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**"RESEARCHERS AT SMU PARTNER WITH ATLANTIC GOLD TO CLEAN
UP OLD MINE SITES"**

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JEFF DOUGLAS: Nova Scotia has a history of gold mining that goes back at least 160 years when the first and most dramatic of our gold rushes began, it's back in 1861 and there are dozens and dozens of sites where operations ceased decades ago.

Quite a number of mines shut down in the 1930s and '40s right through to the '50s, for instance, but environmental consequences remain.

A new five-year study is going to look at how to clean up wetlands used by these sites with an eye to sustainability and cost effectiveness. It is a partnership involving Atlantic Gold and is led by Linda Campbell.

Linda Campbell is a professor of Environmental Science at Saint Mary's University. We are working with two American Sign Language/English interpreters. Professor Campbell, welcome to Mainstreet.

PROFESSOR CAMPBELL: Thank you. Good to talk to you today.

JEFF DOUGLAS: It's good to talk with you too. How did gold mining in this historical period at these sites contaminate wetlands?

PROFESSOR CAMPBELL: At that time how people were extracting gold from the rock, they were actually using mercury to extract the gold and the process was called amalgamation. And so by doing that, they did try their

CBC MAINSTREET - MARCH 5, 2021

best to recover the amount of mercury they were using but there was always some that was lost to the environment. And mercury does ... is a potentially toxic element and it does biomagnify through the food chain. And what happens is that they were using fresh water from lower lying water areas, which is including wetlands and they were using that water to process that crushed ore. And where you think about where they would put the water back to after using it, they would go back to those wetlands and low lying areas.

Another challenge as well that we're looking at is arsenic. And arsenic is naturally found in our rock here and when you're crushing those rocks to a fine powder then the arsenic becomes available. And it becomes available to the oxygen from being crushed and it's very sensitive to environmental chemistry. And it gets then flushed out with that mercury after that amalgamation process and it gets flushed back to those low lying areas.

And those fine tailings are still here, that waste product is called tailings from that process and it's a very fine sandy material with mercury and arsenic in that and it's been left in those wetlands.

JEFF DOUGLAS: How pervasive is that kind of contamination from this historic mining?

CBC MAINSTREET - MARCH 5, 2021

PROFESSOR CAMPBELL: That's a good question. People are trying to figure that out exactly. We know that there was over 360 mines across Nova Scotia and that's from the Eastern Shore, to the Southern Shore, it follows the geological formation of our province.

And so over 360 mines and many of those sent their ore or processed the ore very close by to their mining sites where they did that amalgamation process with mercury. And the tailings are probably at many of those sites across the province. And the challenge that we have is that the tailings are moving with the water and so we have a good historical documents of where the corporations were operating at that time but the tailings are moving since that time so it's very important to quantify and map that information. And it's good work that's being done now.

JEFF DOUGLAS: Arsenic clearly is a word that, you know, is a substance that all of us are familiar with, it's as ominous sounding as is mercury. How much of a problem could these historical mines pose to ... I mean, us; obviously I ask as a human being, but also just to the fauna and flora of Nova Scotia.

PROFESSOR CAMPBELL: Uh-huh. And both arsenic and mercury are non-essential elements and so they do have the potential to be toxic and could interfere with

CBC MAINSTREET - MARCH 5, 2021

biological functions. And with arsenic specifically, depending on the form of arsenic, it can be carcinogenic and it causes damage to internal organs and their functions. And when we're looking at mercury we ... it is well known that it is a neurotoxin and so it can affect the nervous system, brain development especially for young children and for mothers who are expecting. And so there's a human health concern there of course.

And looking at the ecosystem perspective, arsenic is a huge issue for the environment. And it has not yet been well quantified in Nova Scotia. And so we're hoping the work that we're doing will quantify that and understand the impacts of arsenic to the wetlands. But we do know that arsenic and mercury are being transferred out of the wetlands through the invertebrates in the system to other organisms that are eating those invertebrates. For example, bats and birds and fish and so forth that are eating those invertebrates.

And the scope is a little bit bigger than the wetlands themselves alone.

JEFF DOUGLAS: For your ... for the purposes of your study, how old does a site have to be to warrant study or to be considered historical?

PROFESSOR CAMPBELL: Uh-huh, and it's based on the practises that were done at that time. The mechanical

CBC MAINSTREET - MARCH 5, 2021

processes that were used were steam power or horsepower or even very early, early on engine power so those practises that took place and using that mercury amalgamation technique was reducing over time until just about before World War II and so all of the preceding World War II times would qualify as a historical practise.

JEFF DOUGLAS: What don't we know that we probably should?

PROFESSOR CAMPBELL: And mostly that would be looking at freshwater systems. It's not as well studied as terrestrial systems. And then the other gap we found was often there were several studies for a few of those larger sites and they're focussed on the bioaccessibility of arsenic within different organisms on those sites. But not a lot of work done with mercury. And so, as well, we're focussed on that part about that.

The interesting thing about historical gold mining practises is that they use mercury to do that amalgamation process to get that gold out of the ore and that's an international issue.

In looking back, Nova Scotia was part of a worldwide global gold rush phenomenon that happened right across the globe from California to New Zealand to Alaska, Yukon, really all of these different places on the globe

CBC MAINSTREET - MARCH 5, 2021

so they did similar practises at that time of using mercury. So there's a lot of sites around the world that are facing this issue.

JEFF DOUGLAS: Professor Campbell, a final question is about your partner in this, your corporate partner in this research, Atlantic Gold currently of course facing 32 charges under the provincial **Environment Act**, they're expected to plea on March 15th. 13 of those charges involve releasing substances into the environments in amounts or concentrations or levels that exceed approval or regulatory levels.

It's not unusual for scientists to have cooperate partners but given that this, your partner is before the courts in this province right now, just interested in asking ... in hearing your answer on how that weighed in your decision to partner with Atlantic Gold?

PROFESSOR CAMPBELL: And we're very excited about the research agreement that we have with Atlantic Gold to focus on the historical issue that we're facing. And it's been persistently impacting our environment for over 100 years and so our team is thrilled to have that opportunity to finally approach those historical issues that our province is facing and we're finally able to develop a remediation strategy for the wetlands that have been impacted over 100 years ago.

CBC MAINSTREET - MARCH 5, 2021

JEFF DOUGLAS: And the process before the courts with Atlantic Gold now, how did you reconcile that?

PROFESSOR CAMPBELL: And we're thrilled about the opportunity to work with this to solve the historical problem that's from the 1860s all the way to the 1940s and we really do need to solve these issues now, we can't let that last for another 100 years in the environment and so we're excited about we finally are seeing those opportunities emerging so that we can face all these issues.

JEFF DOUGLAS: Professor Campbell, this sounds very exciting. Our wetlands thank you.

PROFESSOR CAMPBELL: Thank you. And thank you for the interview.

JEFF DOUGLAS: Linda Campbell is a Professor of Environmental Science at Saint Mary's University and lead researcher on a five-year partnership with Atlantic Gold on remediating historic gold mine sites.

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