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Successful Reclamation Planning and Implementation

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One Team. Infinite Solutions.

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Outline

- Who is Stantec?
- Successful Reclamation Projects
- Socio-ecological Reclamation

Who Is Stantec?

- Broad-based and fully integrated environmental services to the mining sector across North America
  - “Exploration to Reclamation”
  - Permitting, Assessment, Engineering, Research, and Consulting
- More than 130 offices in North America
  - Vancouver, Abbotsford, Kelowna, Kamloops, Victoria, Yellowknife, Ft.McMurray
- Over 10,000 employees
- An example of current/recent EA projects include…

ENVIRONMENTAL ASSESSMENTS

Coal Projects

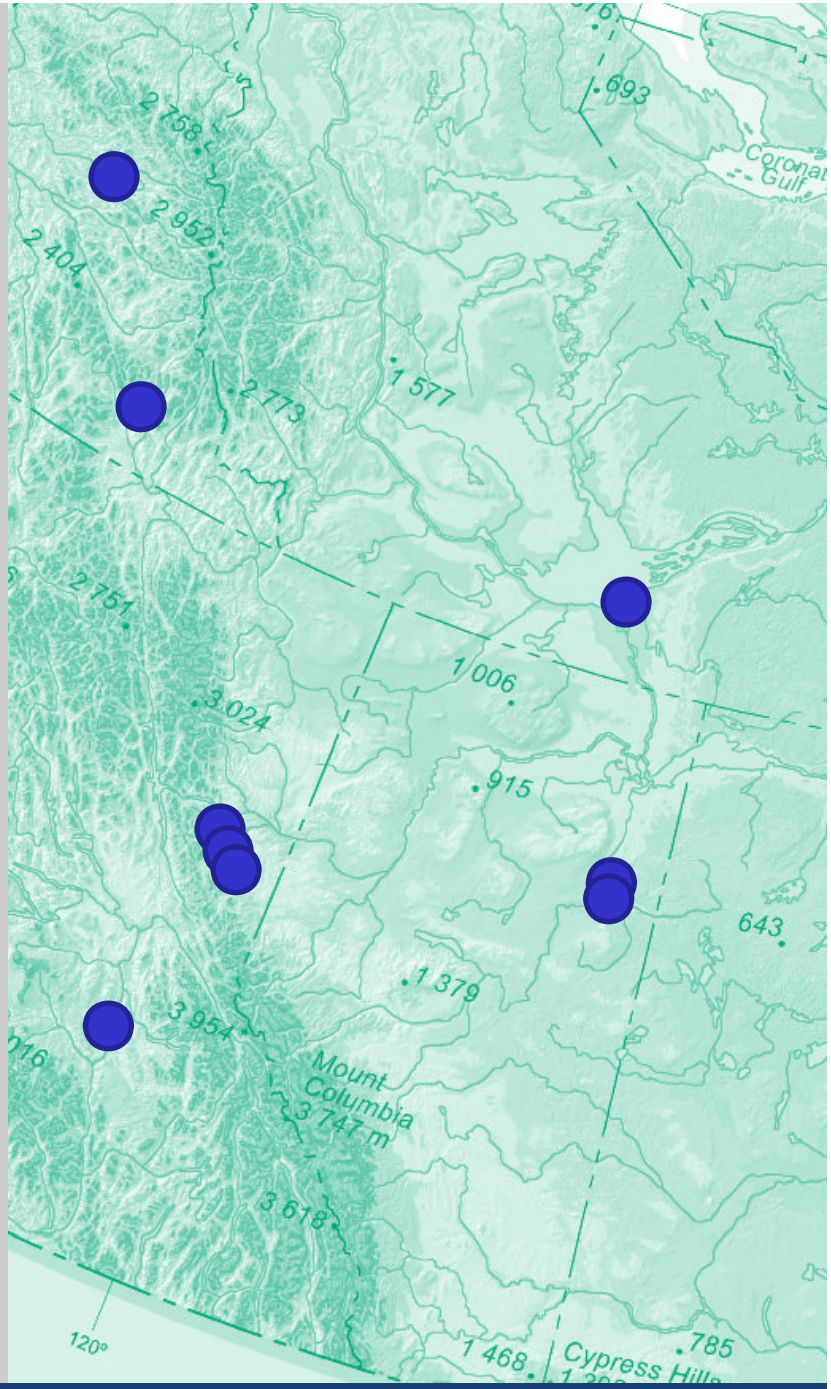
- Roman project
- Trend project
- Wolverine project
- Hermann project

