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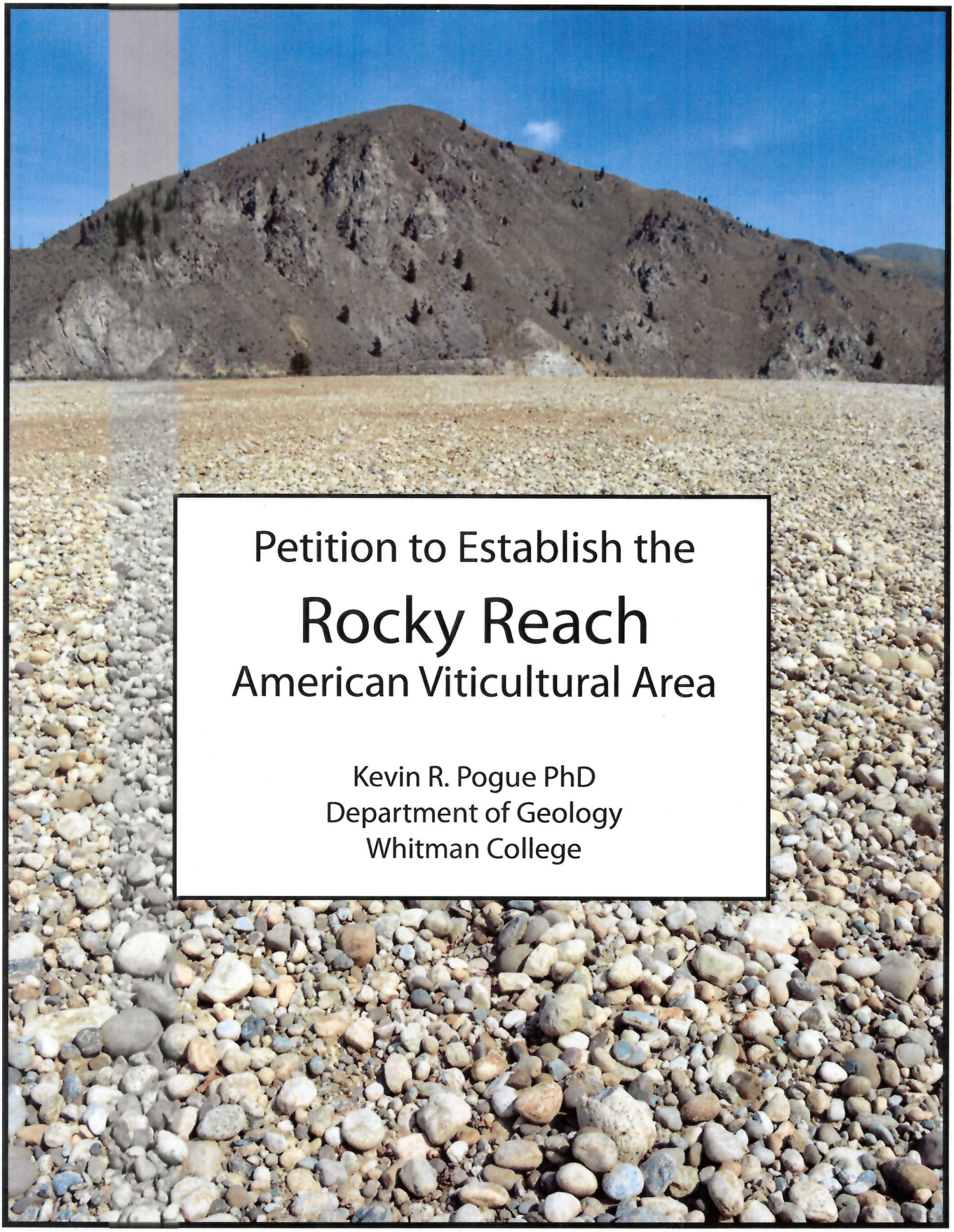

Petition to Establish the
Rocky Reach
American Viticultural Area

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Revised Version
9/10/18

Petition to Establish the Rocky Reach American Viticultural Area

Introduction

This petition proposes the establishment of a new American Viticultural Area (AVA) in the central part of the State of Washington to be called "Rocky Reach" (Figure 1). It is submitted on behalf of owners of vineyards within the boundaries of the proposed AVA. The proposed AVA is situated entirely within the boundaries of the 17,802 sq. mi. Columbia Valley AVA.

As proposed, the Rocky Reach AVA encompasses 32,333 acres (50 sq. mi.) within the canyon of the Columbia River along the western margin of the Columbia Basin, at the base of the eastern slopes of the Cascade Range. Approximately 7,900 acres, constituting 24 percent of the area within the proposed AVA, are occupied by the Columbia River and Rocky Reach Reservoir. Within the proposed AVA are currently 7 vineyards totaling 117 acres (Figure 2, Appendix 1).

The proposed AVA has viticultural characteristics, based on topography, soils, and climate, which are distinctive from the surrounding area. They derive from the unique geologic history of the proposed AVA, which features the erosion of a deep canyon that was repeatedly swept by catastrophic glacial outburst floods. The following sections will detail evidence in support of the name, boundaries, and distinguishing features of the proposed AVA. This petition also includes maps of the proposed AVA, a narrative boundary description, and a discussion of the shared and contrasting attributes of the Columbia Valley AVA and the proposed AVA.

Name Evidence

The name of the proposed AVA is "Rocky Reach." The AVA takes its name from the dam and reservoir that lie within its borders (Figure 3). Rocky Reach Reservoir, also known as Lake Entiat, is a central feature of the area within the proposed AVA. The name originated with steamboat captains in the late 1800's who applied it to rapids within a stretch (reach) of the Columbia river near the present site of Rocky Reach dam. According to Layman (2002, p. 70), " a shallow, rocky reef extended out from the west bank, leaving a narrow, crooked channel close to the east side of the river. Steamboat travel through the 8 mile-an-hour rapids was manageable, but required a captain who could stay in the deeper channel and dodge the rocks that at certain times of the year were just beneath the surface" (Appendix 2). In addition to the dam and reservoir, the name "Rocky Reach" has been applied to a recreational trail within the proposed AVA that extends from the city of Wenatchee to the dam, and to the discovery center near the dam, which houses a regional history museum (Appendix 2). Part of the proposed AVA lies within the Rocky Reach Dam USGS (7.5 min.) topographic quadrangle. References to "Rocky Reach" for the dam, reservoir, trail, and discovery center can be found in recent articles in the Wenatchee World newspaper (Appendix 2).

