Mine Closure 2025 – S Knutsson, AB Fourie & M Tibbett (eds)

doi:10.36487/ACG_repo/2515_83

Continued evolution of mine closure practices: integration of Indigenous perspectives and climate change in revegetation prescriptions

Terryn Kuzyk [a,*], Shan Seahra [a], Jessica Lowey [a], Roberta Pedlar [a], Anne-Cecile Bequet [a]

[a] *ERM, Canada*

Abstract

Climate change is having an impact on weather patterns worldwide. Predicted changes in average conditions and an increase in extreme weather events are expected to have measurable effects on existing ecosystems. Current climate change models, particularly at northern latitudes, indicate the expansion of more moderate ecosystem types, and the potential for entirely new ecosystem types to develop. The success of mine reclamation is conventionally measured against baseline information or historical conditions. However, given the effects of climate change, closure planning and development of associated success criteria solely based on historical weather and ecosystem data and expectations, may be a prescription for failure.

To ensure successful post-mining landscape resilience, new methodologies are being developed and regulatory bodies, such as the British Columbia Ministry of Mining and Critical Minerals, are encouraging incorporation of climate change considerations in mine closure and returning land use planning. Recent ecosystems planning methods for reclamation employ the use of a climate-shifted baseline to develop metrics for evaluating closure success and include evolving success criteria based on lessons learnt and the ability to integrate improved climate knowledge, models, and predictions. ERM Consultants Canada (ERM) has been exploring climate modelling and climate change informed species selection tools, and multi-phased planting strategies in land reclamation.

The success of these methods is underpinned by the need to align and collaborate with Indigenous nations on their intended future use of the land. By aligning what is technically feasible on post-closure landscapes from a climate change perspective with the cultural values and traditional uses, vegetation prescriptions can be designed to ensure post-closure success in a changing climate. This paper explores these best practices, and identifies ways that the industry can adapt, combine, and iterate these practices to improve reclamation success in northern latitudes.

Keywords: *climate change, revegetation, closure, reclamation, Indigenous knowledge*

1 Introduction

Climate change has multiple, sometimes compounding, effects on how we approach mine closure. While mining represents a temporary use of the land, features such as open pits and waste rock storage areas remain as permanent features on the landscape following cessation of mining operations. Changes in climate have impacts on the hydrological cycle, which is intimately tied to cover system performance, and the distribution of plant and animal species. Examples of these changes include variation in the amount and frequency of precipitation events, the timing and extent of freeze/thaw cycles, and the extent of evapotranspiration, all of which influence the cover system performance.

These changes result in the northward advance of more temperate ecosystem types (in the northern hemisphere). As climate change expands these more temperate ecosystems northward, closure practitioners

[*] Corresponding author. Email: terryn.kuzyk@erm.com

are faced with the challenge of developing closure prescriptions that account for ecosystem changes while aligning with Indigenous and stakeholder values and evolving needs.

ERM Consultants Canada (ERM) is currently working with clients in northern British Columbia (BC) and the Canadian Arctic to develop and implement closure plans. This paper explores the impact of climate change in these environments, how best practice and local governments are guiding the development of closure plans, and how climate change adaptation is implemented.

2 Regulatory guidance and context

2.1 Climate change science

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organization and the United Nations Environmental Program (UNEP) to support all levels of government by, providing scientific information that they can use to develop climate policy. The IPCC regularly evaluates the state of climate change knowledge and provides assessment reports that summarise various climate change scenarios, their implications, and associated risks.

In 2021, Working Group 1 of the IPCC published the first part of the Sixth Assessment Report, *Climate Change 2021: The Physical Science Basis* (IPCC 2021), which outlines five climate change scenarios, known as shared socio-economic pathways (SSPs) and simulations of climate change from 2021–2040 (near term), 2041–2060 (mid-term), and 2081–2100 (long-term). The SSPs represent five different radiative forcing scenarios (SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP4-8.5). The first number refers to the assumed SSP, and the second to the global effective radiative forcing (IPCC 2021). The SSPs are best described as follows (British Columbia Ministry of Mining and Critical Minerals [BC MCM] 2025):

- **SSP1 – sustainability:** The IPCC issued two SSP1 scenarios. The SSP1-1.9 scenario assumes that global temperatures warm by 1.5°C by 2100. The SSP1-2.6 scenario assumes that strong climate change mitigations will take place in the near future to enact change
- **SSP2 – middle of the road:** This scenario acknowledges global trends since the 2015 Paris Agreement and integrates a gradual change towards sustainable development
- **SSP3 – inequality:** This scenario assumes that a global approach to climate change cannot be reached, resulting in a 'fragmented approach' to climate change mitigation between developed and developing countries
- **SSP4 – fossil-fuelled development:** This scenario assumes that resource-heavy and fossil fuel-heavy lifestyles are adopted at a global scale with investments focused on health and education rather than sustainability initiatives.

