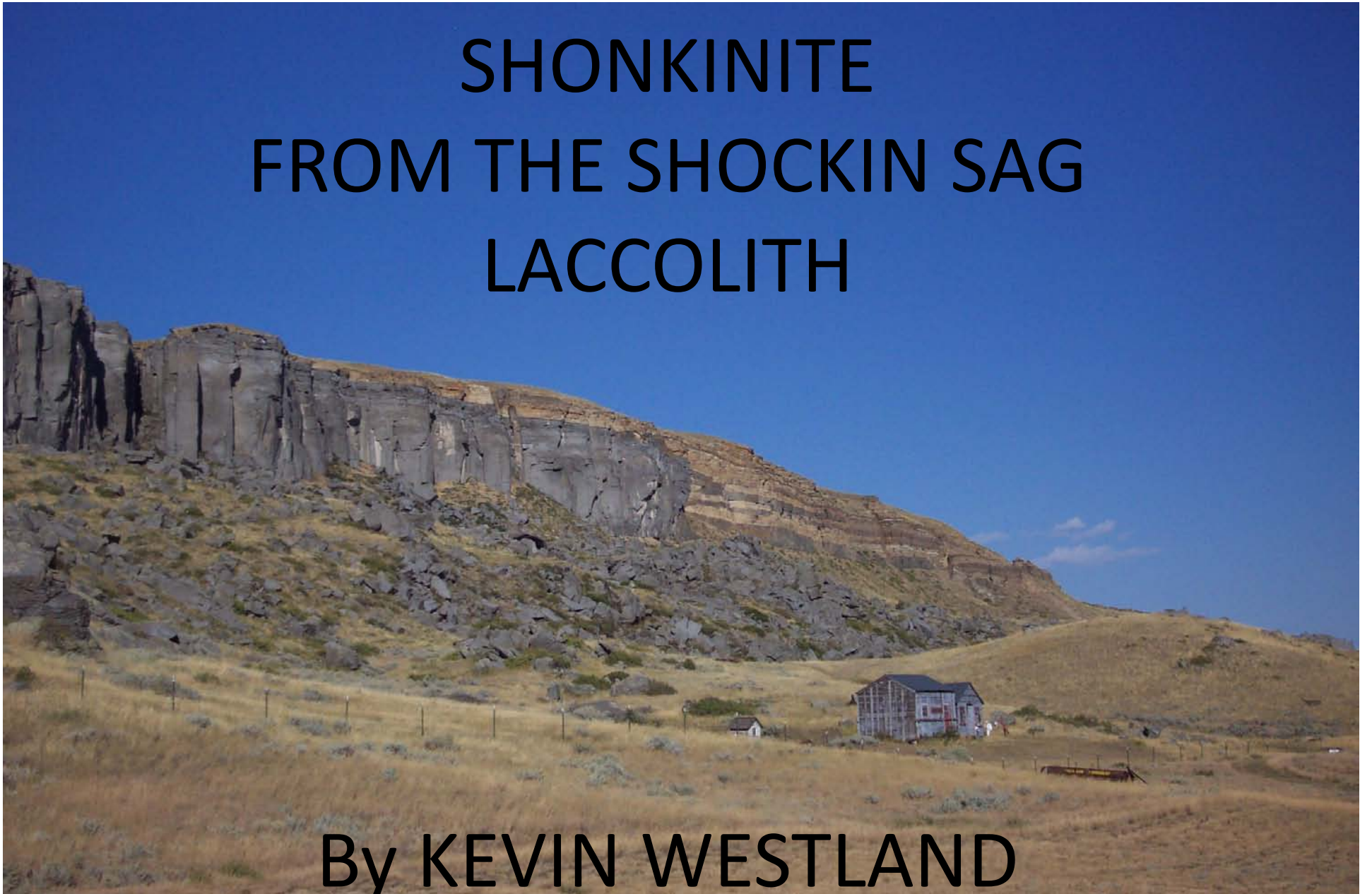


SHONKINITE FROM THE SHOCKIN SAG LACCOLITH

By KEVIN WESTLAND

Picture courtesy of Bernie



SHONKIN SAG LACCOLITH

- What is a laccolith?
 - a laccolith is an igneous intrusion that has been injected between two layers of sedimentary rock
- Where is the Shonkin Sag Laccolith?
 - The Shonkin Sag Laccolith is located in the north eastern foothills of the Highwood Mountains, just to the north of Mary Tanner Four Sisters Ranch:
4890 Lonetree Stage Rd Geraldine, MT 59446
- Brief history of how it formed
 - A single injection of magma followed by differentiation