Boundary Evidence

The boundary for the proposed AVA was devised to encompass glacial outwash and flood terraces resting on metamorphic bedrock on either side of the Columbia River south of the glacial limit of the Cordilleran ice sheet. The southern (downstream) boundary is near the southern limit of exposures of metamorphic bedrock along the Columbia River (Figure 4). Downstream from Wenatchee, metamorphic bedrock is not present within the valley of the Columbia River. The southern limit is also near the northern limit of urbanization associated with the cities of Wenatchee and East Wenatchee.

The eastern and western boundaries, which parallel the Columbia River, are topographic contour lines that confine the AVA to lower elevations that are associated with a warmer climate and the presence of terraces composed of gravels derived from glacial outwash and glacial outburst floods. The elevation of the boundaries increases upstream because the maximum elevation of the terraces increases upstream.

The northern (upstream) boundary is defined by the southernmost extent of the Cordilleran ice sheet during the last ice age glaciation (Figure 5). North of this line, the landscape was buried under thousands of feet of ice, which scoured and shaped the landscape and left behind deposits of glacial till and large erratic basalt boulders. Glacial till and erratic boulders are not present within the boundaries of the proposed AVA.

Geography

The topography of the proposed AVA, particularly its low elevation and level terraces, distinguishes it from the surrounding area, which features higher elevations, steeper slopes, and glacier-carved valleys. All of the proposed AVA lies within 2.5 miles of the Columbia River in an area where the river has eroded a deep canyon between the foothills of the Cascade Range (Entiat and Chelan Mountains) on the west and the Waterville Plateau and Badger Mountain on the east (Figure 6). The AVA lies entirely below 1600 ft. and elevations rise rapidly to over 3000 feet to its east and west (Figure 7). Near the floor of the canyon and perched low on its sides are conspicuous flat-topped terraces (Figure 7). The low elevation land on the surfaces of these terraces has long been exploited for agriculture due to access to irrigation from the nearby Columbia River, the relatively warm climate, and ease of farming on the nearly level ground.

The area west of the proposed AVA is higher, and has rugged mountainous topography. The area east of the proposed AVA, along the western escarpments of Badger Mountain and the Waterville Plateau, is also higher and much steeper. Farther east lies the Waterville Plateau with an average elevation of approximately 2500 feet and consequently, a much colder climate than the proposed AVA.

Unlike the section of the Columbia River valley that hosts the proposed AVA, the valleys to its north, including most of the area within the Lake Chelan AVA, were filled with ice during the last glaciation, which ended approximately 12,000 years ago. In the Lake Chelan AVA the glaciers eroded a deep and broad glacial trough now

partially filled with Lake Chelan. South of the proposed AVA, the valley of the Columbia River abruptly widens where the bedrock changes from hard, erosion-resistant metamorphic rocks to much softer sedimentary rocks.

Geology

In the northwestern part of the Columbia Basin, erosion by the Columbia River has removed the Cenozoic cover rocks (mostly Miocene Columbia River basalt) and carved a deep valley into the underlying Mesozoic crystalline basement rocks. The proposed AVA lies within this part of the Columbia River valley, so its bedrock is crystalline basement composed primarily of metamorphosed sedimentary and igneous rocks (Figure 4) that were once part of a chain of islands offshore of western North America. Between 100 and 70 million years ago, during the Mesozoic Era, the motion of tectonic plates thrust the islands underneath North America to depths of up to 35 kilometers (Miller et al., 2009). The increased heat and pressure recrystallized the rocks, transforming them into metamorphic rocks like the gneiss and schist that comprise the Swakane Gneiss (Figure 8a)and Napeequa Schist and the granitic gneiss and migmatite that comprise the Chelan Complex (Figure 8b). Together, these rocks make up part of what is known as the "crystalline core" of the Cascade Range. They were created deep in the Earth's crust and now form the foundation on which lie younger Cenozoic sedimentary and volcanic rocks, such as the Columbia River basalt. For this reason, geologist often refer to them as "crystalline basement" rocks.

Throughout most of the Columbia Valley AVA, the surface bedrock consists of Cenozoic volcanic and sedimentary rock, predominantly Miocene Columbia River Basalt (Figure 9). Mesozoic crystalline basement rock forms the surface bedrock within a narrow strip along the northern boundary of the Columbia Valley AVA that accounts for less than 5% of its total area. Of the sub-AVAs of the Columbia Valley, only the Lake Chelan AVA and the proposed AVA lie within the zone with crystalline basement bedrock.

The absence of basalt bedrock within the proposed AVA clearly distinguishes it from the areas to the east and south and from 95 percent of the Columbia Valley AVA. Basalt is a silica-poor and iron-rich volcanic rock that is chemically distinct from the silica-rich crystalline basement rocks of the proposed AVA, which are dominated by minerals that are not present in basalt, such as quartz and mica. For grapevine roots that reach bedrock within the proposed AVA, these differences in chemistry and mineralogy create a chemical environment that is distinct from that associated with basalt bedrock.

The areas within the proposed AVA that are currently utilized for viticulture and are most likely to support the growth of viticulture are situated on flat and gently sloping terraces composed of cobblestone gravels (Figure 10). The gravels were deposited by glacial outwash and a sequence of glacial outburst floods associated with the advance and retreat of lobes of the Cordilleran ice sheet between 10 and 20 thousand years ago (Waitt, 2017). The sequence of terraces is best preserved on the inside of the large bend in the course of the Columbia River north of the town of Orondo (Figure 11).

Refer to Figures 11 and 12 for the following discussion of the relationships between the glacial history and terrace formation. The gravels that form the oldest and highest terrace (Figure 11, terrace 1) within the proposed AVA were deposited approximately 18,800 years ago by gigantic floods associated with the failure of a glacial ice dam and the subsequent draining of Glacial Lake Missoula in western Montana. By 18,500 years ago the Okanogan lobe had advanced south to block the Columbia Valley near the present location of Brewster and create Glacial Lake Columbia. The Okanogan lobe diverted later Glacial Lake Missoula floods into Moses and Grand coulees (Figure 12b) and the Columbia River Valley downstream of the Okanogan lobe began to be filled with outwash (cobblestone gravels deposited by meltwater). By 18,000 years ago the Okanogan lobe had advanced down the Columbia Valley to the northern (upstream) boundary of the proposed AVA, which was its maximum extent (Figure 12c). During this time, the Columbia Valley upstream of the proposed AVA, and the Chelan Valley were filled with thousands of feet of ice, which scoured the bedrock and created classic glacial landforms like rôche moutonnée (Figure 13). The Columbia River valley downstream of the glacier, within the proposed AVA, continued to fill with the outwash gravels. The Okanogan lobe had retreated to near Brewster by 16,000 years ago (Figure 12d) leaving behind sediment deposited directly by the melting ice, called glacial till. The most conspicuous components of the glacial till are the large basalt boulders, known locally has "haystack" rocks, that litter the slopes of the Columbia Valley north of the proposed AVA (Figure 14). As the climate warmed during the end of the last glaciation, the Chelan glacier also retreated up-valley toward the Cascade Range, leaving behind an ice-carved landscape mantled with till, and Lake Chelan, a water-filled glacial trough.

