YUKON RESEARCH CENTRE
Yukon College

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Yukon Research Centre

Centre for Northern Innovation in Mining

Geoscience 2013
Whitehorse
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Yukon Research Centre

- Yukon College Research arm on northern topics
- Established in 2009, core funding from Dept. of Education and Economic Development (YG)
- Ranked 4th in Canada's Top 50 Colleges for research income (Research Infosource)
- **Mine remediation and restoration Research theme**

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Research capacity

Laboratory

- New research building financed by the Arctic Research Infrastructure program
- > 600 sq.m lab space and storage

Facility

- Water treatment
- Plant growth
- Rock preparation

Analytical capacity

- Water Quality
- Metals (GFAA)
- Organic (TOC/TN)

Applied Research – Why?

- Solving specific problems!
- Collaborative, industry-driven research
- Development of local capacity & expertise to support community and economic development
- Training & education

Applied Research – How?

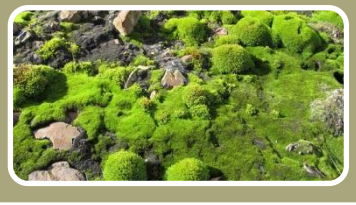
- Trigger: **a specific issue and the will to fix it**
- Connections with relevant experts
- Project discussion & proposition
- Funding application
- Project realization, close collaboration between researchers and partners

Yukon Mine Research Consortium

- Branch of the **Yukon Producers Group**

  → Industrial Research Chair at Yukon College

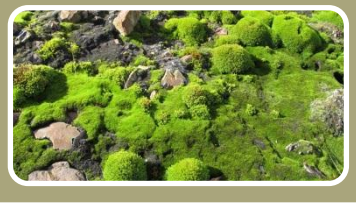
  - Mine Life Cycle – environmental remediation
  - Industry commitment
  - NSERC funding



Mines remediation & restoration

Selected projects:

- Bioremediation for water treatment
- Water recycling
- Mine site revegetation, by Dr. Katherine Stewart



Bioremediation

Definition:

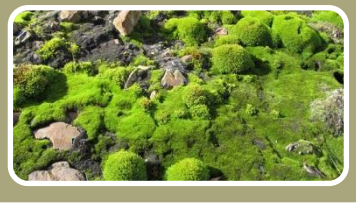
- Use of microbial population and chemical mechanisms to achieve water treatment objectives for discharge

Goal:

- Help developing bioremediation in the Yukon for water treatment during operation and after closure

Why?

- Long term, sustainable solution for improved protection of the environment at lower cost