Base Metal / Precious Metal

- Wolverine Zn/Pb (Yukon)
- Prosperity Cu/Au (Williams Lake)
- Dublin Gulch Au (Yukon)
- Thor Lake REE (NWT)

Oil Sands

- Frontier AB
- Kearl AB



SUCCESSFUL BC RECLAMATION PROJECTS

4 Recent Examples of Reclamation

- Revegetation for Forest Land Use
- Revegetation for Winter Range Use
- Revegetation for Wildlife Habitat
- Revegetation for Closure

Revegetation for Forest Land Use

Fording Coal Mine

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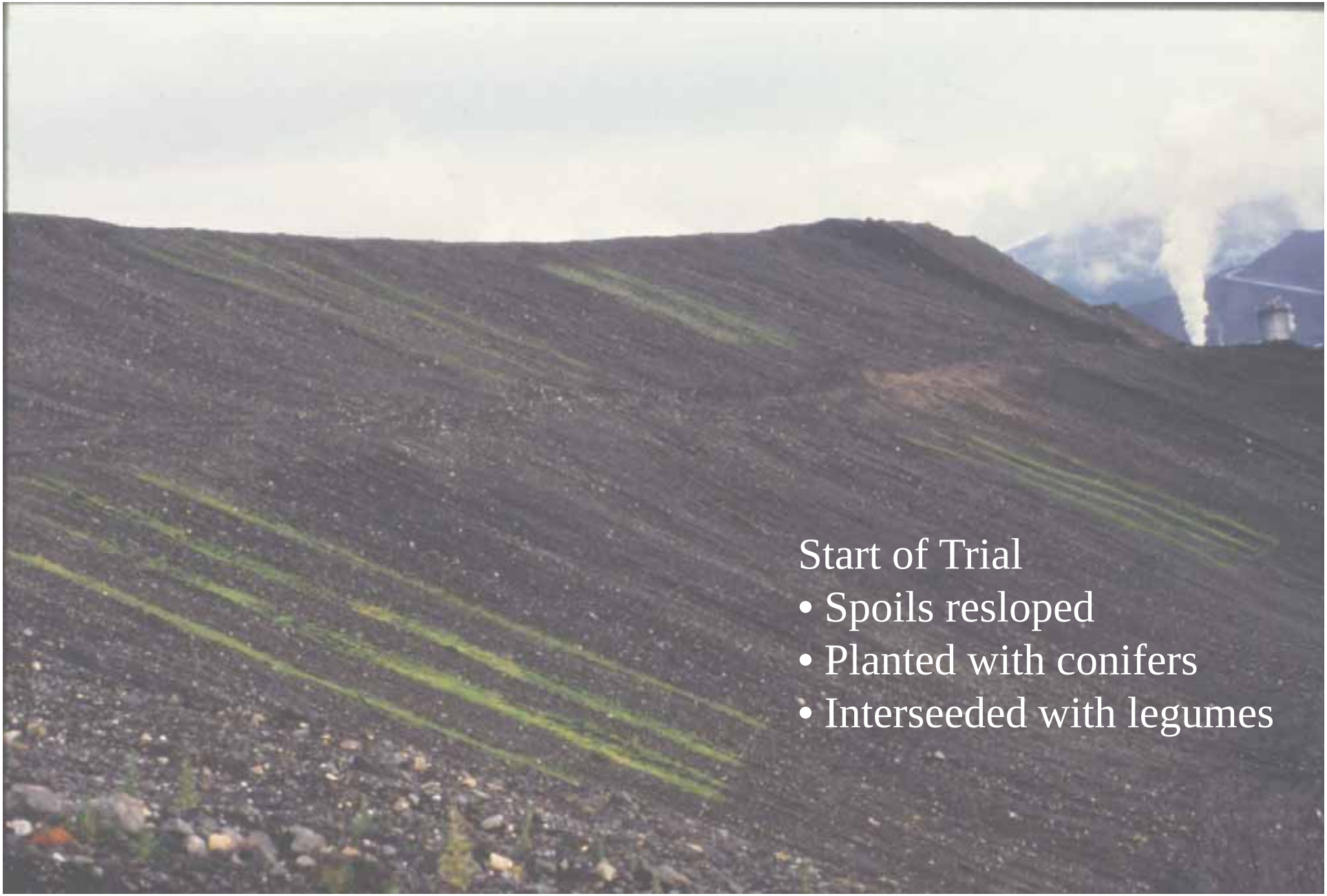
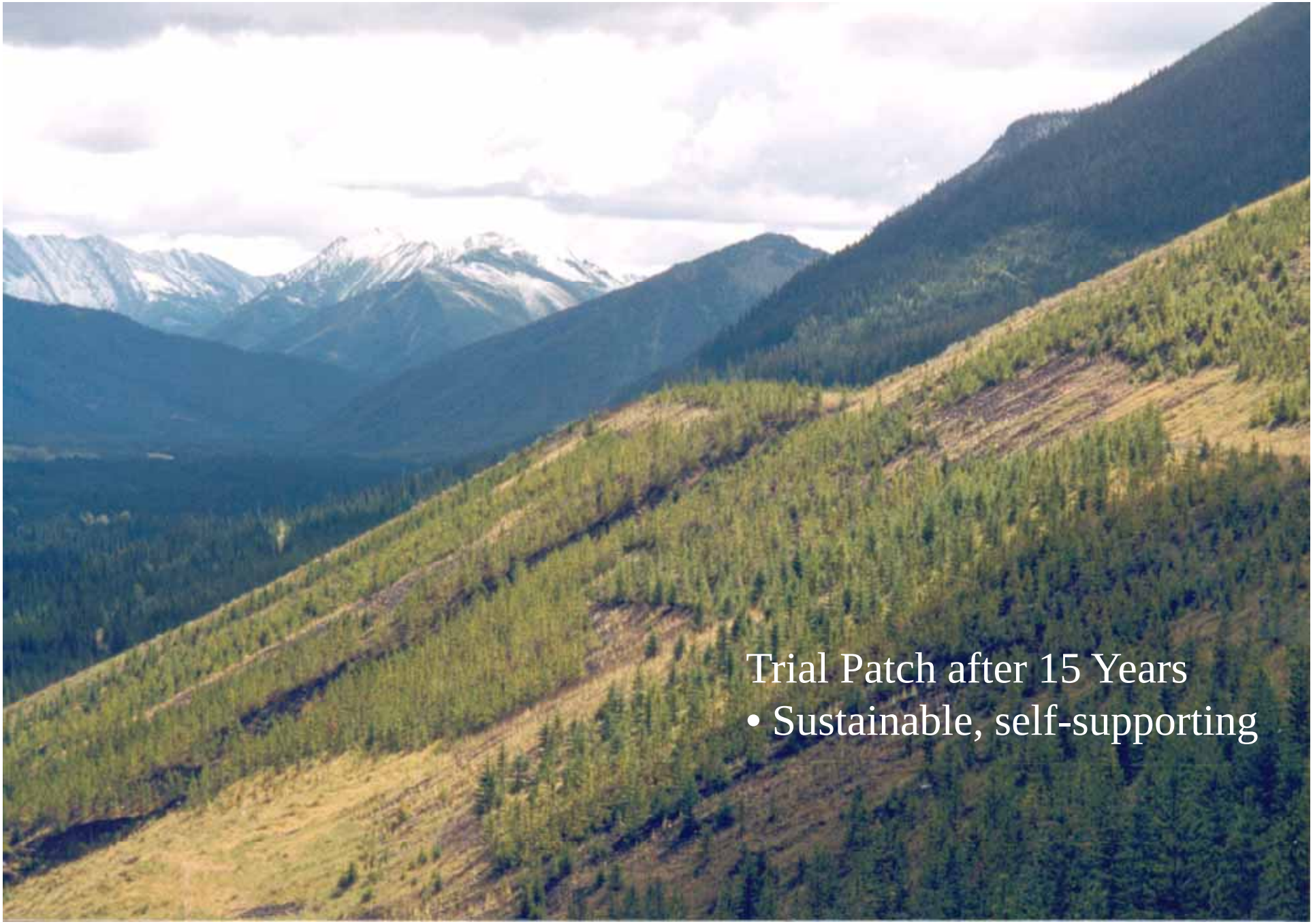
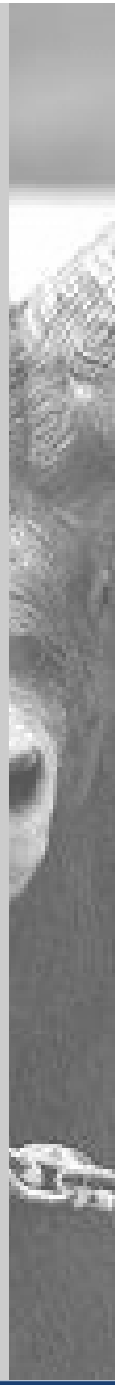