Approximately 15,000 years ago, the Okanogan lobe ice dam collapsed, draining Glacial Lake Columbia, and releasing another gigantic flood into the Columbia Valley (Figure 12e). The valley-filling glacial outwash was swept by this flood, creating a new set of terraces (figure 11, terrace 2). Around 13,300 years ago yet another set of floods, probably derived from the sudden draining of Lake Kootenay in British Columbia, coursed down the Columbia, eroding the Glacial Lake Columbia flood gravels and creating a third set of terraces (Figure 11, terrace 3). The Lake Kootenay floods swept across the lower elevations of the proposed AVA, removing earlier terrace-mantling wind-deposited sediment as well as 13,600 year-old ash and pumice derived from Glacier Peak volcano(Figure 12f).

Its ice-age history of terrace-forming flood events distinguishes the proposed AVA from the surrounding areas and imparts unique viticultural characteristics. Unlike the areas upstream in the Columbia Valley, the proposed AVA was never glaciated. It contains no glacial till or erratic rocks and its landforms have not been shape by erosion by ice. The mountains and plateaus to the east and west of the proposed AVA contain no cobblestone-rich ice-age flood terraces. The soils of the nearby Lake Chelan AVA are generally deeper and developed not on flood terraces, but in a mixture of glacial till, lake deposits, and ash and pumice from the Glacier Peak volcano. Volcanic materials present within the soils of the Lake Chelan AVA were removed by flood erosion from much of the proposed AVA.

Soils

The soils of the proposed AVA are developed in eolian (wind-deposited) sand and silt overlying cobblestone gravel and sand deposited by ice-age floods that in turn overlies metamorphic crystalline basement rocks (Figure 15). On the steeper slopes above the flood terraces, a mixture of wind-deposited silt and sand and colluvium overlies metamorphic bedrock. The soils are typically clay-poor and well- to excessively well-drained. In general, a greater thickness of sand and silt mantles the gravels of the higher terraces since their greater age allowed more time for wind deposition (Figure 16a).

The soils of the lower flood terraces, where most vineyards are planted, are very coarse-grained, consisting largely of cobblestones deposited by glacial floods and outwash (Figure 16b). Vineyards planted on these terraces require no cover crops since erosion is not an issue due to the coarse texture of the soil.

The soils in vineyards with stony surfaces warm more quickly and the hot stones radiate heat to the vines and promote faster and more complete ripening (see climate section, below). The drainage characteristics of the coarse-textured soils, which more efficiently transmit water to deeper soil horizons, encourages vines planted in them to be more deeply rooted compared to vines planted in silty or sandy soils.

When compared to the soils of the surrounding areas, the soils of the proposed AVA are richer in sand and cobblestones and poorer in volcanic-derived materials. Unlike the glaciated valleys to the north, such as the Lake Chelan AVA, the soils of the proposed AVA contain no glacial till or erratic rocks. Volcanic ash and pumice, which are common in the soils of the Lake Chelan basin, are absent throughout much of the proposed AVA, having been removed by erosion of floods subsequent to the 13,800 year old eruption of the Glacier Peak Volcano. Compared to the soils of the majority of the Columbia Valley AVA, which are dominated by wind-deposited silt (loess) and fine sand over basalt bedrock, the soils of the proposed AVA are more coarse-grained and lack a basalt substratum.

Climate

The climate of the proposed AVA distinguishes it from the higher elevation areas that lie to its east and west and from the Lake Chelan AVA to its north. For the following discussion please refer to Figures 17 and 18 which display the climate data for the 2015, 2016, and 2017 growing seasons (Apr. 1-Oct. 31) and locations for five AgWeatherNet (https://weather.wsu.edu/) stations maintained by Washington State University. The Waterville North station was installed in 2016 so data for only one complete growing season (2017) was available. The Brays Landing and Orondo stations lie within the proposed AVA, and the Chelan S. and Boyd District stations lie within the Lake Chelan AVA. All stations lie within the Columbia Valley AVA.

Due to its location within the deep valley of the Columbia River, the proposed AVA encompasses the lowest elevations in the region. Lying entirely below 1600 feet, it has a warmer and longer growing season than the higher elevations of the

surrounding mountains and plateaus. The data on Figure 18 show that the average temperature, average minimum temperature, average maximum temperature, and extreme maximum temperature were all lower for the Waterville N. and Boyd District AVAs, which are at significantly higher elevations. The highest average maximum and extreme maximum temperatures in the area were recorded by Brays Landing and Orondo, the two stations within the proposed AVA. Both minimum and maximum temperatures at the Chelan S. station show the moderating effects of its proximity to Lake Chelan. This lake effect is characteristic of the lower elevations of the Lake Chelan AVA. Although vineyards planted within the proposed AVA near the shores of Rocky Reach Reservoir (Lake Entiat) may experience some temperature moderation, it is relatively minor compared to that produced by the large thermal mass of 1400 ft.-deep Lake Chelan. The absence of a pronounce temperature-moderating lake effect in the proposed AVA allows average growing season temperatures within the proposed AVA to be the highest in the region. These warm temperatures make it easier to ripen warm-climate red grapes such as Syrah, Grenache, and Mourvedre, and enhance the ripening of all varieties.

The average soil temperatures on Figure 18, recorded at a depth of 8 inches, show the effect of the higher thermal conductivity and heat retention of the rocky soils of the proposed AVA. The stations within the proposed AVA have the highest average soil temperatures, even though the Brays Landing station is at a higher elevation and has lower average air temperature than the Chelan S. station. According to Jackson (2008, p. 241) "An important property based on the textural character of the soil is heat retention. In fine-textured soils, much of the heat absorbed during sun exposure is transferred to water as it evaporates. This energy is subsequently lost as the water evaporates. In contrast, stony soils tend to retain most of the heat they absorb within their structural components. This heat is subsequently radiated back into the air at night. The heat so derived can significantly reduce the likelihood of frost damage and accelerate fruit ripening in the autumn."