2.1.1 General observations and trends

It is difficult to discern trends specific to subarctic and boreal regions from the analysis completed in the report (IPCC 2021); however, the general observations on changes in global temperature and precipitation trends are useful for more broad discussion regarding how climate is expected to evolve in these areas.

In the near term (2021–2040), a time period in which many mines that are currently in operation will enter into closure, there is likely to be a global average temperature increase of 1.5°C over the SSP2-4.5 and SSP3-7.0 scenarios (IPCC 2021). According to the IPCC (2021), for all scenarios except for SSP4-8.5, the 1.5°C threshold will be crossed before the early 2030s. Compared to the period from 1995 to 2014 (IPCC 2021), the global surface air temperature over the long-term (i.e. 2081–2100) is very likely to increase by 0.2–1.0°C under the low emissions scenario (SSP1-1.9) and by up to 4.8°C under the high emissions scenario (SSP5-8.5).

Variations in precipitation are less clear, with a broad long-term (i.e. 2081–2100) range of −0.2 to +12.9% over all five scenarios, relative to the period from 1995 to 2014 (IPCC 2021). In the near term, there are not expected to be discernible differences in precipitation changes between scenarios (IPCC 2021). Interacting weather patterns over oceans and across land masses make it difficult to indicate how precipitation may react in continental regions of the world.

2.1.2 Climate change in the Arctic

Current climate change models indicate that the average annual air temperature increase in the Arctic will be 2.5 times that of the global average (IPCC 2021); this corresponds to 0.5°C to 6.6°C for the SSP1-1.9 scenario, and 6.2°C to 15.2°C for the SSP5-8.5 scenario in the long-term (i.e. 2081–2100). Figure 1 shows that the largest degree of warming under two SSPs occurs at northern latitudes.