Start of Trial
• Spoils resloped
• Planted with conifers
• Interseeded with legumes


Trial Patch after 15 Years
• Sustainable, self-supporting

Close up of 15 year trial plot.
Method is now used on all areas that are planned for productive forests.

Revegetation for Winter Range Use

Fording, Greenhills



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Reclamation objectives were to provide specific winter range habitat

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Numerous Woody Species Required To Support Ungulate Winter Range

Range of shrub species were established, providing important food for ungulates during winter

Revegetation for Wildlife Habitat

Highland Valley Copper

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Sites prepared and planted with trees and shrubs

Heli-seeding of other sites

One reclaimed area in foreground

Trees and shrubs established to provide sustainable wildlife habitat

Revegetation for Closure

Kitsault Mine

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Majority of infrastructure removed, site recontoured, planted with trees and shrubs

5 Years Later

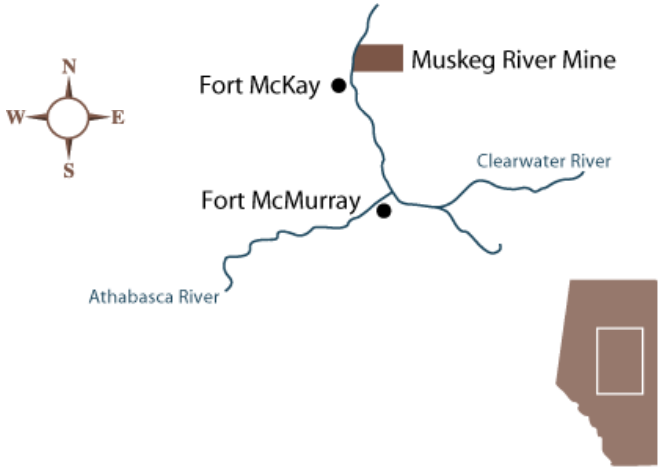
High elevation sites also effectively revegetated with native trees and shrubs

An Expanded Focus

SOCIO-ECOLOGICAL RECLAMATION

Fort McKay Project (Alberta Oil Sands)

The scale and pace of development and associated impacts on the community necessitates an integrative approach to address community-landscape issues (both biological and cultural diversity are affected)



The community of Fort McKay began the Fort McKay TEK Project to explore ways to reclaim both social and ecological components affected by oil sands development

Project Intent

Identify a mechanism to more meaningfully use Traditional Environmental Knowledge to help inform the reclamation process after mining

Address environmental, social and spiritual components in land reclamation

Encourage and support community involvement in reclamation

More Than Just Land Reclamation

- From an indigenous perspective social processes are reflected in and exist concurrently with ecological ones.
- Social-ecological reclamation supports community involvement with the lease site
- Inclusion of cultural values (such as spirituality) in reclamation design and process

Project Findings (Project Ongoing)

- More time focusing on species relevant to community members has encouraged sharing of traditional knowledge with direct implications for reclamation
  - “Cultural Keystone Species (CKS)”

Project Summary

- Provides reclamation targets that are meaningful to the community

- Moving away from the “commoditization” of traditional knowledge towards a process of community engagement in reclamation

- Provides potential indicators for monitoring both impacts of development as well as monitoring reclamation success

THANK YOU

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Land Use and Reclamation

- Reclamation provides a point of meaningful engagement with communities through:
  - Participation in developing end land use goals that take in to consideration social as well as ecological parameters
  - Consideration of current land use and plan for future land use
  - Maintenance of connection to site under development
  - Discussions may support connectivity to areas adjacent to mine lease

Why Use Cultural Keystone Species?