Boundary description

The boundary of the proposed Rocky Reach viticultural area falls within 8 United States Geological Survey 1:24,000 scale topographic maps (Figure 19). They are:

Ardenvoir, WA, 2003

Chelan, WA, 2004

Entiat, WA, 2003

Orondo, WA, 2003

Rock Reach Dam, WA, 2003

Waterville, WA, 2014

Wenatchee, WA, 2003

Winesap, WA, 2004

The proposed Rocky Reach viticultural area is located in Chelan and Douglas Counties, Washington. The boundary is described below:

(1) The beginning point is on the Wenatchee map at the intersection of the 1200 ft. topographic contour line and the eastern boundary of section 16, township 23 north, range 20 east. From the beginning point, follow the 1200 ft. contour northeast, passing through the Rocky Reach Dam Quadrangle and onto the northwest corner of the Orondo Quadrangle.

(2) Continue following the 1200 ft. topographic contour generally northward through the Orondo Quadrangle and as it winds its way through the Rocky Reach Dam, Entiat, and Ardenvoir Quadrangles, near their intersection.

(3) Continue following the 1200 foot topographic contour generally northwestward through the Entiat Quadrangle and then westward up the Entiat River Valley, passing onto the Ardenvoir Quadrangle.

(4) Continue following the 1200 foot topographic contour to its intersection with the boundary between range 20 east and range 21 east.

(5) Follow the boundary between range 20 east and range 21 east northward to its intersection with the 1200 ft. contour line on the north side of the Entiat Valley.

(6) Follow the 1200 foot contour line eastward onto the Entiat map and then generally northward, crossing onto the Winesap map.

(7) Continue following the 1200 foot topographic contour northeastward through the Winesap map to its intersection with the boundary between sections 11 and 12, township 26 north, range 21 east.

(8) Follow the boundary between sections 11 and 12 northward for approximately 300 ft. to its intersection with the 1400 foot topographic contour line.

(9) Follow the 1400 foot contour line eastward around Knapp Coulee and onto the Chelan Map.

(10) Continue following the 1400 foot contour line eastward across the Chelan map to its intersection with the boundary between section 1, township 26 north, range 22 east, and section 36, township 27 north, range 22 east.

(11) Proceed south-southeastward in a straight line, for 1.45 miles, crossing the Columbia River, to the intersection of the 1600 foot topographic contour line with the boundary between range 22 east and range 23 east.

(12) Follow the 1600 foot contour line as it trends generally westward through the Chelan map (twice dipping southward for short segments onto the Waterville map) and onto the Winesap map.

(13) Continue following the 1600 foot contour line across the extreme southeastern corner of the Winesap map and onto the Entiat map.

(14) Continue following the 1600 foot contour line southwestward on the Entiat map to its intersection with an intermittent stream in section 35, township 26 north, range 21 east.

(15) Follow the intermittent stream 0.45 mile westward to its intersection with the 1200 foot topographic contour line.

(16) Follow the 1200 foot contour line southward through the Entiat and Orondo maps, and onto the Wenatchee map to its intersection with the boundary between section 14 and section 23, township 23 north, range 20 east.

(17) Proceed west-northwestward in a straight line for 1.47 miles, crossing the Columbia River, to the beginning point.

Attributes of the Proposed Rocky Reach AVA Consistent with the Columbia Valley AVA

According to the petitioners, Columbia Valley AVA typically has a growing season of greater than 150 days, growing degree-days exceeding 2000, and average annual precipitation of less than 15 inches. All of these criteria apply to the area included within the boundaries proposed for the Rocky Reach AVA.

Distinctions Between the Proposed Rocky Reach AVA and the Columbia Valley AVA

The Columbia Valley, as described in petition for the Columbia Valley AVA, is a "large treeless plain surrounding the Yakima, Columbia, and Snake Rivers". The area within the proposed Rocky Reach AVA lies within the canyon of the Columbia River, not on a plain, and has unique characteristics of geology and soils, detailed elsewhere in this petition, that distinguish it from the basalt bedrock and loess-based soils that are typical of the Columbia Valley AVA.

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Miller, R.B., Gordon, S.M., Bowring, S.A., Doran, B.A., McLean, N.M, Michels, Z.D., Shea, E.K., Whitney, D.L., Wintzer, N.E., and Mendoza, M.K., 2009, Linking deep and shallow crustal processes in an exhumed continental arc, North Cascades, Washington, *in* O'Connor, J.E., Dorsey. R.J., and Madin, I.P., eds., Volcanoes to Vineyards: Geologic field trips through the dynamic landscape of the Pacific Northwest: Geological Society of America Field Guide 15, p. 373-406.

Waitt, R. B., 2017, Pleistocene glaciers, lakes, and floods in north-central Washington State: *in* Haugerud, R.A. and Kelsey, H.M., eds., From the Puget Lowland to East of the Cascade Range: Geologic Excursions in the Pacific Northwest: Geological Society of America Field Guide 49, p. 175-205.

Figure Captions

Figure 1 – Map of part of central Washington State showing the location of the proposed Rocky Reach AVA.

Figure 2 – Map of the proposed Rocky Reach AVA showing the locations of planted vineyards.

Figure 3 – Map of the proposed Rocky Reach AVA showing the locations of the features bearing the name "Rocky Reach" used to justify the name of the AVA.

Figure 4 – Bedrock geologic map of the area of the proposed Rocky Reach AVA.

Figure 5 – Map showing maximum extent of glaciers during the most recent continental glaciation.

Figure 6 – Digital elevation model of the area of the proposed Rocky Reach AVA, showing profile lines used for Figure 7.

Figure 7 – Topographic profiles A-A' and B-B' through the proposed Rocky Reach AVA.

Figure 8 – a) Photograph of a typical outcrop of Swakane Gneiss along US Hwy 97 within the proposed Rocky Reach AVA. b) Photograph of an outcrop of Chelan Complex migmatitic granitic gneiss above US Hwy 97 within the proposed Rocky Reach AVA.

Figure 9 – Geologic map of surface bedrock types of the Columbia Valley AVA.

Figure 10 – a) Photograph of terraces above the north shore of Rocky Reach Reservoir, north of the town of Orondo. b) Photograph of terraces above the south shore of Rocky Reach Reservoir, north of the town of Orondo.

Figure 11 – a) Oblique view Lidar image (looking east) of the large bend in the Columbia River upstream of Orondo, Washington, showing prominent terrace landforms produced by glacial outwash and glacial outburst floods. b) Same image as Figure 11a colorized to designate terraces created by specific events.

