

Question from Agoracom.com:

" I read where hydrochemical sampling is starting to be used to search for Carlin-style gold deposits in Nevada. While I understand that those are sediment-hosted deposits of the Basin and Range Province (that may not quite extent into Arizona's Cochise County), would such be of value at Hay Mountain, or is such just not appropriate in the case of porphyry or caldera-related deposits?

Or, perhaps the plant-based geochemical sampling already accomplished at Hay Mountain does much the same thing? If so, which is of more value?

Thank you - VP <http://agoracom.com/ir/libertystar/messages/2208099>

Answer from Jim Briscoe:

Your question is a little bit confusing as you are asking about water sampling and vegetation sampling. So, I will address both, as they are both the same.

As a short answer to your question: Vegetation was used in gold exploration early in the Carlin – gold fields of Nevada (where because of intercompany connections I was one of a small group of outsiders of Newmont that were allowed to see the Carlin pit and its mineralization, - and I still have the samples I collected there) but during gold price downturns its use declined as with all other exploration techniques. It has been “discovered” again recently and includes its use for all other metals throughout the world, where used properly, including Australia where metallic gold has recently been discovered in eucalyptus leaves attesting to the uptake of gold through its root system.

#### Water sampling vs. vegetation indications

As I reread my answer to your question I realize that I may have mis understood the question as you may have been referring to testing stream or well water. The drawback to water sampling is you must have a stream or well to take samples from. We have used water sampling where is convenient, but it seldom is because ore deposits, nor streams or wells, favor one another. With vegetation sampling you have your own pumps by the thousands or millions in plants which pump water to the surface and hold the metals in their stems just waiting for you to come along and take a correct sample that you have been trained to do. Furthermore, plants always concentrate on cracks or faults which in potentially mineralized areas are almost all veins. When I take visiting geologists to Bisbee Arizona I always stop at the Copper Queen adit and the Copper Prince ventilation and escape tunnel. After they have examined the leached capping and malachite in veins in the limestone, I direct their eyes about 75 feet up the cut made by highway widening and ask them to tell me which plants are not growing in a mineralized vein. Of course, they can't because all the plants are growing on veins or veinlets. They are doing the work for an exploration geologist to come along and sample their stems, so she or he can “see” if there is mineralization below.

Another example that took place 30 years ago, in the Tombstone District while I was mapping on color enlarged photos air photos at 1 inch = 50 feet: very large scale. I noticed an absolutely straight line of mesquite trees. I could only see this because of my color photo base map, and if I wasn't looking straight down the line of trees they couldn't be discerned from other mesquite trees irregularly distributed. I walked this line out carefully because I was pretty sure it was a vein like other silver bearing veins in the area. I measured 3,000 feet of tree alignment. Then because there was a back hoe immediately available I marked two lines about 90 feet apart for the hoe operator to cut a trench across the suspected vein. I was right on and had estimated the width of the vein exactly at about 80 feet, with altered rock on either side. I had an x-ray fluorescence analyzer with me and analyzed the exposed rock which went about 2.5 ounces of silver, less than 6 inches below the surface. It was never tested further

nor mined. I went back 10 years later and took a shovel to expose fresh rock and got the same 2.5 ounce per ton silver reading as before but with a much better XRF assayer. Those trees had been waiting for maybe a century or more for me to come along and see they were in an exact line and tell me their secret or sample their twigs to tell me what kind of metallized water they had been drinking.

The point is whether you are sampling from a well or a stream or a tree or bush that has been waiting all its life to tell you what it has been drinking – it is the same mineralized water we are talking about, as if we had a running stream or producing well.

### Vegetation used in porphyry copper exploration

Experimentation over a known, drilled out but unmined porphyry copper deposit (North Silverbell Mine), within the North Silverbell porphyry complex, show unequivocally that at least 51 metals are solubilized in the supergene leaching environment and then move with copper into the enriched chalcocite copper blanket. Under modern climatic conditions these metals are still soluble and move upward where they can be identified and mapped by vegetation sampling, and in surface soils. These methods were used to define our East Silverbell porphyry copper enrichment zone – potential orebody that has yet to be completely drilled but initial drilling shows the chalcocite blanket with all other metals mobilized.

Vegetation sampling (or soil sampling) must be done properly and stringently, or the results will not be dependable. We “do it right” and thus for Liberty Star it is gigantically useful for all metals we seek, in all climate zones (desert, forest, arctic) so far tested.

The only criterium is that there must be woody plants present, which are of the same species and are not contaminated from outside sources. In Australia a certain grass (spinifex) appears to be useful, for gold. Not thought to be useful is a similar plant which grows in the USA.