- Provides a culturally relevant compass to guide people as they engage in long-term reclamation and land use planning;
- Directs attention to a finite number of culturally meaningful species which is fiscally and logistically more manageable;
- Promotes community participation - the communities who consider these species to be keystone may have the most obvious reason for wanting to see their sustainable return;
- Offers a tool for translation of knowledge;
- Provide a starting point for further analysis of environmental change and community resilience in the face of that change;

Why Use Cultural Keystone Species?

- Offers a better understanding of the interactions of cultural keystone species and other species;
- Offers a tool for translation of knowledge;
- Provide a starting point for further analysis of environmental change and community resilience in the face of that change.

Project Findings

- CKS offer a relatable linkage that people can visualize and discuss between the current state of the developed landscape and the long-term goals for the land following reclamation

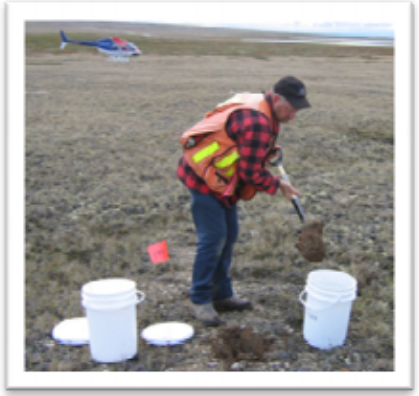
- Directed attention being paid to include CKS in reclamation design as well as associated species.

Conclusion

Additional opportunities to explore various potential paths for social-ecological reclamation include:

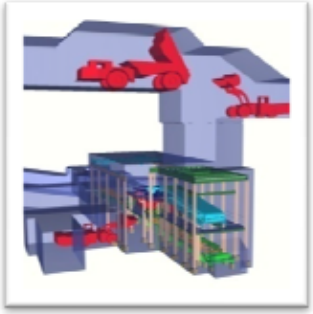
- Establishing land use objectives with regional communities
- Conducting ethnobotanical inventory prior to disturbance
- Creating community Advisory Groups
- Support community-based monitoring

Deposit Appraisal and Feasibility Study Stage



- Detailed Environmental Site Surveys
- Geochemical and Geotechnical Investigations
- Surface and Groundwater Monitoring and Modeling
- Public and First Nations Consultation
- Strategic Regulatory & Permitting Assistance
- Detailed Social Surveys
- Underground Mine Feasibility Studies
- Full Environmental Assessment Reports
- Human Health & Ecological Risk Assessments
- Due Diligence and Project Audits

Mine Development & Construction Stage



- Water Management and Treatment Plans
- Water Treatment Plant Engineering
- Environmental Assessment Reports & Environmental Protection Plan Development
- Ongoing Detailed Environmental Surveys and Baseline Studies
- Mine Engineering, Site Planning, Tailings and Material Handling Plans
- Regulatory Compliance Monitoring
  - Human, Ecosystem, Water, Air
- Project Management Services
- Reclamation and Closure Planning
- HSE Management System Design