Figure 12 – Maps illustrating the sequence of events that produced large scale terraces within the proposed Rocky Reach AVA.

Figure 13 – a) Photograph of glacial polish and striations on Chelan Complex bedrock in a rôche moutonnée landform near Chelan Falls, in the glaciated area north of the proposed AVA. b) Photograph of interpretive sign near the outcrop featured in Figure 13a.

Figure 14 – a) Photograph of a hillside with many large basalt glacial erratics, known locally as "haystack" rocks, in a glaciated area 7 miles northeast of the proposed AVA. b) Basalt glacial erratics resting on Chelan Complex bedrock in a glaciated area 5 miles northeast of the proposed AVA.

Figure 15 – a) Photograph of soil profile typical of the lower (younger) T3 terraces within the proposed Rocky Reach AVA. b) Photograph of terrace gravels overlying Swakane Gneiss bedrock along US Hwy 97 within the proposed Rocky Reach AVA.

Figure 16 – a) Photograph of eolian (wind-deposited) sand covering the surface of a higher (older) T1 terrace within the proposed Rocky Reach AVA. b) Photograph of the cobblestone-covered tilled surface of a lower (younger) T3 terrace within the proposed Rocky Reach AVA.

Figure 17 – Map showing locations of Washington State University AgWeatherNet stations utilized for comparison of climate data.

Figure 18 – Climate data derived from Washington State University AgWeatherNet stations in the vicinity of the proposed Rocky Reach AVA. Asterisk indicates station within the proposed AVA.

Figure 19 – Index map of USGS 7.5 minute series topographic maps used to delineate the boundaries of the proposed Rocky Reach AVA.