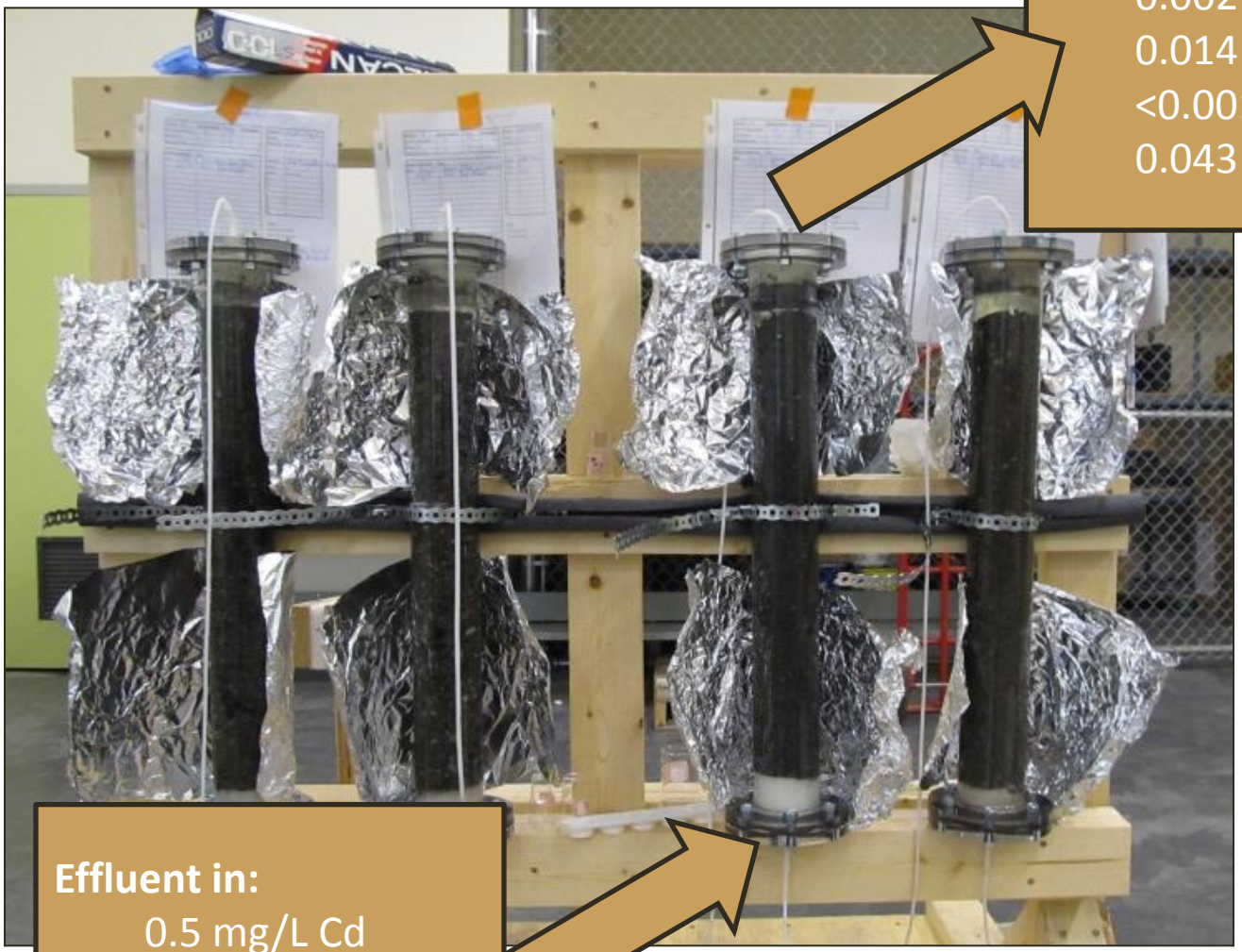
Bioremediation

Objectives:

- Tailor the technology for application in the North.

YRC involvement:

- Examine locally available substrates
- Lab and pilot-scale bioreactors
- Identification of North-specific substrate "recipe"
- Build confidence in the technology

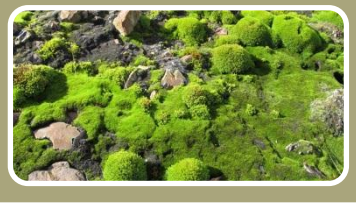


Effluent out:

0.002 mg/L Cd
0.014 mg/L Cu
<0.001 mg/L Se
0.043 mg/L Zn

Effluent in:

0.5 mg/L Cd
5 mg/L Cu
0.5 mg/L Se
5 mg/L Zn



Water recycling

Context:

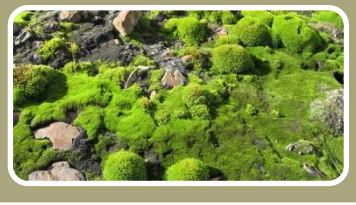
- To reduce water discharge in the environment, all mines are recycling water. Impacts of recycling water on Metal recoveries by flotation is suspected.

Goal:

- Enhance water recycling practices and reduce its impact on flotation

Why?

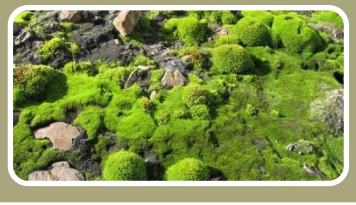
- Increase metals recovery from the ores and increase revenues



Water recycling

Water collection to Mill

Tailings disposal from Mill



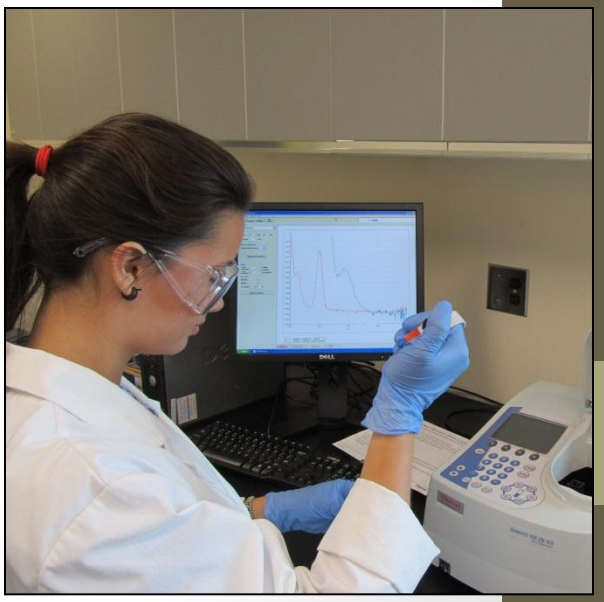
Water recycling

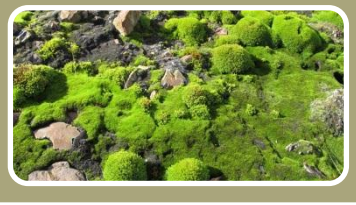
Objectives:

