.</td>
</tr>
<tr>
<td>Biodiversity documents from site</td>
<td>For some sites, considerable biodiversity information was available from Teck or regulator websites or was provided by site managers after the interviews.</td>
</tr>
</tbody>
</table>
2.2 Defining NPI strategy and targets

In order to develop detailed NPI strategy and targets, in late 2012 Teck engaged its operations and corporate functional personnel (e.g., Exploration, Project Development) to provide direction on the scope of Teck’s NPI vision, the methods for applying the mitigation hierarchy in pursuing NPI and the biodiversity targets a site should seek to achieve. A custom online survey was used to survey personnel at their convenience, and this was followed by a facilitated workshop.

The survey offered respondents a range of possible targets for various aspects of a corporate NPI strategy. For example, with respect to the baseline against which sites would measure their net biodiversity impacts, respondents were offered the following choices: (i) the premine condition; (ii) 2011, the year Teck made its NPI commitment; (iii) the year that Teck acquired the mine; and (iv) other (respondents who chose this option were asked to provide details). The consensus or majority choices would form the basis of an initial draft of NPI Strategy and Targets, which could then be subjected to additional review.

2.3 Developing and testing draft biodiversity management plan workbook

Once the NPI strategy and targets were developed, we developed a workbook that took sites through a systematic process in developing their biodiversity management plans. We define a biodiversity management plan as a high-level document that describes an operation’s plan for achieving NPI, as defined by the NPI strategy and targets.

In general, the biodiversity management plan should include such things as the following:

- a list of ecosystem and biodiversity elements at the site that fall within the scope of Teck’s NPI strategy and targets;

- a summary of the risks and impacts that the site and its activities pose to the identified ecosystem and biodiversity elements (both risks and impacts should be calculated in reference to the relevant baseline as defined by Teck’s NPI targets and strategy);

- a mitigation plan, developed using the biodiversity mitigation hierarchy, that demonstrates how the site will manage its impacts (avoid, minimise, rehabilitate, offset and undertake additional conservation actions) to achieve net positive impact for each ecosystem and biodiversity element; and

- a list of activities required to implement the mitigation plan, including monitoring of plan execution and effectiveness.

The draft Biodiversity Management Plan Workbook was tested and refined on the pilot sites identified above before being rolled out to a broader audience.

3 Results and discussion

3.1 Company-wide scan and prioritisation of sites

Personnel from all 16 operating sites and advanced projects participated in interviews and provided data and other information for this assessment. Personnel were well informed about biodiversity issues at their sites, and the 100% participation rate helped to ensure the accuracy of the results and provided an opportunity to engage sites regarding the biodiversity program.

The two criteria that made the largest contribution to site prioritisation scores were the residual risks to ecosystem and biodiversity elements posed by Teck’s sites and the risks to Teck posed by community of interest positions around biodiversity issues (Figure 2). The majority of sites scored high against both criteria, so these two criteria made the largest contribution to overall site scores. The two criteria are clearly linked, and they foreshadow the benefits in risk reduction and increased social license that successful implementation of our NPI strategy may deliver.
The two criteria that made the smallest contribution to prioritisation scores were representativeness and timing of the biodiversity management plan requirement. Only the individual steelmaking coal mines in the Elk River Valley in southeastern British Columbia, Canada, were found to be representative of many other Teck sites; and only Line Creek had an external requirement for a plan that was significantly in advance of Teck’s internal deadline.

Line Creek, an open-pit steelmaking coal mine, emerged as the top priority for the pilot testing, owing to clear and imminent regulatory and community of interest expectations for development of a stand-alone biodiversity management plan as part of its Environmental Assessment Certificate for a mine-life extension project. In the end, Quebrada Blanca, an open-pit copper mine in Chile, was selected as the second pilot site in order to include one pilot each from the Northern and Southern Hemispheres and from two of Teck’s three main commodity-based business units. The remaining sites were prioritised for support going forward, primarily on the basis of the timing of regulator and/or community of interest expectations.

The two pilot sites received corporate and expert technical support to develop first-iteration biodiversity management plans. External technical consultants worked with site environmental managers and their regional consultants to populate the *Biodiversity Management Planning Workbook* with baseline information on relevant ecosystem and biodiversity elements and existing or planned mitigation actions. Consultants and managers then worked together to evaluate impacts and risks and identify where anticipated residual risks would likely require reclamation and closure plans and/or the design of appropriate biodiversity offsets to be revisited.

