

70: Phytomining – 2000s research in New Zealand



Figure 143. PHYTOMINING
 Small-scale field trials of gold phytomining trial in Brazil. (photo: courtesy of Dr. Chris Anderson of Massey University - <http://ite.massey.ac.nz/staff/rhaverka/Phytomining.htm>)

Phytomining is a still largely experimental. Research is investigating plants able to grow on toxic soils polluted by mine waste or from natural high toxic metal anomalies. Not only is a 'ground cover' of plants produced, but also some plants absorbed such large amounts of toxic metals that 'bioremediation' is sometimes possible by cropping the plants to remove the metals.

The next step has been very recent – to investigate if valuable metals can be mined by cropping such plants, the plants absorbing the valuable metals from the soil – and so a new scientific line of investigation emerged for which term 'phytomining' has been coined. The first experimental success was as commercial production of nickel metal from plants grown on soils with abnormally high concentrations of nickel.

Recently there has been some success by New Zealand researchers with gold recovery from crops of plants grown on soils with high gold content [189-192] see: <http://ite.massey.ac.nz/staff/rhaverka/Phytomining.htm>.

Operation

The gold-bearing soil, such as a natural placer or more likely an expanse of gold-rich tailings, is first planted with a plant capable of absorbing gold in solution and storing it ('bioaccumulation').

The plant species needs to be a fast-growing and high-biomass species. When the crop reaches maturity, lixiviant chemicals capable of dissolving gold are applied to the soil that make some of the gold (plus any mercury) and other toxic metals soluble.

The plants absorb the solutions with the metals and bioaccumulate the metals in their roots, shoots and leaves.

The lixiviant chemical may be toxic to animals and man but harmless to the crop, such as cyanide that may be broken down in the soil.

After a few days or weeks, the crop is harvested and processed by incineration to recover gold, mercury and other metals in the ash.

Researchers at Massey University in New Zealand are testing the use of common crops such as rapeseed to soak up toxic contaminants from soil at abandoned gold mining sites, and to return the land to safe agricultural use. The idea is that the gold harvested during the operation covers the cost of clean-up and provides revenue for the education and training of the communities to create sustainable incomes by farming the land.

Adoption by placer gold miners

Phytomining is making rapid progress. The author suggests several routes to commercialisation may emerge:

- ☒ phyto-reclamation as an incentive to cleaning up tailings; and
- ☒ gold recovery from difficult placers, e.g. fine gold in laterites.

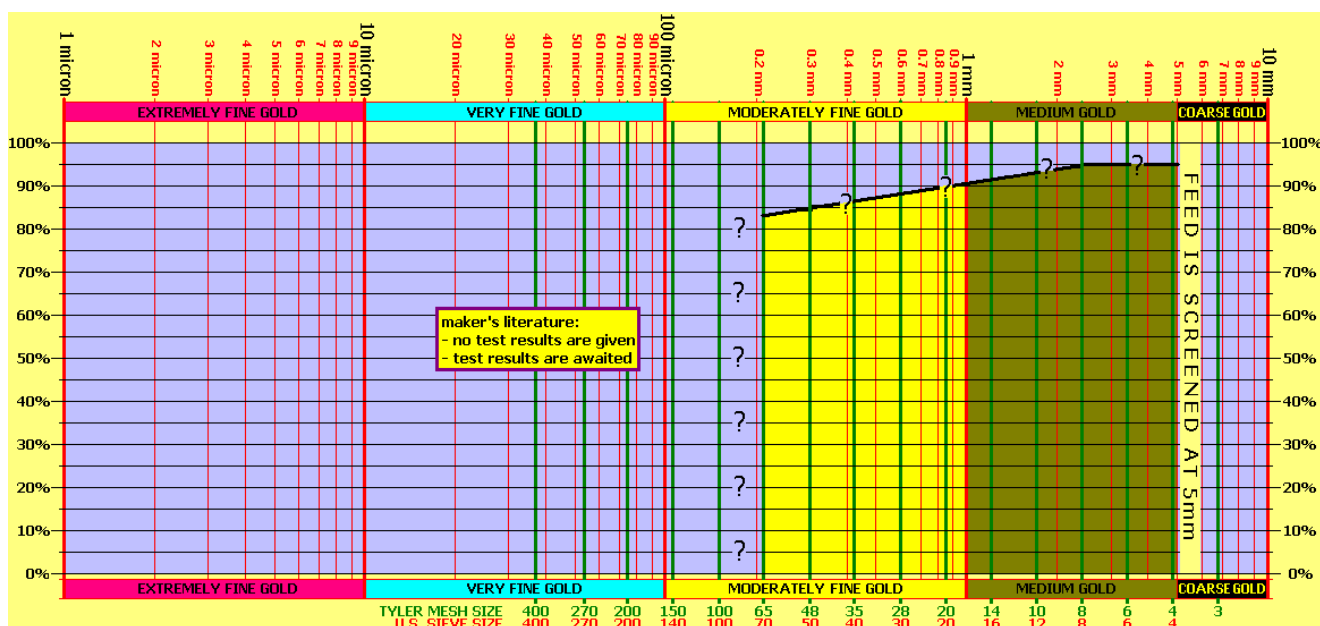


Figure 144. GOLD RECOVERY BY ECOLOGIC E-TOWER
 Recovery of placer gold by the Ecologic 'gold concentrator' based on manufacturer's information. (compiler: Robin Grayson)