FIELD TRIP GUIDE – IDAHO MUSEUM OF MINING EXCURSION TO NORTHEAST OREGON,
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We will follow another of Ellen Mullen's 1983 Oregon Geology field trip guides today. Focus is on the pre-Tertiary terranes of northeast Oregon. I have added some comments on some of the mining-related features that we will come across during the tour. The field trip begins at the Stevenson Memorial Park in Huntington, Oregon and proceeds in a circular route down the Burnt River and Snake River before crossing the ridge into the lower Powder River valley at Richland, then proceeding back upriver to Baker City.

The field trip begins in the Huntington Volcanics, the basal part of what is now called the Olds Ferry – Izee Terrane. The Huntington Volcanics are part of an old Island Arc that is believed to have once laid a short distance off of the southern margin of the old North American Craton. Considerable work has been done on the Huntington Volcanics and overlying Weatherby Formation since the 1983 field trip guide was printed. Much of the newer work was done by faculty and students at Boise State University and the University of Oregon (Kurz and others, 2008, LaMaskin, 2008), Tumpane, 2010).

Begin at Stevenson Memorial Park in Huntington, Oregon

Proceed 0.1 mile east on Hwy 30, turn left onto Snake River Road.

0.5 mile, outcrops of Huntington Volcanics along road to right. Rugged topography

1.6 mile Light colored band to left is a tuff in the Huntington Volcanics. Outcrops here are in the lower part of the Huntington Island Arc and are now referred to as either the lower Huntington or the "Spring Creek". Fossil and radiometric ages indicate the beds are late Triassic (late Carnian-Norian stages). Tumpane (2010) reports an oldest radiometric age is 221.72 The lower Huntington/Spring Creek is a sequence of massive, mafic to intermediate lava flows, volcanic breccias and shallow intrusive sills. Also includes minor interbedded volcaniclastic and carbonate sedimentary rocks. Fossils and depositional environments all indicate shallow marine conditions.

1.8 mile - Alteration zone to left in greenstones. Dark brown, spheroidal weathering rocks are younger dikes to the Columbia River Basalt.

2.1 miles – Volcanic sandstones and shales in the Huntington Volcanics in road cut to left. Some of the sandstones in the Huntington contain Triassic fossils.

2.5 miles – turn left, following Snake River Road downstream at the mouth of Burnt River

3.4 miles – Spring Creek Recreation Site to right.

4.5 miles – Nice Columbia River Basalt dike exposed to left.

5.5 miles – Road enters an early Triassic granitic intrusion (Brownlee pluton). 237.77 ± 0.`1 Ma zircon age (Kurz et al, 2008).

5.6 miles - STOP 1 Outcrops here of a coarse grained intrusion now interpreted as an eroded pluton that forms the basement upon which the lower Huntington/Spring Creek was deposited. Granitic clasts in Huntington conglomerates indicate that the intrusion had been eroded deep enough to be exposed by late Triassic time. One question that remains to be answered is: Just what did this intrusion intrude? Part of an older island arc that has been since been eroded? The Brownlee pluton is cut by younger greenstone dikes and sills believed to be related to flows in the lower Huntington/Spring Creek. Geochemistry of flows and intrusions are suggestive of consistent an island arc that was originally a short distance offshore of the North American craton.

6.0 miles – re-entering greenstones of the Huntington Volcanics, typical of the lower Huntington.

6.9 miles – Large landslide complex.

8.7 miles – Steeply dipping tuffs and tuffaceous sediments in the upper part of the Huntington Volcanics, also called the Bayhorse formation/member by Tumpane (2010). Upper Huntington volcanic rocks (rhyolites, andesites, and pyroclastic rocks) generally contain more silica than do lower Huntington volcanic rocks. Waterlain tuffs include rhyolite. In nearby Idaho, the upper Huntington rests unconformably across an intrusive contact between the lower Huntington and 210 Ma Iron Mountain pluton.

9.1 miles – STOP 2 Lithic tuffs here are typical of the upper Huntington/Bayhorse. Tumpane (2010) reports a radiometric age of 187.03 ± 0.04 Ma on tuffs at top of Huntington near here. This is one of the areas drilled in the 1980's for paleomagnetic data. Measured declinations are interpreted to indicate that the beds were originally deposited in lower latitudes.