### 3.2 Defining NPI strategy and targets

As in the overall sustainability strategy development process, the development of our NPI strategy revealed that our personnel are very interested in participating as the company sets direction for this key area of
environmental stewardship. Participation in the online survey and workshop to develop Teck’s NPI strategy was very strong, and several participants expressed appreciation at the opportunity to be significantly involved in a manner that fit with their workload and schedule.

The results of the online survey were presented and discussed at the workshop (an example of survey results is shown in Figure 3). Presenting the results in this format facilitated a rich discussion around the different views that people held; during the course of this discussion, it was clear that some people modified their positions.

![Figure 3](image)

**Figure 3**  **Illustrative results from one question from the online survey; this question asked Teck staff to indicate which baseline was the most appropriate for Teck’s NPI commitment**

A draft of *NPI Strategy and Targets*, which used the majority responses to the survey, was then presented and discussed. Together the workshop participants worked through their differences and towards a revised draft that met most people’s expectations. The active input and participation from the executive level of the company was instrumental in helping the group reach consensus on the content of the strategy.

Some of the key elements of Teck’s NPI strategy and targets emerged from the workshop:

- The scope of the NPI commitment applies to natural habitats and ecosystems; critical landscape functions (e.g., connectivity); and highly threatened and/or vulnerable populations and species of plants and animals, sites and ecosystem services.

- Teck sites will use the biodiversity mitigation hierarchy to manage their biodiversity impacts and develop mitigation strategies to achieve NPI (Table 3). Figure 4 shows how the mitigation hierarchy can be applied during the various stages of the mining life cycle to move from an unmitigated impact level to an NPI by mine closure or sooner.

- The baseline against which NPI will be measured is the condition of the site prior to mining.

- Quantitative metrics will be used to demonstrate NPI on beneficial, valued and sustaining ecosystem and biodiversity elements that are relevant to Teck’s operations and activities.

- For those biodiversity elements that can tolerate temporal losses without losing significant viability or function, NPI should be achieved by the time of mine closure. Otherwise, NPI should be achieved as soon as practicable without jeopardising the viability or function of those elements.
Table 3  Biodiversity mitigation hierarchy

<table>
<thead>
<tr>
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<th>Description</th>
</tr>
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<tr>
<td>Avoid</td>
<td>Whenever possible, avoid impacts. Some biodiversity features are sufficiently important and/or threatened to require a change in plans to protect critical areas.</td>
</tr>
<tr>
<td>Minimise</td>
<td>Minimise impacts that are unavoidable, adopting best practices in mine operations in order to reduce the severity of impacts.</td>
</tr>
<tr>
<td>Rehabilitate</td>
<td>Rehabilitate areas to re-establish ecosystem and biodiversity elements. Reclamation practices can replace much or most of the diversity of natural habitats that existed before mining.</td>
</tr>
<tr>
<td>Offset</td>
<td>It may not be feasible to fully rehabilitate all ecosystem and biodiversity elements that are impacted. For these elements, design and implement biodiversity offsets to achieve a net positive impact on biodiversity.</td>
</tr>
<tr>
<td>Other conservation actions</td>
<td>Certain types of conservation actions are important, but they may produce benefits that are measured in different ways than our impacts are measured, and so they do not contribute quantitatively to our NPI calculations (e.g., environmental education).</td>
</tr>
</tbody>
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A key lesson from Teck’s biodiversity strategy development and communication process has been that many employees from various levels and locations in our company are interested in participating in efforts to define aspirational goals that will drive continued performance improvements that will ultimately be needed to sustain the longevity of our business and the positive contributions we make to society. Packaging our bold vision and goals in a clear report and other communication tools has also been effective in gaining increased support and interest from investor groups, potential partner organisations and our communities of interest.

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Figure 4  Stages of the mining life cycle and application of the mitigation hierarchy

One ongoing challenge has been to effectively reach all segments of our target audiences with our key messages. “Biodiversity” is a term with a very broad meaning, and it is not simple to concisely convey what our strategy means in terms of concrete differences in practical approach and actions. This will require
continued efforts in expertly crafting simple messages and case studies that resonate with people, especially the general public and our employees in communities where we operate.