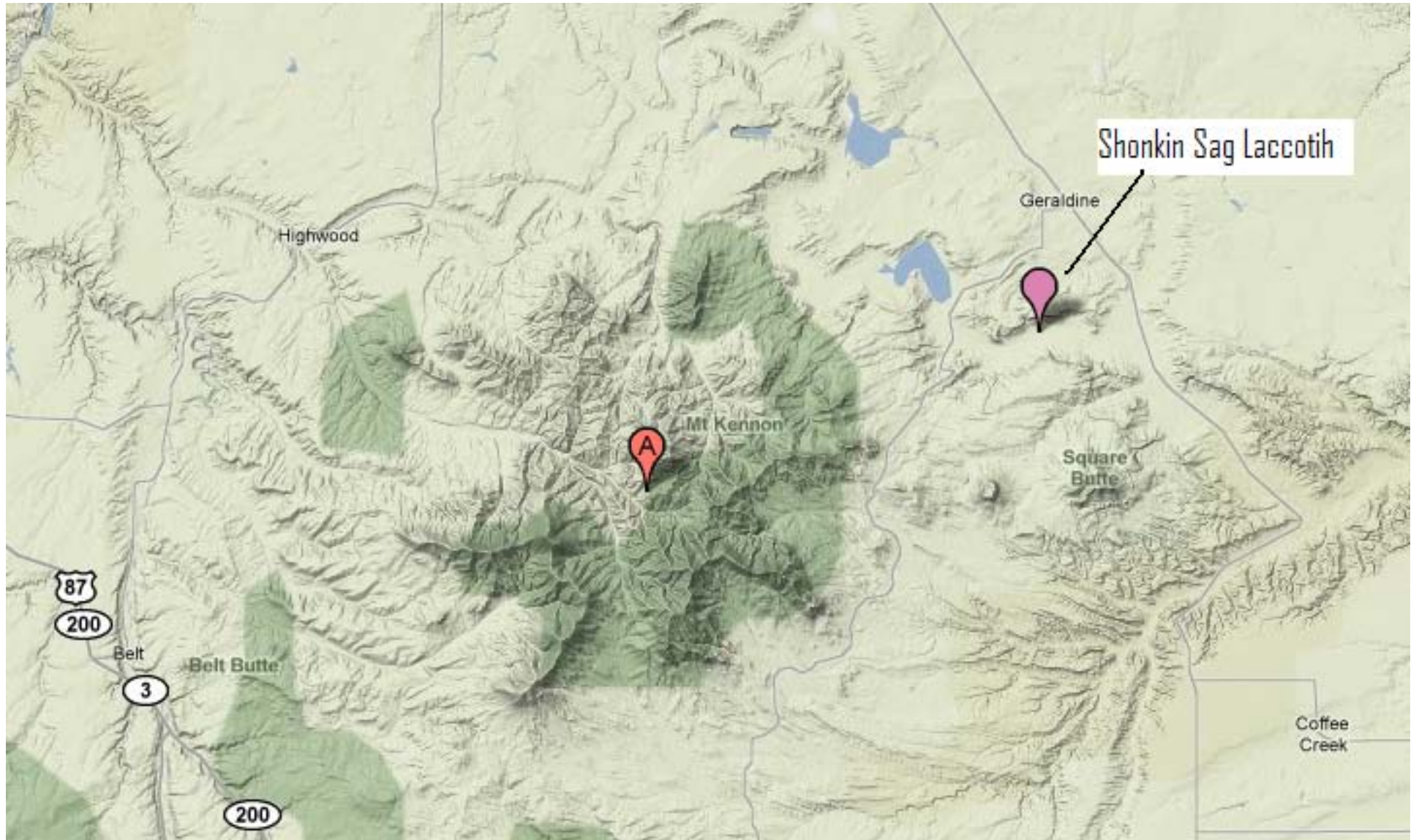




Image Courtesy of Bernie



Image Courtesy of Bernie

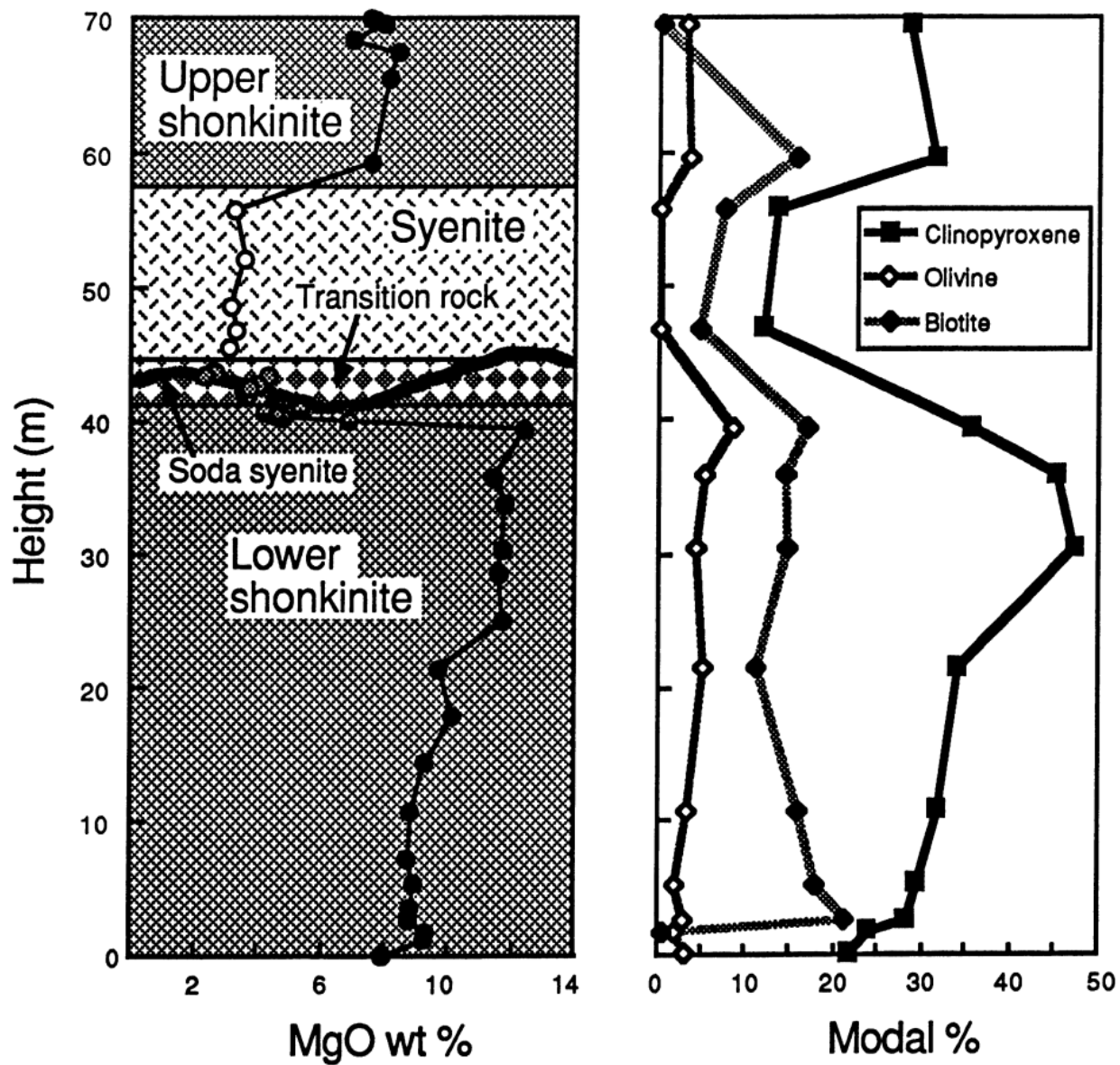


Fig. 8. The stratigraphic distribution of rock types and bulk magnesiumian content (left) and the modal distribution of minerals in Shonkin Sag laccolith.

Minerals Present

- Hand Specimen
 - Dark: Diopside, Augite, Biotite (phlogopite)
 - Light: Sanidine
- Thin Section
 - Diopside/Augite
 - Biotite (Phlogopite)
 - Sanidine
- XRD
 - Diopside/Augite
 - Sanidine
 - Phlogopite

HAND DESCRIPTION

- The hand specimen of shonkinite is a dark green/black coarse-grained, mafic rock. It is the coarse-grained equivalent of mafic phonolite (Hearn et al.). It is composed mainly of clinopyroxenes, phlogopite, and sanidine crystals. Some of the diopside and augite crystals have been elongated up to 7mm in length.