9.4 miles – STOP 3 The Bayhorse Silver Mine is situated on the hills side above the road. The Bayhorse Silver Mine is a stratabound volcanogenic deposit in a rhyolite at the top of the upper Huntington Formation. Mineralization is confined to alteration zones within the rhyolite and along the contact between the rhyolite and an andesite. Mineralization occurs in high-grade pods and stringers of tetrahedrite-tennantite, sphalerite, quartz and/or calcite that appear to be fracture controlled. Stringers are silver rich, containing as much as 1,000 ounces of silver/ton. Gold content is practically nill.

The Bayhorse is a stratabound deposit that appears to have formed during the last stages of Huntington volcanism. Extremely low gold values at the Bayhorse are typical of pre-Tertiary and early Tertiary alteration zones in the Olds Ferry – Izee Terrane. Underground workings have recently been rehabilitated and a bulk sampling plan is reportedly in the works.

9.5 miles – STOP 4 Here the contact between Huntington Volcanics and overlying Weatherby Formation is a small thrust fault. Basal Weatherby Formation sediments are a "red and green" conglomerate that contains clasts derived from the underlying upper Huntington/Bayhorse. Base of the Weatherby to the west includes shallow water limestone and massive gypsum deposits. The conglomerate, limestone and

gypsum deposits form part of the Jet Creek member of the Weatherby Formation (Brooks,). is the "red and green" conglomerate of Brooks. Contains clasts derived from the underlying upper Huntington Volcanics. Tumpane (2010) reports a radiometric age of 180.61 ± 0.17Ma on a tuff atop the Jet Creek member limestone.

The Weatherby Formation becomes finer-grained upsection and to the north, transitioning from shallow water limestones and conglomerates of the Jet Creek member to deeper water turbidite deposits. The entire Weatherby Formation is believed to have been deposited in a fore-arc basin that laid between the old Huntington volcanic arc and the older, largely deep ocean marine rocks of the Baker Terrane.

10.2 miles – Road crosses another large landslide complex

10.5 miles - gravel bar here was probably left by the Bonneville Flood. Forested ridge to the north is part of the Baker Terrane. The terrane-bounding Connor Creek Fault separates older Baker Terrane rocks from the younger Olds Ferry – Izee terrane.

12.2 miles – mouth of Morgan Creek. Good exposures of the upper part of the Weatherby Formation, referred to as the Big Hill shale by Payne and Northrup (2003). This is a folded sequence of fine-grained turbidites .

13.8 miles- downfaulted block of Columbia River Basalt visible across the Snake River

16.4 miles STOP 5 Exposures of steeply dipping, deeper water facies of the Weatherby Formation at the mouth of Connor Creek. Connor Creek itself was a noteworthy placer stream. The Connor Creek lode mine is located upstream in Baker Terrane rocks north of the Connor Creek Fault

No lode gold deposits have been discovered in either the Huntington Volcanics or the Weatherby Formation. There are a considerable number of gold mines and prospects located in Baker Terrane units and younger intrusive complexes along the Connor Creek Fault. Largest of these was the Connor Creek Mine, which worked a high grade quartz vein discovered in 1871. Although the mine is said to have produced some $9,000,000 in the early days, Lindgren (1901) indicates that the total production prior to 1901 probably did not exceed $2,000,000. Placers along Connor Creek supposedly produced more than 6,000 ounces,

17.1 miles - active landslide visible across the river

17.5 miles – road crosses travertine mound mantled by Bonneville gravels. Reports of a warm spring in this area before the reservoir was filled

18 miles – More exposures of Weatherby formation along the road. Part of the finer-grade, turbidite facies of the Weatherby Formation.

21.3 miles – Columbia River dike cutting Weatherby Formation

22.8 miles STOP 6 Connor Creek Fault The Connor Creek Fault is the major terrane-bounding fault that separates the Olds Ferry – Izee Terrane (Huntington Volcanics and Weatherby Formation) from the

Baker Terrane (Burnt River Schist and Elkhorn Ridge Argillite.) The Burnt River Schist Baker is a phyllite that is more highly deformed and of a more higher metamorphic grade than the Weatherby Formation. The Burnt River Schist contains marble lenses that coalesce to the west to form the Nelson Marble, possibly the most important industrial mineral deposit in Oregon. Marble is current being mined at AshGrove's Nelson Point facility on I-84

23.1 miles Burnt River Schist cut by Columbia River Basalt dike

23.4 miles Discountinuous quartz veins in Burnt River Schist. Along the Snake River Road, the quartz seams appear to be most abundant in areas cut by CRB dikes. The basalt dikes are not mineralized.