Figures

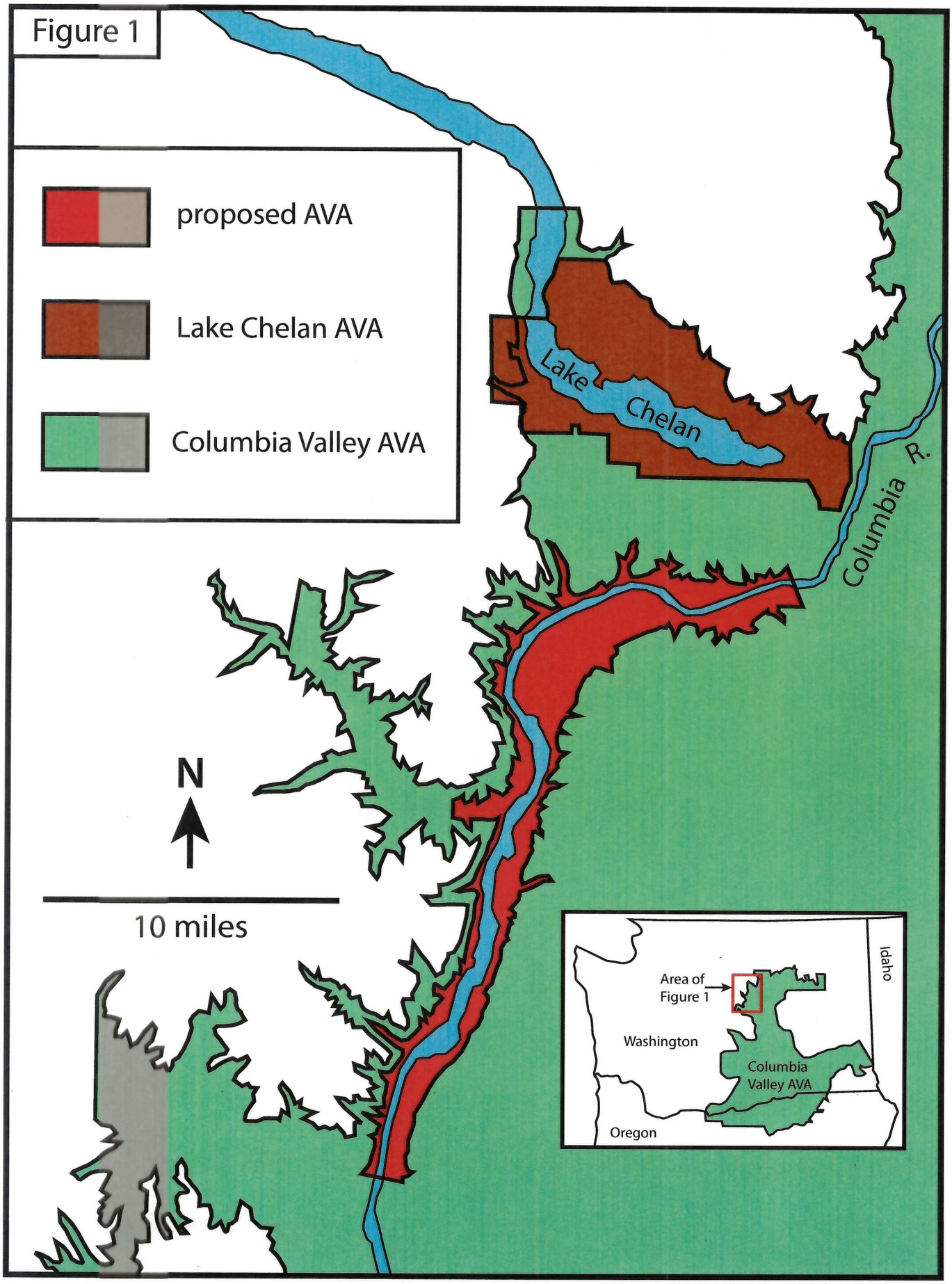
Figure 1
proposed AVA
Lake Chelan AVA
Columbia Valley AVA
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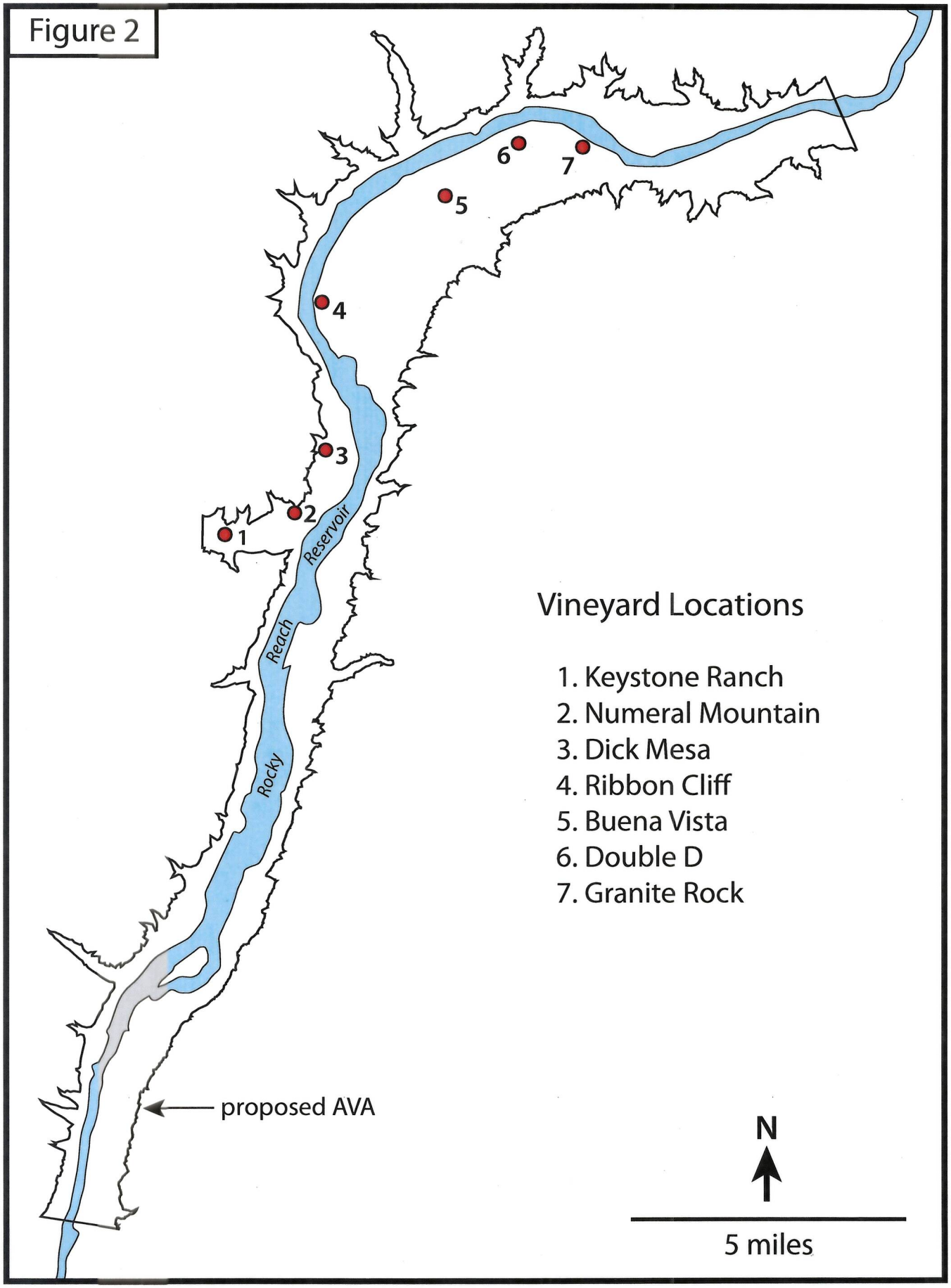
Area of Figure 1
Washington
Idaho
Columbia Valley AVA
Oregon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Rocky Reach Reservoir
1
2
3
4
5
6
7
Vineyard Locations
1. Keystone Ranch
2. Numeral Mountain
3. Dick Mesa
4. Ribbon Cliff
5. Buena Vista
6. Double D
7. Granite Rock
proposed AVA
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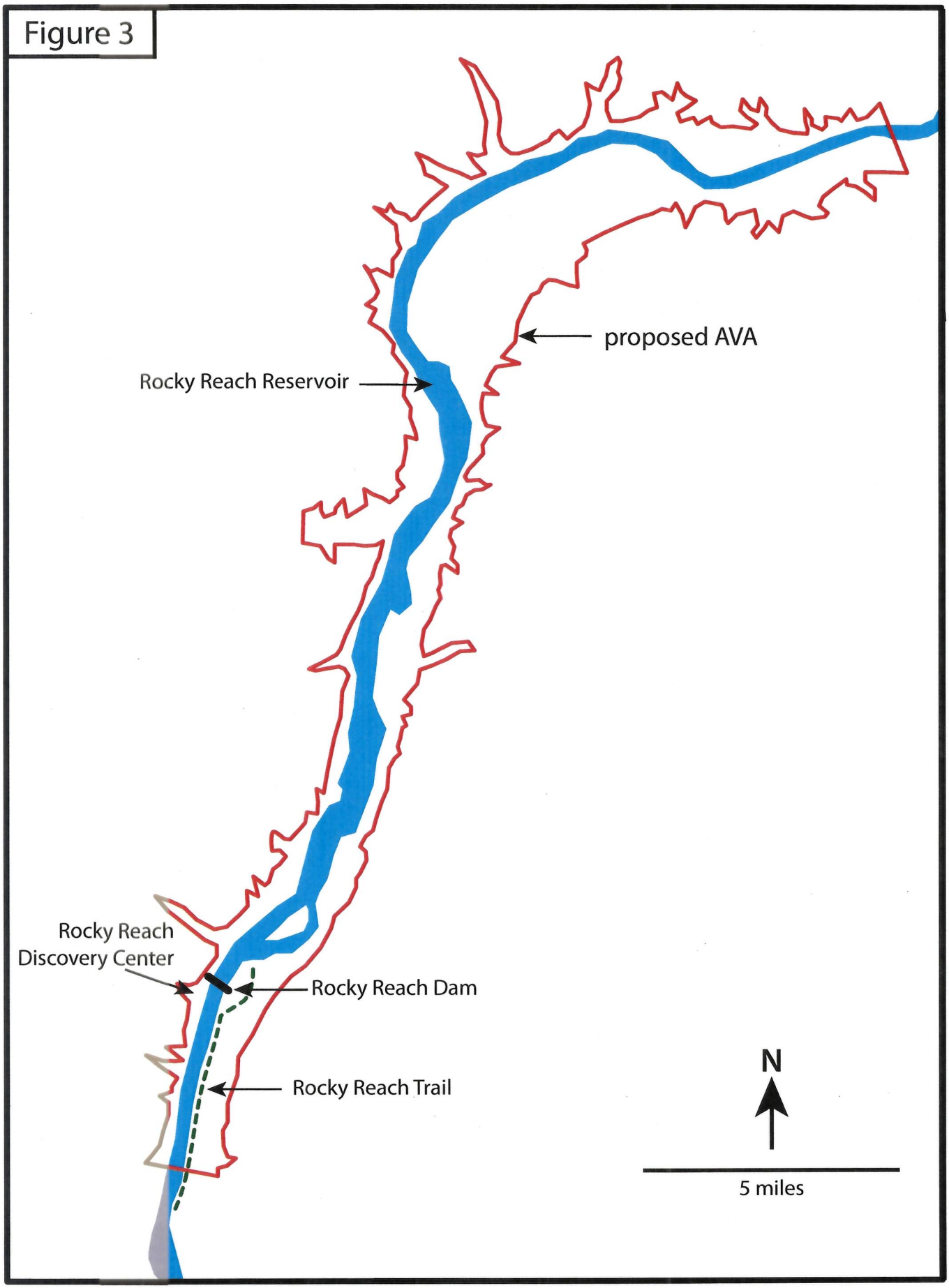
Figure 3