THIN SECTION

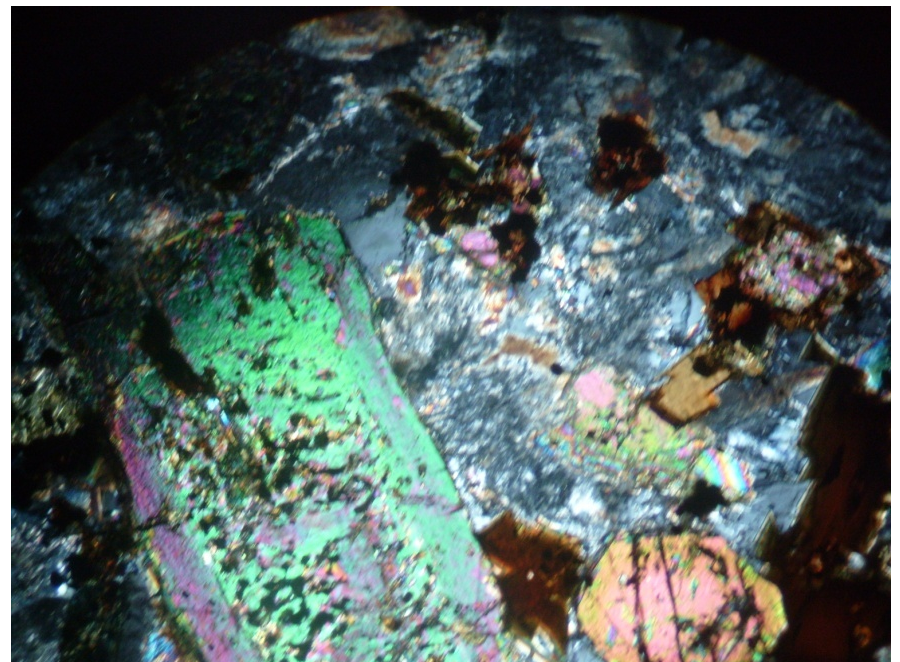
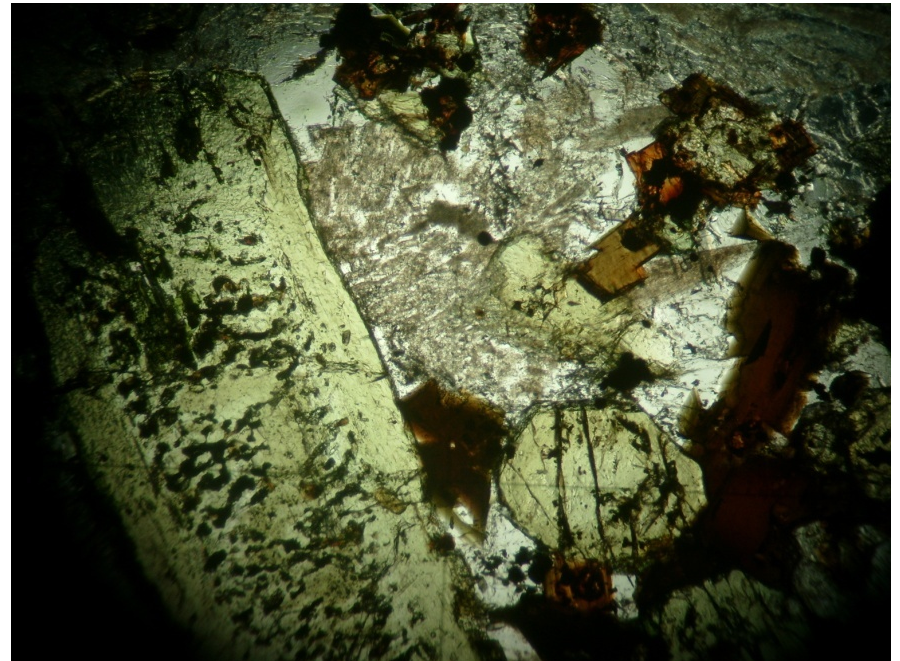
- Minerals Present
 - Diopside: ~25%
 - Augite: ~25%
 - Phlogopite: ~15%
 - Sanidine: ~35%

Texture: Lamprophyric

Top: Plane polarized light picture of augite, diopside, phlogopite crystals surrounded by sanidine matrix