23.7 miles – more Burnt River Schist, note micaceous sheen.

24.3 miles STOP 7 Burnt River Schist, quartz seems and Columbia River Basalt dikes. Note the phyllitic sheen in the Burnt River Schist. Several mines east of here have explored gold-bearing, discontinuous quartz seams and pods in the Burnt River Schist.

26.3 miles Bonneville Flood gravels

26.9 miles Swedes Landing bathroom break. Flood, bench and Snake River channel gravels have been extensively placered downstream of Soda Creek. Sturgill Bar was a noteworthy Snake River placer mine located downstream of here

27.3 miles Snake River Road leaves Snake River and begins ascent out of canyon.

27.7 miles Massive outcrops of Columbia River Basalt at top of ridge are Imnaha Basalt. The Imnaha is the oldest of the northeast Oregon Miocene flood basalts.

28.0 Argillite and chert of the Elkhorn Ridge Argillite. The Elkhorn Ridge Argillite is one of the more extensive units in the Baker Terrane. Much of the Elkhorn Ridge Argillite is deep ocean floor deposits such as siliceous argillite and ribborn chert. The sediments have been folded about two different fold axes and include rocks as old as Permian. Late Pennsylvanian, Permian and Triassic limestone blocks have been found within the Elkhorn Ridge Argillite. "Tethyian" fossil assemblages indicate that these rocks are part of the world sea that surrounded the Pangean supercontinent before the opening of the Atlantic. All of the modern Pacific Ocean basin is younger than these ancient oceanic rocks.

28.1 Another active landslide visible across the river. Some slides reactivated by fluctuating reservoir level eroding toe of slide

28.4 miles Snake River Road crosses placer ditch that carried water to high bars above Sturgill Bar.

28.8 Nice exposures of ribbon cherts to left. Typical of deep water sedimentary rocks in the Elkhorn Ridge Argillite.

29.1 STOP 8 Pillow basalts in the Baker Terrane. In areas of more detailed geologic mapping, volcanic rocks such as these greenstones have been separated from the Elkhorn Ridge Argillite. Greenstones here

are pillow basalts that are associated with ribbon cherts. Bishop (1995) descirbes pyroxene and geochemical compositions suggesting that the pillow basalts are ocean island tholeiites. The association of ribbon cherts and oceanic pillow basalts suggest a deep water marine environment.

29.9 miles Road runs along the deeply weathered top of the Baker Terrane. Here weathered greenstones and in places, base of the Columbia River Basalt

31 miles Quartz vein in greenstones to left

31.6 miles Top of ridge. The thick section of Columbia River Basalt to north extends clear down to river level and includes both the Imnaha and younger Grande Basalt. The road from descends on the northward dipping upper surface of the Grande Ronde Basalt.

32.2 miles Surface of the ridge along the road here is mantled by Tertiary gravels. These are probably middle Miocene gravel laid down after the last Grande Ronde Basalt eruptions.

33.6 miles Light colored outcrops along road are Dinner Creek Ash-flow tuff. The Dinner Creek erupted from a vent located west of Vale, near Castle Rock. The ashflow erupted following the last Grande Ronde eruptions and covered more than 2,000 km^2 of eastern Oregon.

33.9 miles Top of Columbia River Basalt section below the Dinner Creek, ledge former of Dinner Creek across the small canyon to right. The Tertiary section conceals the contact between the oceanic Baker Terrane and the volcanic island arc rocks of the Wallowa Terrane

35.4 miles Road crosses into base of Miocene sedimentary section atop the Dinner Creek

38.4 miles Snake River Road crosses the Powder River.