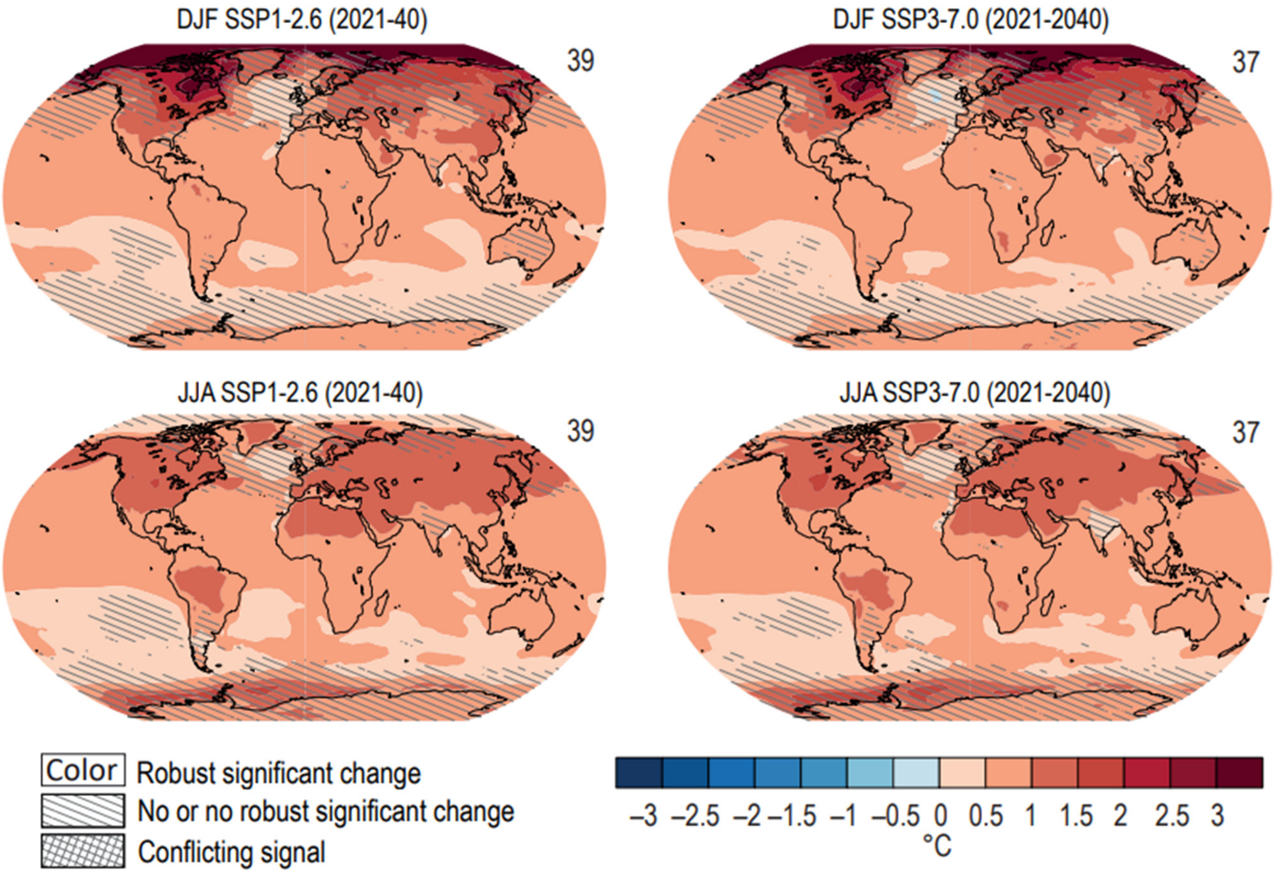

Figure 1 Seasonal mean temperature change for SSP1-2.6 and SSP3-7.0 (IPCC 2021). Note: DJF refers to December–January–February; JJA refers to June–July–August

The increase in the impact of climate change in northern latitudes is known as Arctic amplification (IPCC 2021). This has been validated in recent decades by the loss of Arctic sea ice. Arctic amplification is also causing a reduction in high-latitude temperature variability (IPCC 2021), as reduced snow and ice coverage over land and sea shorten the cold season and result in an earlier onset of the warm season.

Climate science shows proponents and closure practitioners that even with large global corrections there will still be climate change impacts felt in boreal and Arctic ecosystems. It is critical for those planning mine closure to consider re-evaluating closure success in ecosystems that have historically relied on cold weather conditions, such as permafrost, for containment as a closure strategy (i.e. frozen waste rock storage area covers).

2.2 Integrated closure planning

The International Council on Mining and Metals (ICMM) developed an *Integrated Mine Closure: Good Practice Guide* (Good Practice Guide) (ICMM 2025) to increase uniformity of closure practices across proponents and closure practitioners. Adapted from the Good Practice Guide, effective closure planning includes (ICMM 2025):

- integration of and support from stakeholders and rightsholders in closure planning
- improved management of closure through planning, and into operations
- improved cost estimations to reduce liabilities
- collaboration on a post-closure vision and end land use
- planning for a just social transition for affected stakeholders.

A critical component of closure planning is the joint development of a closure vision with input from rightsholders and stakeholders. This vision should be iterated throughout the life of mine and should integrate an end land use that is developed collaboratively with rightsholders and stakeholders. From this vision, closure principles, objectives, and criteria can eventually be developed to guide and evaluate final closure and reclamation activities.

Engaging with internal and external stakeholders on the closure vision and objectives has been shown to lead to more successful outcomes (ICMM 2025). This can be attributed to the integration of socio-economic context and stakeholder relationships – alignment on end land uses for mine sites that meet the needs of the communities in which the sites are located, leads to successful closure outcomes.

3 Planning for (climate) change

In British Columbia (BC), Canada, the Ministry of Mining and Critical Minerals (MCM) has recently published a document that specifically addresses the need to consider climate change risks and impacts when planning for mine closure and reclamation. The document, *Consideration of Climate Change in Mine Reclamation Planning* (BC MCM 2025), provides guidance to mine operators and closure practitioners on how to explicitly consider climate change in closure planning. It specifically highlights consideration of climate change impacts when (BC MCM 2025):

- developing reclamation targets and conducting comparisons of equivalent capability
- creating reclamation cover systems
- selecting plant species for revegetation systems
- developing wildlife habitat/suitability targets
- monitoring reclaimed areas and establishing research trials.