proposed AVA
Rocky Reach Reservoir
Rocky Reach
Discovery Center
Rocky Reach Dam
Rocky Reach Trail
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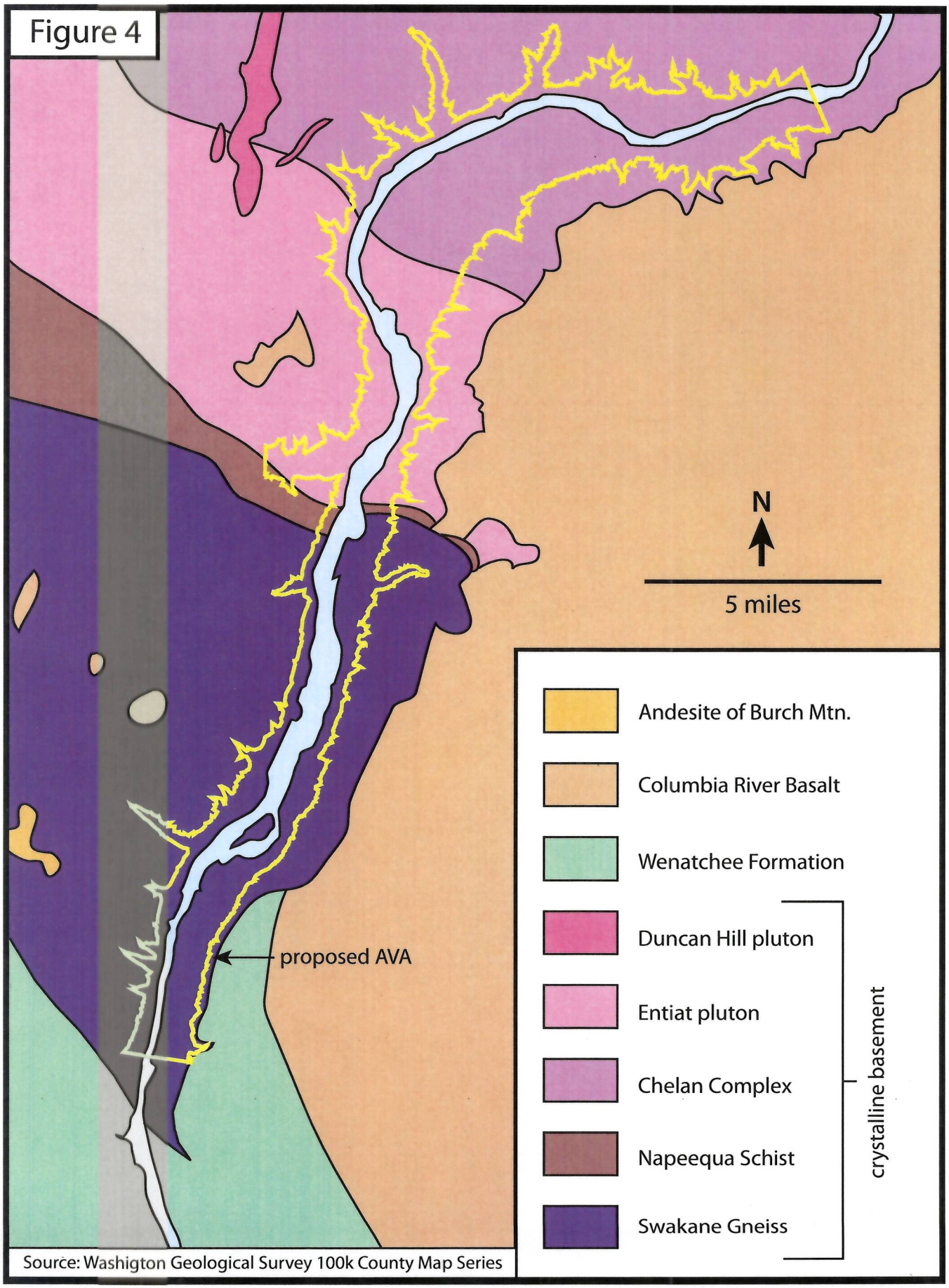
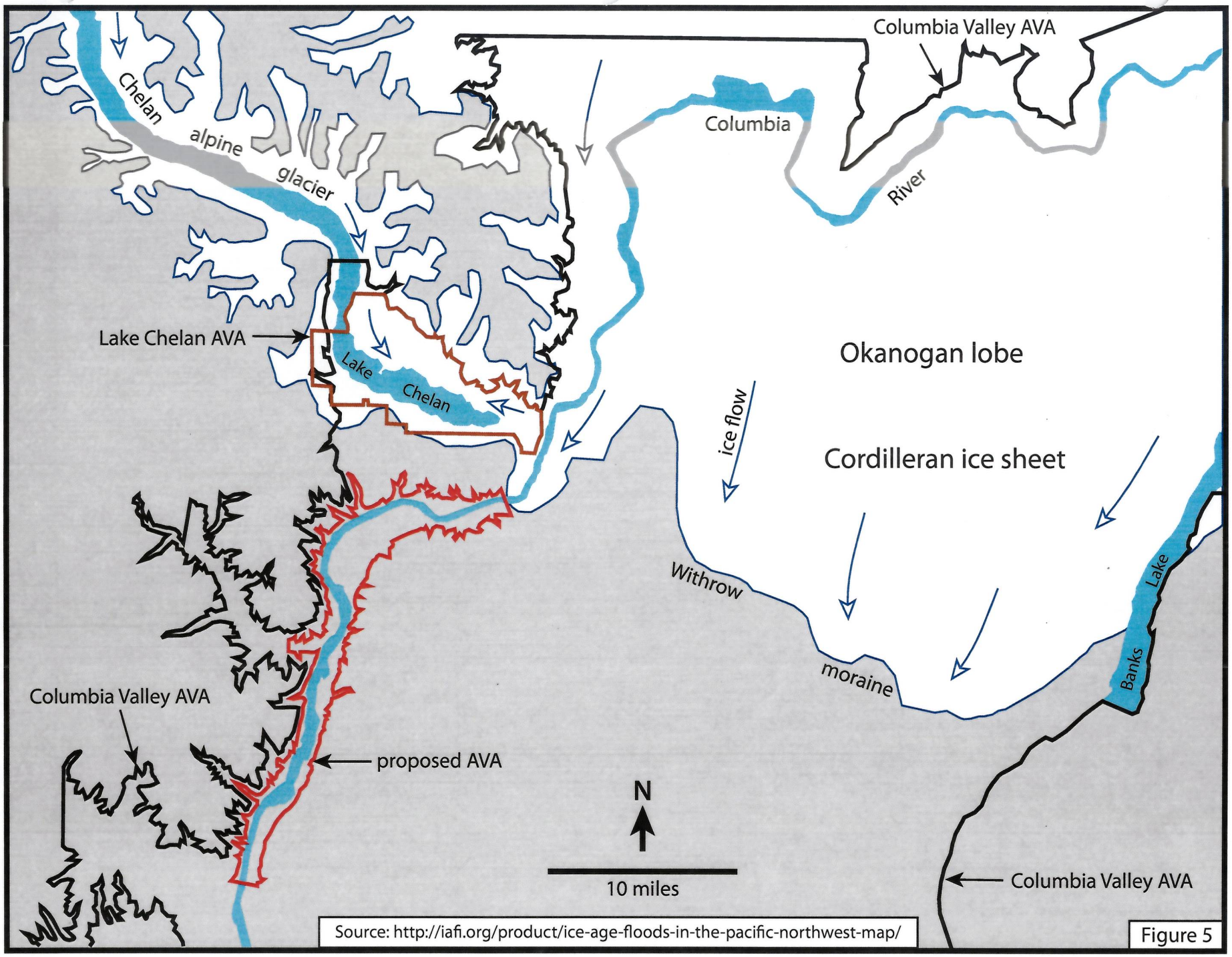