Vegetation samples gathered at Hay Mountain, August 2017

### Detailed summation of metal solubility in disseminated porphyry copper alteration zones, and gold zones

Your question regarding use in porphyry copper exploration is a good one and I have gone into some length to touch upon the basics of the discovery of the solubility of almost all metals and why. It is important to note that Carlin gold zones are also known to be associated with porphyry copper alteration zones most notably around the Bingham Canyon mine in Utah, but others including Hay Mountain as well.

The studies are voluminous and for the layperson, confusing. Even though I have only encapsulated just a bit of the science, for any one that is bored with such things please just refer to paragraphs 1 and 2 above.

For anyone else with strong interest – please read on and send in additional questions if you wish or call me on my phone.

#### -Leaching associated with porphyry copper alteration of all host rock types

Geochem application to mining exploration is something that I know a great deal about and have studied it starting in 1960 when my college chemistry professor (Quantitative Analysis) was very excited about gold being soluble in humic acid. I wondered why he was so excited about this, but I should have paid more attention.

#### -Humic acid in gold dissolution

We don't think about it much but when plant matter (leaves, wood, bark, fruit) rots it creates humus as it mixes with soil, which in part becomes humic acid. This happens everywhere in the world but let's use the Amazon basin where large amounts of placer gold is found.

In the Amazon basin, thick with humus and generating lots of humic acid, which is thought to leach small gold veinlets in the mineralized bedrock and change it to clay called saprolite where gold may crystalize and grow into nuggets later to be brought near to the surface to be mined by placer miners. Does gold grow back forming more placer concentration as we (scientists) have been told by placer and other gold miners that this is true. Is it?

Robert W. Boyle answers in detail in his book GOLD: History and Genesis of Deposits, Society of Economic Geologists [1987]. This is a wonderful book that every gold prospector (and geologist) should read cover to cover, all 671 pages. I keep mine handy about 2 arms lengths away from my desk chair, so I can re-read the important sections with some degree of regularity, lest I forget them.

What else solubilizes gold? Various natural acids too numerous to mention when combined with common table salt (sodium chloride) particularly in the presence of manganese oxide solubilizes gold easily and causes it to migrate downward and react with copper minerals and other metal minerals and other things like carbon which gold and many other migrating elements love.

At Tombstone (only 6 or fewer miles east of Hay Mountain) where I started working in 1972, I was perplexed for some years why there were no gold placer deposits around Tombstone – most gold bearing deposits have placer deposits around them – until I read Boyle's book and realized conditions at

Tombstone were exactly right for gold solubilization and moving directly down to from a gold blanket that enriched the Tombstone ore bodies. Close examination of specimens revealed textures that demonstrated unequivocally that it was supergene (i.e. came from above).

-Metal dissolution of all metal minerals in porphyry copper leached capping zones

Later when logging drill cuttings from drill holes of a new porphyry copper deposit, which I along with my team of specialists including Dr. John Guilbert discovered that metals associated with porphyry coppers go into solution and move downward through oxidized & leached capping where they are precipitated with copper or other reductants or at the water table. Very careful construction of core boards (boards with cuttings from rotary drilling, glued to a thin board 6 inches wide by 5 feet long – at a scale of 1 inch = 10 feet. With this very simple but carefully done procedure we could see, with assays of all elements, that not only solubilized copper moved downward but so did all the other elements including zinc, manganese, arsenic, molybdenum, lead, cadmium and other metals were also solubilized and moved downward as well. I don't believe this had been noted before. Because in essentially all porphyry copper exploration up to that drilling which I oversaw – the only metals assayed for were copper and molybdenum and sometimes gold and silver. The other 50 or so we now know are associated with porphyry copper deposits were not assayed for. Because assay techniques were not developed where many elements could be analyzed simultaneously, as is the case today, and later no one bothered because it was not known nor suspected that many elements were zonally present and anyway other assays were expensive when the only metals of interest were copper, moly and maybe gold and silver. Thus, the onion skin like metal zoning pattern was not suspected (personal conversations with Dr. John Guilbert). This mineral deposit will someday be mined. This site is currently held in a wildlife preserve and off limits even though ASARCO operations are within less than a mile.

Prior to this point in time of the Silverbell successful porphyry exploration, briefly described above, I had purchased an analytical device called “the Jerome Instrument Company, Gold Foil Mercury Detector” detecting mercury down to less than 2 parts per billion in soil or crushed rock. I did this because I had read that mercury moved upward from mercury bearing ore minerals of which there are many, through barren rock and soil overburden where it could be detected geochemically at the surface over ore bodies that contained a mercury component. And it proved to be true and helped me discover both gold at Randsburg California, and the Wind Mountain mine in Nevada (but that is another interesting story for another day and letter), and elsewhere. Later, Shea Clark Smith and I used the Jerome mercury detectors all over the western US as well as Alaska.