The BC *Health, Safety and Reclamation Code for Mines in British Columbia* (the Code) (British Columbia Ministry of Energy, Mines and Low Carbon Innovation [BC EMLI] 2024) defines land capability as 'the capability of achieving a specified end land use estimated by limitations as a result of climate, topography and soils'. Requiring equivalent capability, as specified by BC MCM (2025) which suggests a comparison of pre-mining and post-mining ecosystems to evaluate reclamation success. However, climate change is altering ecosystems surrounding mines even as mining is occurring and therefore would have also altered the pre-mining baseline ecosystem. Reclamation prescriptions designed to match baseline conditions may be unattainable, and the reclaimed sites may underperform or fail, depending on a variety of factors including which SSP scenario the future most closely tracks.

To counteract the challenges that climate change places on reclamation success, BC MCM (2025) recommends the use of a 'climate-shifted baseline'. A climate-shifted baseline refers to using climate models to predict the ecosystems that would have existed at a mine site had it not been developed. This strategy uses climate models to estimate the ecosystems that would have occurred on the mine site in the future if mining did not proceed. Utilising a climate-shifted baseline helps closure practitioners design a closure landscape that is realistic for potential climate change and that supports reclamation success.

Monitoring data collected regularly post-reclamation can help to address uncertainties in climate models used to create closure designs and revegetation prescriptions. The data can be used to validate or reject model trends through plant establishment and vigour observations, combined with long-term data from climate stations to assess species suitability (BC MCM 2025). The need for adaptive management strategies (e.g. replanting with more suitable species) in response to climate trends can be identified promptly through early frequent monitoring and long-term monitoring at less frequent intervals. Although climate models may suggest certain species as most suitable for future conditions, planting a diversity of species is still best practice, to reduce future uncertainty (BC MCM 2025).

4 Integrating Indigenous perspectives

When considering re-establishing vegetative communities as part of mine reclamation and closure, it is critical to also leverage and integrate Indigenous traditional knowledge. In BC, a critical part of mine reclamation is returning the land to a state that supports cultural practices and biodiversity recovery. When considering a lens of climate change, shifting climactic conditions may result in traditional vegetation species and communities no longer thriving in the post-closure ecosystem.

There is no way to counteract the effects of climate change on the ability of traditional species and communities to flourish in a post-mining environment; however, proponents and practitioners alike have the opportunity to proactively engage with Indigenous communities to discuss these impacts and create a resilient future that both parties' support.

Indigenous traditional knowledge and practices are deeply intertwined with the health of the land. In general, Indigenous perspectives emphasise the importance of holistic and interconnected approaches to land and ecosystem management, and so they offer valuable insights into adaptive strategies that have been developed over time to prevent or mitigate local environmental extreme events. A well-known example is the use of traditional fire management practices that can promote the growth of fire-adapted species and reduce the risk of catastrophic wildfires, or control pest proliferation. For example, the Anishinaabek (in East North America) and the Karuk Tribe (in Northern California) have long used controlled burns to manage forest and/or meadow ecosystems (Status of Tribes and Climate Change Working Groupe [STACCWG] 2025).

In both cases, fire management practices have also been an integral part of maintaining access to traditional and required food sources. For the Anishinaabek, it supported the regeneration of culturally significant plants such as manoomin (wild rice), while for the Karuk Tribe it maintained the health of oak woodlands and meadows, which are essential for acorn production (STACCWG 2025).

Climate modelling uncertainties may impact Indigenous communities in particular who are more vulnerable to climate changes because of their relationships with the local environment for subsistence and spiritual connection (United Nations Environment [UNEP] 2025). Significant insights can be gained through equitable engagement with Indigenous communities to understand local climate patterns and ecological responses. Indigenous knowledge can be used to inform mitigation of uncertainties in climate modelling and improve the validity of climate predictions that are used to inform reclamation plans, thereby ensuring that these communities can sustainably continue their land-based practices (BC MCM 2025).