- Develop methodology to assess the economic impact of water recycling
- Test and screen appropriate technologies for water treatment

YRC involvement:

- WQ data analysis
- Impact assessment
- Bench-scale testing of different technologies





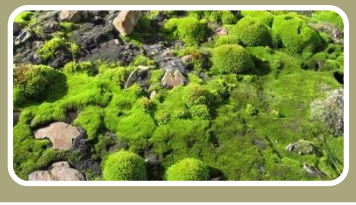
Mine site revegetation, Dr. Stewart

Context:

- Closure and reclamation options are heavily site dependent; however, development of soil amendments and use of suitable native species could significantly increase revegetation success.

Goal:

- Increase restoration success while reducing the cost of restoration.



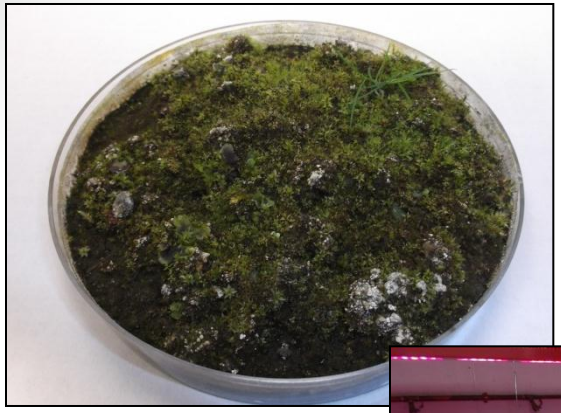
Mine site revegetation, Dr. Stewart

Objectives:

- Examine formulations of soil amendments that improve the condition of the soil and promote germination and growth of native Yukon species
- Examine the potential to include local native nitrogen-fixing herb species and nitrogen-fixing biological soil crusts in northern restoration

YRC involvement:

- Field work, greenhouse trials, growth chamber trials, nitrogen fixation analysis