About 1980 I met my now longtime friend and collaborator and Liberty Star technical advisor, Shea Clark Smith when he gave a talk about using acacia twigs to test a gold anomaly, discovered by a large gold mining company, just a few miles out of the Bisbee copper district. When the veggie anomaly that resulted from his sampling was drilled, the anomaly did show gold in drill cuttings, but not enough to define a mine at least at that time. I listened to a talk he gave on that project, and I was very impressed. Since that time, we have been collaborators for 39+ years now along with Dr. John Guilbert now deceased.

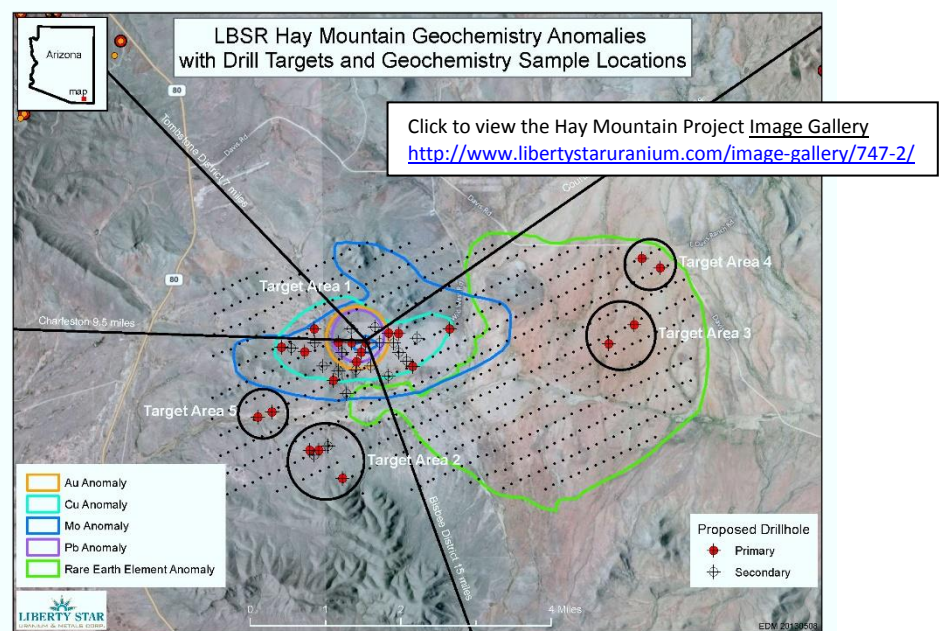
Vegetation sampling is Shea Clark's specialty and with his supervision on the precise way to collect such samples which we professionally videotaped – then as technology changed committed the tapes to CD disks, and now have them on thumb drives and on everyone's iPhone for ready reference.



We have collected more than 10,000 vegetation samples including mesquite, thorn bushes of various types, creosote bushes, paloverde, and other less well known trees and bushes in the southwest USA & northern Mexico, over porphyry copper targets and precious metal zones, and in Alaska where we identified the East Pebble ore body's presence first, through more than a thousand feet of cover, and other mineral zones in the Big Chunk Caldera, sampling tundra vegetation. As I said above – any woody plant will do if the plant type is uniform.

And of course, we have identified the porphyry center at Hay Mountain with similar marker metals using veggie geochemistry. Our project has yet to be drilled but is the same per new information just published - geochemical information on the Rosemont Porphyry which is waiting for mining permits. The Hay Mountain anomaly appears to be much larger than Rosemont but rock type and geochemically they are exactly the same. Not surprising as they are less than 50 miles apart in the same geologic environment.

In short, your answer is: yes, vegetation geochemistry has been proven over and over by many users in the Carlin trend and throughout the US, Mexico, Canada and Australia. But it is only useful to those who understand it, who take proper samples according to a very stringent sampling protocol established by Shea C. Smith developed over his decades of work and assayed by a Certified Assay Lab for multielement analysis. Smith evaluates assay labs around the world periodically and determines which are best and they receive our assay business. He has recently evaluated J.C. Crawford our field manager, who has taken most of our veggie samples over the last decade and has overseen sampling by his subordinates. Smith wrote a 2-page report on Crawford and without going into detail, he evaluated him as the best he has ever worked with.



When all things mentioned above are considered, vegetation sampling, where appropriate vegetation is present, is one of the best exploration technics for “sensing” mineralization at depth.

I would be happy to have any investor visit Tucson and come into the field for a demonstration of this technique.

Jim Briscoe  
October 16,2018



“James A. Briscoe” [James A. Briscoe](#), Professional Geologist, AZ CA  
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**RISK FACTORS FOR OUR COMPANY ARE SET OUT IN OUR 10-K AND OTHER PERIODIC FILINGS WITH THE SEC ON EDGAR.**

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