Adaptive strategies such as the examples above are only one of the ways that Indigenous perspectives can be used to develop reclamation strategies that work with climate change processes. As part of best practice, proponents and practitioners should continually engage with relevant rightsholders and stakeholders to find ways to integrate Indigenous perspectives into closure planning.

5 Practical applications

In BC, the reclamation planting prescriptions often used the provincial stocking standards for reforestation (British Columbia Ministry of Forests [BC MOF] 2021) and the dominant plant communities associated with the Biogeoclimatic Ecosystem Classification (BEC) zones identified at baseline. As discussed, this traditional methodology inherently assumes static climate and land use conditions, which is increasingly unrealistic with ongoing climate change and its anticipated cascade of effects to the environment. Further still, some reclamation prescriptions included agronomic, non-native grass species for their quick establishment and erosion control.

ERM has begun using climate-shifted baselines as ecosystem targets in mine reclamation, an approach endorsed by BC MCM (2025). Using this approach, the ecosystem reclamation targets are based on climate projections of their pre-mining ecosystems, to establish climate-resilient and adaptable ecosystems. In other cases where pre-mining baseline ecosystem data is not available, climate projections of surrounding ecosystems may be used.

5.1 British Columbia case study

Many of the projects ERM supports are located in northwestern BC, in an area known as the Golden Triangle. The Golden Triangle is a region that includes most of the major gold, silver, and copper deposits in the province (BC EMLI 2022). Winters in the Golden Triangle are long, cold, and abundant in snow, and the primary growing season in the summer is relatively short for vegetation establishment and growth (Province of BC 2024). The melting and receding of glaciers in the region due to a warming climate has provided new opportunities for mining companies (Investing News Network 2021).

ERM's work in the Golden Triangle is completed in partnership with Tahltan Nation Development Corporation (TNDC), in a 51/49 joint venture partnership known as TEEM (Tahltan ERM Environmental Management). Formed in 2004, TEEM continues to leverage longstanding collaborative work, with equal board representation from TNDC and ERM, blending scientific and Tahltan Knowledge and Indigenous knowledge in the provision of environmental and related management services. TEEM provides environmental, social, health and safety, and sustainability consulting services for existing and proposed activities in Tahltan territory, including fisheries; terrestrial; ecological risks assessments; environmental effects monitoring; water treatment; social and economic sciences; as well as life of mine and closure and reclamation planning and support. The joint venture partnership also focuses on continuing to build capacity – with a particular focus on training and knowledge-sharing opportunities for Tahltan youth – and mutual business interests.

TEEM's approach to developing reclamation research programs in this region uses the ClimateBC tool (Centre for Forest Conservation Genetics 2022) to determine climate-shifted ecosystem reclamation targets. ClimateBC uses long-term weather station records, existing ecosystem mapping for the province, and global climate models to predict future climate conditions and ecosystems (BC MCM 2025). Revegetation planting prescriptions are then based on a combination of the current and projected ecosystems for the 2011–2040 to 2041–2070 periods, with the SSP2-4.5 climate scenario. Tree species are selected based on the provincial stocking standards (BC MOF 2021) of the current and projected ecosystems, and on culturally important species. TEEM weaves Indigenous knowledge into the reclamation approaches by integrating Tahltan land use information (from Tahltan-led studies, interviews, and other engagement) specific to the project areas, to select native tree, shrub, and herbaceous species identified as culturally important. A diverse set of species are then selected to establish intermediate ecosystems capable of adapting to climate change, with the anticipation that these ecosystems will continue to evolve. Incorporating a diverse mixture of species will enhance ecosystem functions and forest resilience, thereby protecting against disturbances such as pest infestations and wildfires, which are anticipated to increase in frequency and intensity in the near future in BC. Selecting a diverse mixture of species will also increase the probability that certain species will be suited to future climate conditions (BC MCM 2025), spreading the risk of uncertainty in a strategy also known as bet-hedging.

The provenance, or origin, of plant species used in revegetation is important for climate-resilient restoration plantings. Provenance of species is known to affect plant performance, pollinator networks, and herbivores, with effects extending up to higher trophic levels (Bucharova et al. 2021). Plants that originate from the local area, and therefore have local provenance, generally perform better due to local adaptation. TEEM is looking forward to supporting a Tahltan-owned plant nursery to provide planting stock for the numerous mine reclamation projects in the Golden Triangle. With the establishment of this nursery, the plants used in the reclamation prescriptions will have the appropriate local provenance and local adaptation. The plant selection and propagation will be guided by Indigenous knowledge and land-based relationships that have existed since time immemorial. It is anticipated that the nursery will be used to research climate-resilient species for revegetation within the region.