3.3 Developing and testing draft biodiversity management plan workbook

We developed a draft workbook-based approach to developing biodiversity management plans and tested the workbook at the two pilot sites. The process was broken down into nine steps (Figure 5). Steps 1 and 2 scope the assessment both spatially and with regard to the ecosystems and biodiversity elements that should be included. In Steps 3 and 4, impact and risk assessments determine current net impact and risk rating (i.e., including consideration of planned mitigation) on ecosystems and biodiversity elements. For sites that currently expect a net negative impact on all or a subset of elements, or that pose high or critical risks, Steps 5 through 7 involve the development of additional mitigation actions following the biodiversity mitigation hierarchy to achieve NPI. In Step 8, sites develop and schedule actions to implement the plan. In Step 9, sites implement the action plan, monitor their progress towards NPI and use this information to adaptively manage the plan as necessary.

The process is designed so that a biodiversity management plan can be produced at any stage in the life of a mine, although its completeness may vary depending on what information is available for the site at that time. Older operations may find that developing the first iteration of their plan identifies significant gaps in Step 2. For example, baseline studies may not be available for all types of potential ecosystem and biodiversity elements. Accordingly, the priority actions described in the first iteration of the plan will include conducting additional baseline studies. It may take several more iterations of the biodiversity management plan before the site has a fully developed mitigation plan. In contrast, recently permitted sites may find that they have all the necessary information to develop a comprehensive mitigation plan in their first iteration. Teck’s biodiversity management plans are intended to be “live” documents, updated periodically to reflect the results of the biological monitoring of the effectiveness of management, changing regulations and changes in the conservation status of different types of biodiversity elements.

Important lessons were learned at the pilot sites:

- Teck’s NPI strategy and targets align more closely with the expectations of communities of interest than approaches often prescribed by environmental assessment agency policies.
- The process of developing a biodiversity management plan generated considerable creativity and enthusiasm on the part of site personnel to identify additional avoidance, minimisation and rehabilitation measures. For example, personnel at the Line Creek Operations pilot site discovered that they could revisit and revise the site’s reclamation and closure plan to increase its contribution to achieving NPI. Personnel also realised that Teck could design and implement possible biodiversity offsets using its own considerable land holdings.
- Most Teck sites are likely to require carefully selected and managed biodiversity offsets to mitigate for ecosystem and biodiversity elements that cannot be restored on site in a meaningful time frame.
- The development of biodiversity management plans will need to overcome some technical challenges such as reconstructing credible premine biodiversity baselines for older sites, understanding a site’s impacts to species that are poorly studied (e.g., rare or listed, irregularly distributed plant species) and identifying high-quality benchmark vegetation that can be used to develop a measurement framework to assess the success of our rehabilitation efforts.

Experience at the pilot sites also indicated that some improvements to the workbook were needed and that sites would benefit from a guidance document, which was subsequently developed.
3.4 Implementing approach and developing additional guidance

In 2014, the workbook and guidance document for developing site-specific biodiversity management plans, revised based on the pilot site experiences of 2013, were rolled out to the remaining sites and projects. Corporate personnel and consultants continued to be available through 2014 to assist sites in applying the guidance to build their biodiversity management plans. The roll-out was successful and the majority of sites have developed at least a first iteration of their biodiversity management plans. Several factors have contributed to this success, including a strong and vocal commitment to biodiversity stewardship from our senior management, inclusion of progress made on developing biodiversity management plans as a key operational performance measure, and the interest and dedication of our personnel. Once planning is completed at our sites, the focus will shift to implementation.

4 Conclusions

This paper describes how Teck corporate and operations/project personnel have worked together to carefully define the scope and details of our biodiversity commitment. Our NPI strategy defines clear targets...
that drive biodiversity actions that can be embraced by employees and communities of interest. We have also described how we identified pilot sites to test our tools and approaches and then rolled out the revised tools across the entire company. Use of these planning tools assists operations to approach their plan development and implementation in a similar manner. A consistent approach is valuable in enabling the effects of our activities to be compared and evaluated cumulatively across a region. In addition to meeting the commitments in our corporate sustainability strategy, Teck biodiversity management plans also serve to meet aspects of our internal Health, Safety, Environment and Community (HSEC) Management Standards and the Mining Association of Canada’s *Towards Sustainable Mining Biodiversity Conservation Management Protocol* (Mining Association of Canada, 2013).

A key reason for our progress to date is the degree of commitment at all levels of our company. Our senior management has advocated strongly for Teck’s need to build from its experiences to further improve its biodiversity stewardship. We have built a strong framework for our future advances with a process that has benefitted from the active participation of our sites, ensuring that they support and inform what Teck is trying to achieve.

**References**