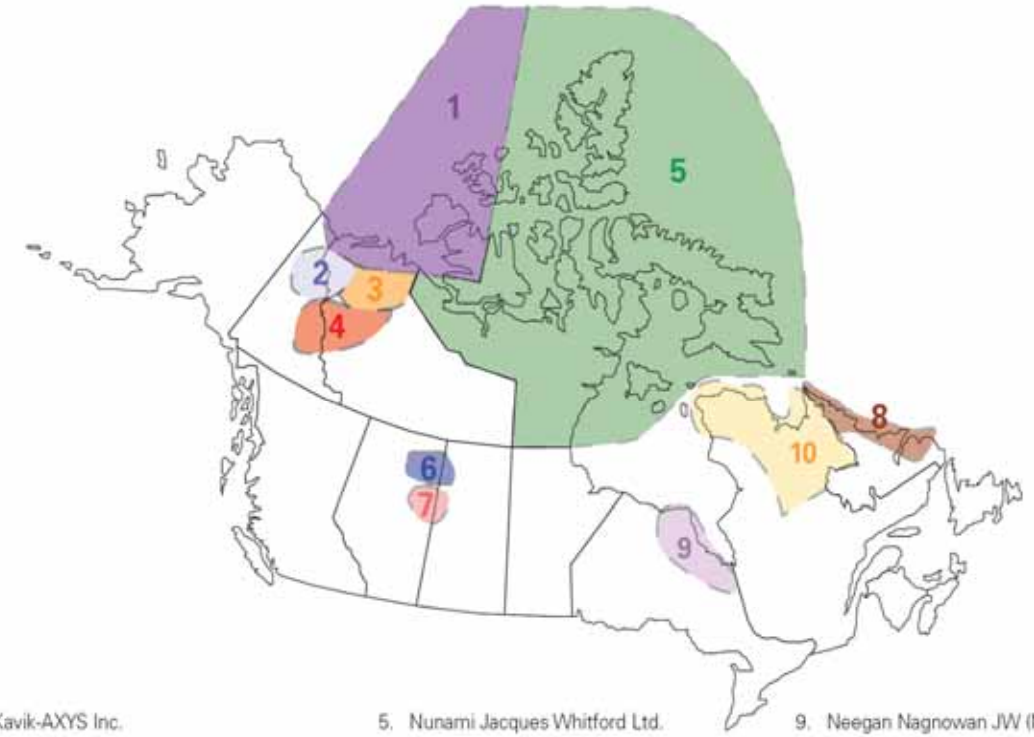
Mine Operation Stage

- Regulatory Compliance Monitoring
  - Human, Environment, Ecosystem, Water, Air
  - Pollution Control Planning and Engineering
- Environmental Effects Monitoring
- Industrial Hygiene Programs
- GHG Monitoring, Accounting, and Reduction Planning
- HSE Management System Design and Auditing
- Operational Reclamation Programs
- Final Closure Planning and Research
- Project Management Services

Mine Closure Stage

- Closure Planning and Permitting
- Regulatory Compliance Monitoring
  - Environment, Ecosystem, Water, Air, Reclamation
- Reclamation and Closure Programs
  - Site Remediation
  - Site Revegetation
- Mine Impacted Water Treatment Engineering
  - ARD/ML testing, monitoring, mitigation
- Project Management Services

Jacques Whitford-Stantec's aboriginal joint ventures include…



1. Kavik-AXYS Inc.
2. Gwich'in Kavik
   Gwich'in Settlement Area
3. SahTu Kavik
   Gasho Gotine District and Settlment Area
4. Tlego'hti Jacques Whitford Ltd.
   Tulita District of SahTu
5. Nunami Jacques Whitford Ltd.
   Nunavut
6. FM JWA Evergreen
   Fort Mckay Traditional Area
7. Nu Nennè – AXYS Inc.
   Cold Lake Traditional Territory
8. Aivek-Jacques Whitford
   Inuit Lands in Labrador
9. Neegan Nagnowan JW (NNJW)
   Mushkegowuk Tribal Council Region – James Bay Lowlands, Ontario
10. Jacques Whitford Nuvumiut (JWN)
    Raglan Agreement Area, north of 55°, Quebec

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Jacques Whitford's Aboriginal JVs

Nu Nennè-AXYS

2100580 Ontario Inc.
Neegan Naynowan
Jacques Whitford Lp

Minaskuat Lp

NUNAMI
JACQUES WHITFORD LIMITED

KAVIK-AXYS Inc.

NUVUMIUT DEVELOPMENTS INC.

AN INUIT COMMUNITY-BASED COMPANY SERVING THE MINING INDUSTRY

FM - JWA Evergreen

A Fort McKay/Jacques Whitford AXYS Joint Venture

Aivek Jacques Whitford Limited Partnership

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What do we do in Mining?

- Environmental Assessments and Baseline Studies
- Geological, Geotechnical, Geochemical Investigations
- Surface & Groundwater Water Management Plans
- Mine Impacted Water Treatment Engineering
- Environmental Management Programs
- Regulatory Compliance Monitoring
- Mine Engineering (U/G)
- Mine Closure / Reclamation / Revegetation
- Public & First Nations Consultation
- Human Health and Ecological Risk Assessment