A multi-phased approach to planting is recommended to apply climate-informed plantings. This approach initially plants tree species appropriate for current ecosystem conditions, followed by subsequent infill planting events of tree species appropriate for climate-shifted, future ecosystem conditions. Using this approach allows for flexibility in planting strategies, enabling reclamation practitioners and mining clients with the ability to manage changes adaptively, such as improvements in climate projections; changes to ecosystems due to extreme climate events; or invasion by non-native species. Implementing multi-phased planting also provides the opportunity for an initial canopy layer to become established before planting more shade-tolerant species. Establishing a canopy layer that provides shade can improve vegetation establishment and persistence (Koutzoukis et al. 2024), by creating microsites and increasing soil moisture, thus improving reclamation outcomes.

ERM's and TEEM's reclamation programs have also integrated Indigenous knowledge by including cultural wildlife values, such as American marten (*Martes americana*) and western toad (*Anaxyrus boreas*), in reclamation prescriptions. The strategic placement of coarse woody debris (CWD) retained during vegetation clearing can be used to facilitate the restoration of wildlife habitat features for American marten, western toad, and other species that may use the area for denning; sheltering; nesting; or as a travel corridor. Connected habitats increase access to food, migratory pathways, and create more suitable habitats under a changing climate (McGuire et al. 2016, Nuñez et al. 2013), as well as support large, genetically diverse populations that can better adapt to climate change (Rudnick et al. 2012, Constanza et al. 2020). Additionally, the incorporation of CWD in reclaimed sites can create microsites for vegetation establishment and survival, increase vegetation structural diversity, and jumpstart natural ecological processes of regeneration (Vinge & Pyper 2012). Placing CWD along edge habitats will also reduce windthrow and lessen edge effects to vegetation communities.

Additional climate change modelling tools in ERM's and TEEM's reclamation planning toolkit include the Climate Change Informed Species Selection (CCISS) tool. The CCISS tool integrates BEC system, ClimateBC, and a variety of climate model ensembles, to provide spatially explicit reforestation feasibility ratings by tree species and ecosystems (MacKenzie & Mahony 2021). ClimateNA is another climate modelling tool available to reclamation practitioners throughout North America. It provides model results for mean annual temperature, climate maps, mean annual precipitation, and climatic moisture deficit using the SSP2-4.5 climate scenario into the year 2100 (Mahony n.d.).

6 Conclusion

Climate change is prompting proponents and closure practitioners to adapt their mindset around closure planning and implementation. ERM, as part of their joint venture – TEEM, has begun to implement changes in projects in BC to align with provincial guidance and best practices; these include integration of climate-resilient species in revegetation programs, long-term monitoring and adaptive management through revegetation research, and increased stakeholder engagement. However, there is potential to integrate these practices into other jurisdictions and leverage experience and learnings to achieve closure success.

As indicated, climate change in the Arctic is advancing much quicker than in more temperate climates, such as BC. Utilising a climate-shifted baseline to not only plan revegetation but also for considerations around long-term closure of mine features that rely on permafrost conditions, represents a novel application of the BC guidance. Uncertainties in existing climate models can be mitigated through early, frequent, and long-term monitoring; incorporation of Indigenous knowledge regarding local climate patterns and ecological responses; and through planting a diverse mixture of species. Closure practitioners can and should begin to pivot reclamation prescriptions to consider the impact climate change will have on revegetation and long-term ecosystem development.

