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Canada

Federal Contaminated Sites Action Plan (FCSAP)

Colomac Mine Remediation Project

Use of locally harvested materials, soil bioengineering techniques and natural processes lead to sustainable revegetation of river and lake shorelines after contamination by a closed gold mine.

Background

Closed in 1997, the Colomac gold mine, located 220 km north of Yellowknife, Northwest Territories, left behind contaminated sediments and harmful hydrocarbons that were leaching into nearby Steeves Lake. After the closure, Aboriginal Affairs and Northern Development Canada (AANDC) took on responsibility for the mine and the remediation of the area. In 2010, AANDC hired a contractor, Tlicho Engineering & Environmental Services/Aboriginal Engineering Ltd. (TEES-AEL), to contain and cap the contaminants along a 750-metre stretch of shoreline, preventing them from reaching the lake.

The vegetation in the area—already a delicate ecosystem because of the harsh northern climate—had also been greatly disturbed by the mine's operations and the remediation activity. An authorization under the *Fisheries Act* required the restoration of shoreline vegetation and riparian areas on the mine site: revegetation would undo some of the damage caused by the capping of Steeves Lake shoreline and other areas disturbed by historical mining activity, while root systems would reduce further erosion of the soil.

2010 – Steeves Lake shoreline infill and cap

The Challenge

Revegetation approaches usually involve first preparing sites by compacting the soil, then using commercial mixes of seeds to establish an initial plant cover, and occasionally transplanting seedlings or shrubs from nurseries. Often, little or no monitoring of success is performed afterward.

Yet several factors at the Colomac site would make revegetation especially challenging: the remote location would drive up costs for both labour and transporting materials; and the establishment of a heavily seeded initial cover in a subarctic climate could easily out-compete native species and hinder natural succession of vegetation at the site.

The need for a more holistic approach to revegetation was clear. AANDC contracted Polster Environmental Services Ltd., which had expertise in land and riparian restoration, to assist in exploring options for revegetation at the Colomac site.

Revegetation materials collected and prepared on site

This project was made possible with support from the Federal Contaminated Sites Action Plan (FCSAP), a program aimed at reducing the environmental and human health risk, and associated federal financial liabilities, from known federal contaminated sites. More information about FCSAP is available at www.federalcontaminatedsites.gc.ca.

Live gravel-bar willow staking

"Rough and loose" technique

Wetland sedge transplant

The Solution

Polster had already determined that, where the natural solutions to addressing problems in vegetation establishment are slow, there may be opportunities to accelerate the process by providing suitable plants or structures. Polster developed a plan that focused on the establishment of local species at the first stage of revegetation, using willow, alder and wetland sedges harvested from the mine site:

- A "rough and loose" technique to prepare the ground surface would create tiny sites for the seeds to lodge and germinate in, and improve natural recovery of the land.
- Using live willow cuttings as stakes would lead to quicker stabilization of the prepared ground and gravel bars.
- Using an arctic-grass seed mix and locally collected alder seeds in some areas would promote the establishment of natural vegetation.
- Sedge plugs would create new wetland and flood-zone areas.

As much as possible, the materials would be harvested from the mine site itself, reducing the need for transportation, lowering costs and using species that had already proven their ability to withstand the local climate.

The revegetation plan applied the same principle to using local skills and knowledge. TEES-AEL, the contractor that had done the original containment and capping, brought in the expertise of Flat River Consulting Ltd. to develop and oversee the revegetation treatments; Polster provided local training and capacity-building.

To ensure that the revegetation was not only completed, but also sustainable, Flat River established a monitoring framework for AANDC, which includes annual and long-term monitoring, as well as photo documentation and sampling of vegetation plots to assess species composition and sustainability over time. In addition to documenting the recovery process, this monitoring also determines the overall success of the revegetation effort—and how the techniques might be applied at other sites.

Outcomes and Benefits

Now that the revegetation plan has been carried out, it has brought about several benefits:

- The plant species used in the revegetation are surviving, while new species are establishing themselves naturally in the area.
- Local capacity for this kind of effort has increased, as local communities have become more involved in the site.
- The revegetation process was much less expensive than the normal costs for a remote area.

As the monitoring continues, it will become possible to gain more insight into the natural recovery of disturbed areas in a northern environment, while the nearby communities will have more confidence that contaminants are being kept from the surrounding environment.

2012 – Steeves Lake shoreline cap and infill

Public Works and Government Services Canada is mandated by FCSAP to promote the use of innovative technologies, approaches and best practices in the remediation of federal contaminated sites. This is one of a series of profiles featuring innovative, sustainable and green remediation technologies, approaches, and best practices in Canada.

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