40.4 miles Turn left onto Highway 86 and proceed toward Baker City

41.2 Eagle Creek Large gravel complex along Eagle Creek includes gravels eroded from glacial moraines on the south side of the Wallowa Mountains

47.4 miles Highway 86 enters the Sparta Complex, the southernmost unit of the Wallowa Terrane. The Sparta Complex includes at least four different phases ranging in composition from pyroxenite to tonalite. All phases have been sheared. The complex includes a sodium rich granite in the that contains distinctive blue quartz crystals. This trondjhemite intrudes Permian silicic tuffs and flows at the base of the Wallowa Terrane

48.3 miles Old gold mine workings to the right and left. Several high grade gold quartz have been mined in the Sparta Complex. Workings were shallow, with none of the veins exploited to any depth.

51.1 Miles STOP 8 Hole in the Wall landslide. Movement here started following a series of small earthquakes. Slide material is Columbia River Basalt and unconsolidated sediments.

54.6 Miles STOP 10 Bathroom at Bishop Springs. Good exposures of the youngest known unit in the Sparta Complex. A radiometric age of 215 Ma (Late Triassic) on the tonalite at Bishop Springs was reported by Walker (1995). Fresh exposures of the tonalite contain xenoliths of older diorite and gabbro.

58.2 Miles Columbia River Basalt flows lapping onto older Sparta Complex

60.3 miles – Road crosses Goose Creek and enters a sequence of younger late Miocene and Pliocene sediments. Wallowa Terrane volcanic rocks further up Goose Creek are mineralized. Stratabound copper-gold deposits have been worked in Permian volcanic rocks upstream from the contact with the Sparta Complex trondjhemite. Walker (1995) reports a radiometric age of 253 Ma. Low cliff former to the immediate north is Dinner Creek Ash-flow Tuff.

63.0 miles Cliff-former to the immediate left is a matrix-supported rhyolitic debris flow. The debris flow contains rhyolite and obsidian clasts that may come from the collapse of a rhyolite dome at the Dooley Mountain Rhyolite vent complex. Similar debris flows have been found stratigraphically above the Dinner Creek Ash-flow tuff south of here.

65.9 miles A sequence of younger late Miocene sedimentary rocks are exposed on both side of Highway 86. The white ash bed one of the units that Dr. Jay Van Tassell has worked up.

68.3 miles Greenstones exposed along the highway here are considered to be the base of the Wallowa Terrane. The deformed greenstones are in places mineralized.

68.4 miles Ledge former to right is an olivine basalt flow that is part of the Powder River Volcanic Field. The basalt overlies the Dinner Creek. Underlying surface at the top the eroded greenstones in places contain pockets of placer gold. Scattered gold values at the base of the ash-flow have led to some unwise attempts at retrieving gold from the ash-flow. Can one say, "Eh, Never Mind".

71.3 miles Highway crosses into Virtue Flat. The old Oregon Trail entered Virtue Flat from the south, proceeding west across the flat to Flagstaff Hill. The trail passed with a couple of miles of the rich surface croppings of the old Virtue Mine.

73.9 miles BLM Interpretative center at Flagstaff Hill to left. Old Oregon Trail crosses through here. Top of hill was site of old Flagstaff mine. Workings of the Virtue Mine visible in distance to left. The quartz vein at the Virtue was discovered in 1862. Ore from the mine was hauled by wagon to a mill on the Powder River in what would become Baker City. Total production up to 1901 was $2,189,000 (Lindgren, 1901). Veins at the Virtue are in greenstones that is believed to be part of the Baker Terrane. The main vein at the Virtue strikes northwest and was worked to a depth of 800 ft where it was cut off by a paralleling fault zone. Shear zone at the Flagstaff is in a sheared diorite that is considered to be part of the Wallowa Terrane. Boundary between the Wallowa and Baker terranes is obscured by Tertiary deposits and late Tertiary – Quaternary faults.

75.4 Highway crosses an east-west striking fault on south side of Virtue Flat. Here the footwall is capped by a steeply dipping section of Little Catherine Creek olivine basalt flows.

76.0 Late Jurassic granitic intrusion that was emplaced along Baker-Wallowa terrane boundary. The Gray Eagle stock is perhaps the oldest Juro-Cretaceous intrusion along the terrane boundary, with a recent radiometric age of ~ 164 Ma. Granitics are overlain by Dinner Creek Tuff.

78.8 Intersection with I-84, turn left and return to Boise or continue into Baker City where the yearly celebration known as The Miners' Jubilee is underway.