Bottom: Same picture with Crossed polarized light

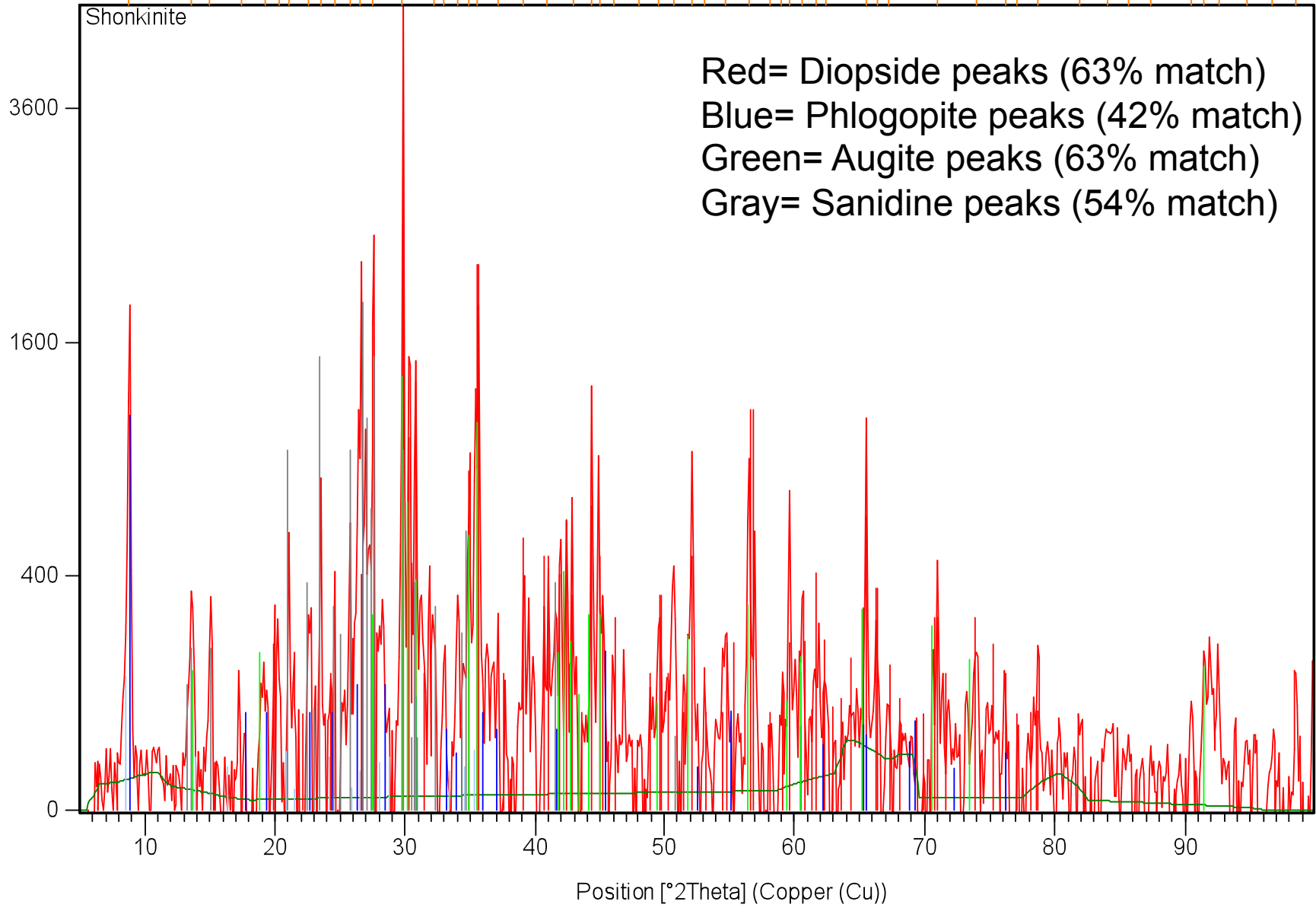
(Westland)