References

British Columbia Ministry of Forests (BC MOF) 2021, *Reference Guide for Forest Development Stocking Standards*, Government of British Columbia, Victoria, https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/stocking-standards

BC MCM 2025, *Consideration of Climate Change in Mine Reclamation Planning*, Government of British Columbia, Victoria, https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/reclamation-and-closure/consideration_of_climate_change_in_reclamation_planning_guidance.pdf

BC EMLI 2022, *The golden triangle of northwestern British Columbia*, Government of British Columbia, Victoria https://cmscontent.nrs.gov.bc.ca/geoscience/PublicationCatalogue/InformationCircular/BCGS_IC2022-05.pdf

British Columbia Ministry of Energy, Mining and Low-Carbon Innovation 2024, *Health, safety and reclamation code for mines in British Columbia*, Government of British Columbia, Victoria https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/health-and-safety/code-review/minescode_april_2024_web.pdf

Bucharova, A, Lampei, C, Conrady, M, May, E, Matheja, J, Meyer, M, Ott, D 2022, 'Plant provenance affects pollinator network: Implications for ecological restoration', *Journal of Applied Ecology*, vol. 59, pp. 373–383, https://doi.org/10.1111/1365-2664.13866

Centre for Forest Conservation Genetics 2022, *ClimateBC,* v7.50, Computer software, The University of British Columbia, Victoria https://climatebc.ca/mapVersion

Costanza, JK, Watling, J, Sutherland, R, Belyea, C, Dilkina, B, Cayton, H, Bucklin, D, Romañach, SS & Haddad, NM 2020, Preserving connectivity under climate and land-use change: No one-size-fits-all approach for focal species in similar habitats, *Biological Conservation*, vol. 248.

International Council on Mining and Metals 2025, *Integrated Mine Closure Good Practice Guide*, London, https://www.icmm.com/website/publications/pdfs/environmental-stewardship/2025/guidance_mine-closure_update.pdf?cb=95109

International Panel on Climate Change 2023, *Climate Change 2021: The Physical Science Basis, Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Masson-Delmotte, V, Zhai, P, Pirani, A, Connors, SL, Péan, C, Berger, S… Zhou, B (eds), Cambridge University Press, Cambridge, https://doi.org/10.1017/9781009157896

Investing News Network 2021, *Glacial Melt in British Columbia's Golden Triangle Uncovers new Discoveries*, https://investingnews.com/innspired/british-columbias-golden-triangle-mining-district-is-known-for-million-ounce-gold-deposits/

Koutzoukis, S, Munger, W, Capito, L, Parry, D, Parry, B, Klain, SC … Taylor, T 2024, 'Collaborative knowledge braiding for restoration: Assessing climate change risks and adaptation options at Wuda Ogwa in southeastern Idaho, United States', *Restoration Ecology*, vol. 32, no.8.

MacKenzie, WH, & Mahony, CR 2021, 'An ecological approach to climate change-informed tree species selection for reforestation', *Forest Ecology and Management*, vol. 481, https://doi.org/10.1016/j.foreco.2020.118705

Mahony, CR (n.d.), *CMIP6-NA – The new Climate Model Ensemble for ClimateNA*, https://bcgov-env.shinyapps.io/cmip6-NA/

McGuire, JL, Lawler, JJ, McRae, BH, Nuñez, TA & Theobald, DM 2016, 'Achieving climate connectivity in a fragmented landscape', *Proceedings of the National Academy of Sciences*, vol. 113, no 26, pp. 7195–7200.

Nuñez, TA, Lawler, JJ, McRae, BH, Pierce, DJ, Krosby, MB, Kavanagh, DM … Tewksbury, JJ 2013, Connectivity planning to address climate change, *Conservation Biology*, vol. 27, no 2, pp. 407–416.

Province of BC 2024, *Climate of B.C.*, https://www.welcomebc.ca/choose-b-c/explore-british-columbia/climate-of-b-c

Rudnick, D, Ryan, SJ, Beier, P, Cushman, SA, Dieffenbach, F, Epps, C … Merenlender, AM 2012, The role of landscape connectivity in planning and implementing conservation and restoration priorities, *Issues in Ecology*, Ecological Society of America, Washington.

STACCWG 2025, *Status of Tribes and Climate Change Report*, vol. 2, BM Panek (ed.), Institute for Tribal Environmental Professionals, Northern Arizona University, Flagstaff, http://nau.edu/staccreport

UNEP 2020, *Indigenous Peoples and the Nature they Protect*, viewed 23 June 2025, https://www.unep.org/news-and-stories/story/indigenous-peoples-and-nature-they-protect

Vinge, T & Pyper, M 2012, *Managing Woody Materials on Industrial Sites: Meeting Economic, Ecological and Forest Health Goals Through a Collaborative Approach*, Department of Renewable Resources, University of Alberta, Edmonton