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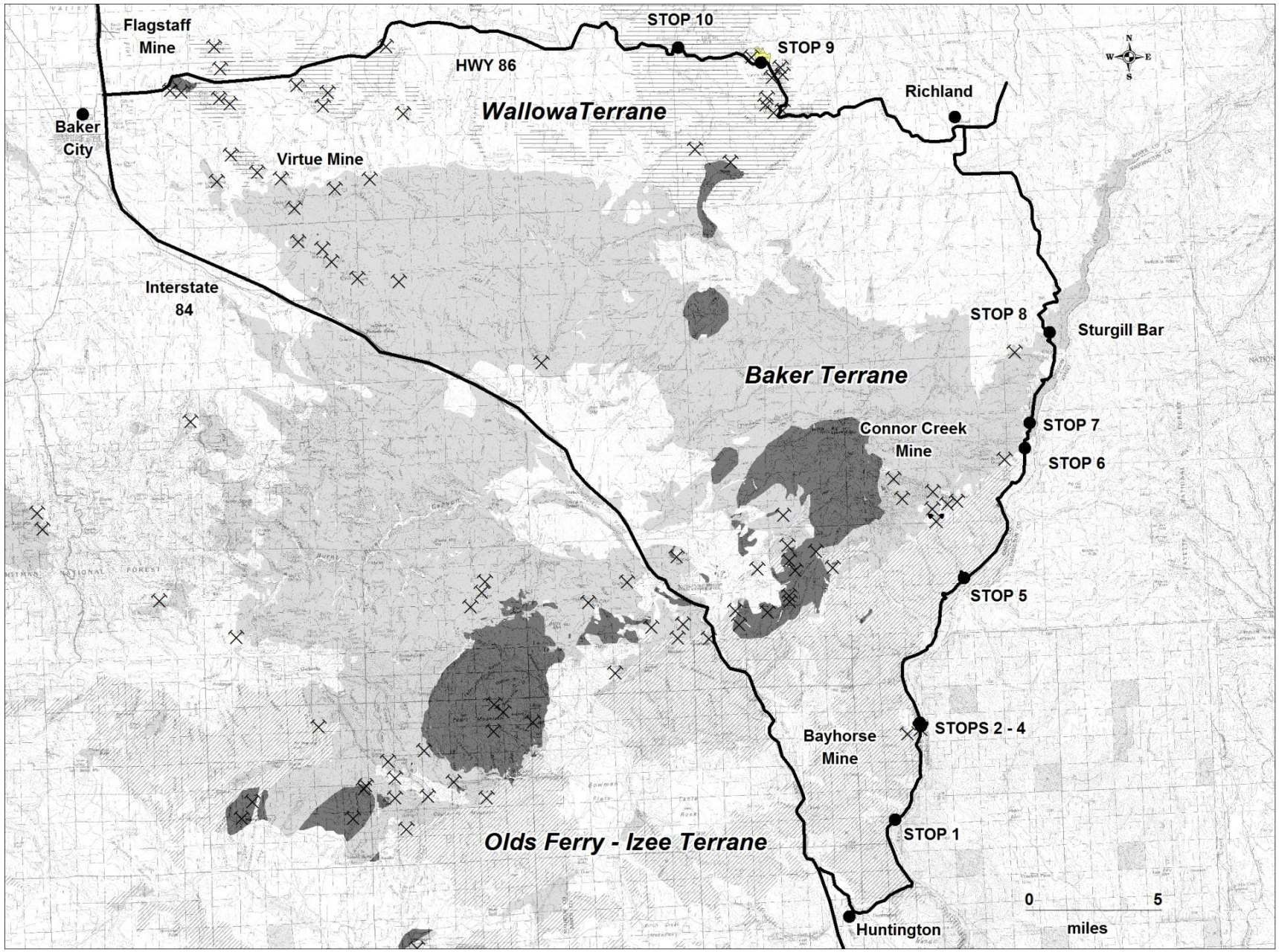
Flagstaff
Mine
STOP 10
STOP 9
HWY 86
Richland
WallowaTerrane
Baker
City
Virtue Mine
Interstate
84
STOP 8
Sturgill Bar
Baker Terrane
Connor Creek
Mine
STOP 7
STOP 6
STOP 5
STOPS 2 - 4
Bayhorse
Mine
STOP 1
Olds Ferry - Izee Terrane
Huntington
0
5
miles