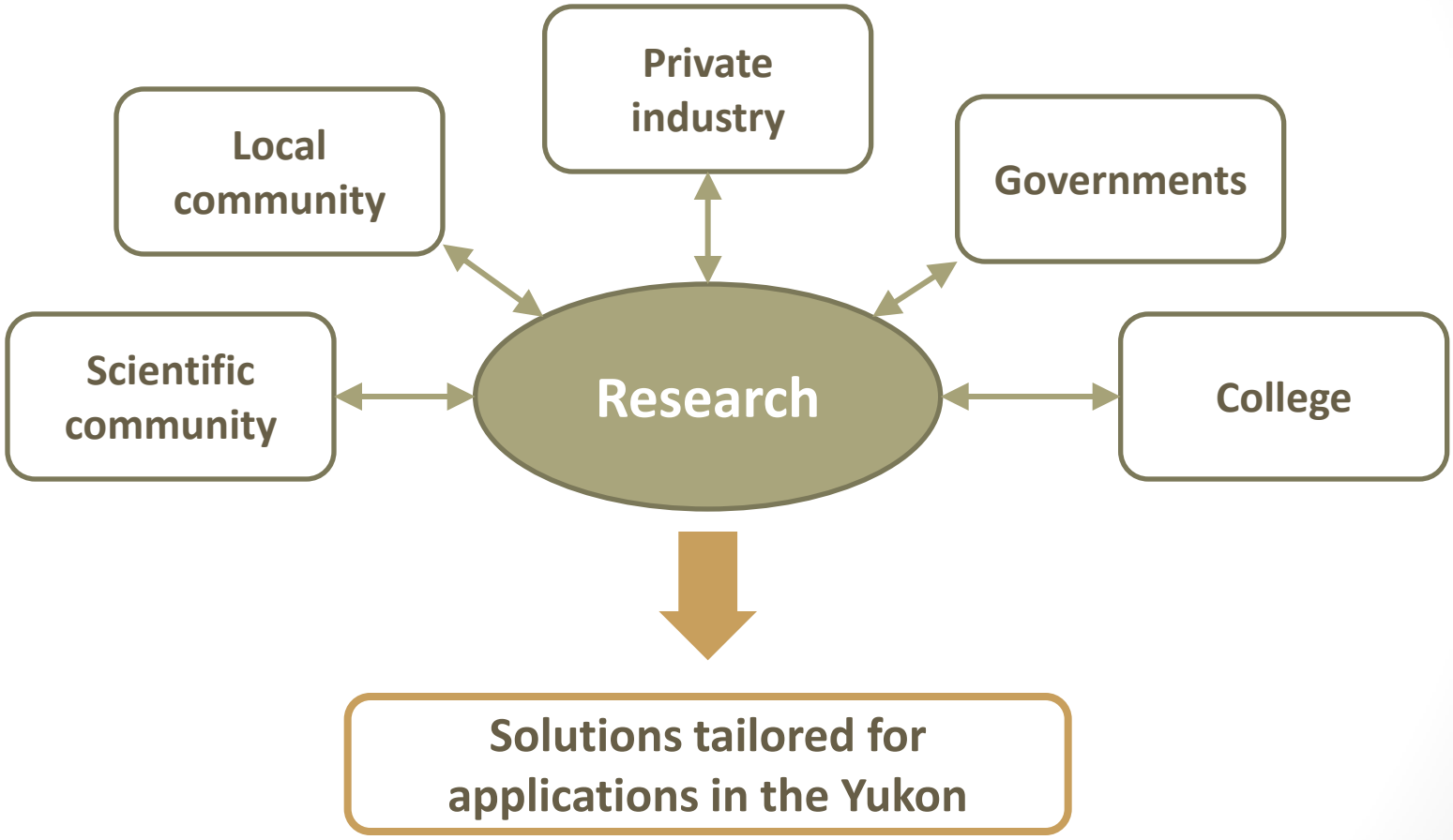


Growth chamber

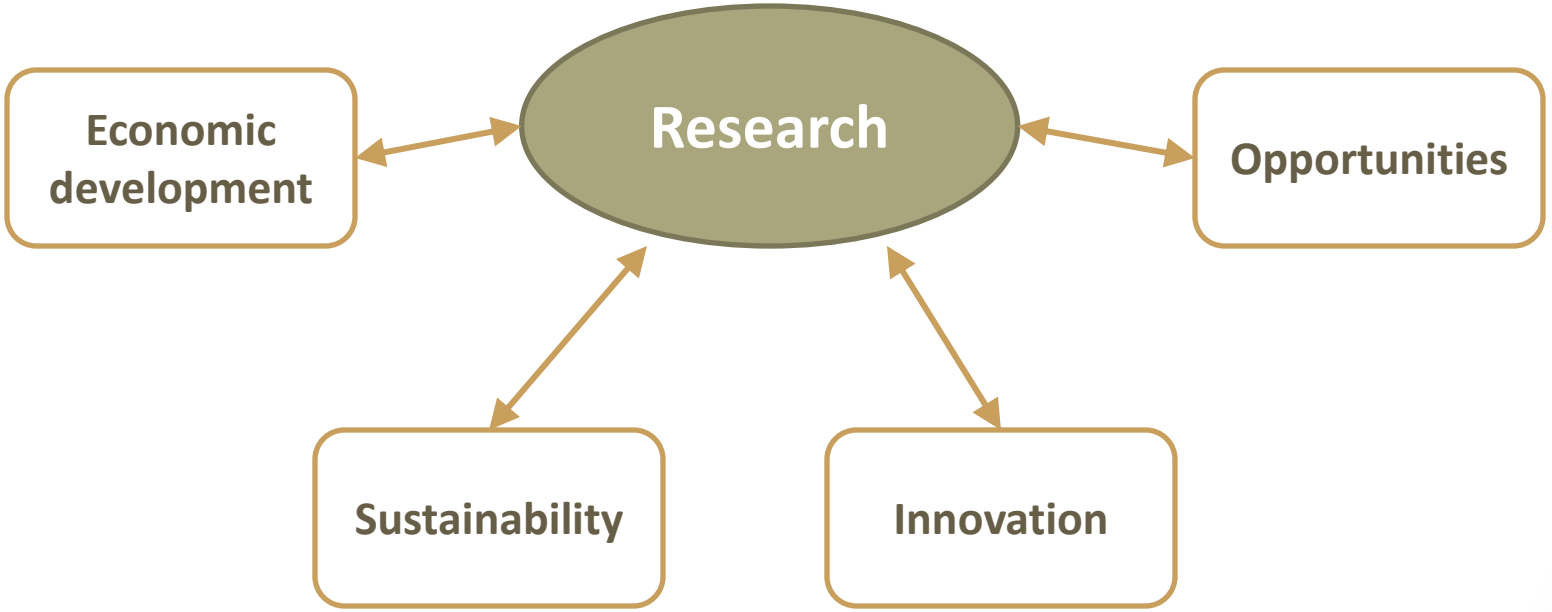
Greenhouse

Field application

Applied Research



Applied Research



Research stories…

Students and Research:
Mine Restoration With Native Plant Species and Biochar

"I'll now focus on learning more about the unique challenges of mining and remediation of mines here in the North."

David Silas,
Research Assistant, Yukon Research Centre,
Student, Renewable Resource Management Program