XRD

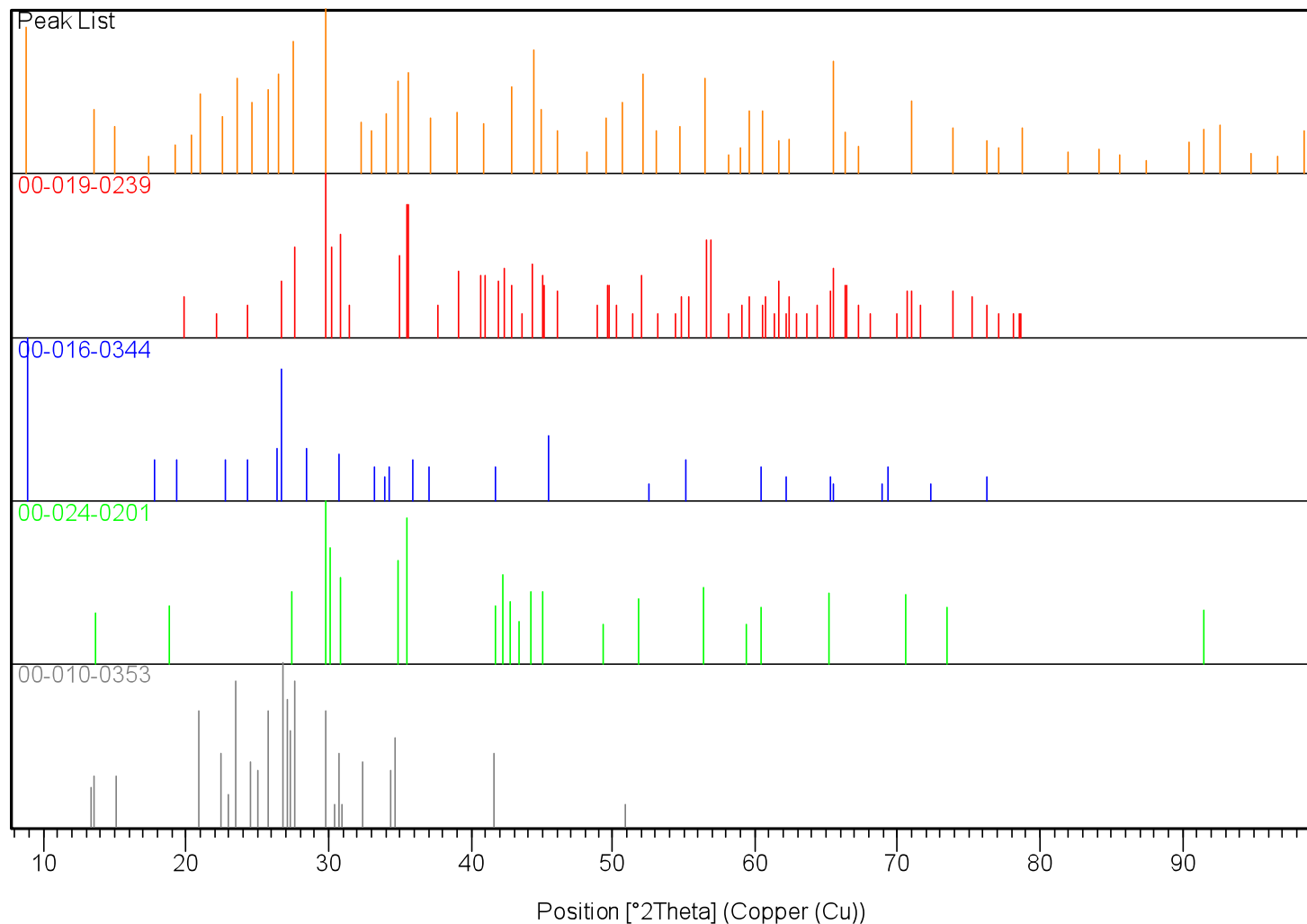
Counts

Shonkinite



Peak List

Visible	Ref. Code	Score	Compound Name	Displacement [°2Th.]	Scale Factor	Chemical Formula
*	00-019-0239	63	Diopside, syn	0.000	0.746	Ca Mg (Si O3)2
*	00-016-0344	42	Phlogopite-1ITMARG, syn	0.000	0.240	K Mg3 (Si3 Al) O10 F2
*	00-024-0201	63	Augite	0.000	0.290	Ca (Fe , Mg) Si2 O6
*	00-010-0353	54	Sanidine, high, syn	0.000	0.397	K Al Si3 O8



Literature Comparison

- Hearn et al
 - Mineral (Vol. %) of Shonkinite in the Shonkin Sag Laccolith
 - Clinopyroxene: 27.1%
 - Olivine: 3.9%
 - Biotite: 17.5%
 - Opaques: 1.4%
 - Sanidine: 30.3%
 - Pseudoleucite: --
 - Apatite: 1.8%
 - Zeolite + Carbonate: 18.0%
 - Groundmass: --

References

- Congdon, Roger D.; Marsh, Bruce D., 1988, GSA: Crystal Capture By Solidification in the Shonkin Sag Laccolith, Montana, V. 20, I. 7, p. 157
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