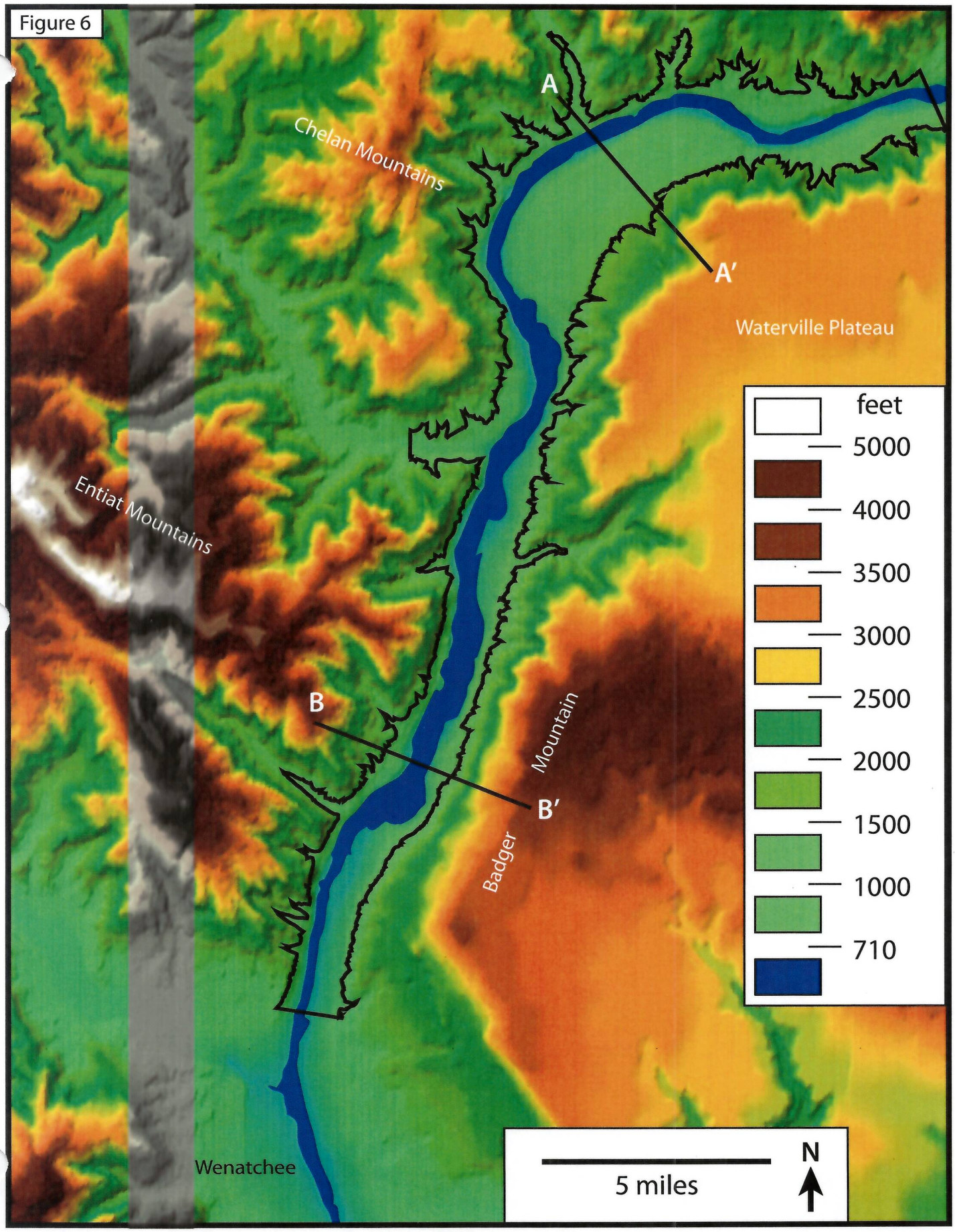
Figure 4
N
5 miles
proposed AVA
Andesite of Burch Mtn.
Columbia River Basalt
Wenatchee Formation
Duncan Hill pluton
Entiat pluton
Chelan Complex
Napeequa Schist
Swakane Gneiss
crystalline basement
Source: Washigton Geological Survey 100k County Map Series



Source: http://iafi.org/product/ice-age-floods-in-the-pacific-northwest-map/

Figure 5

Figure 6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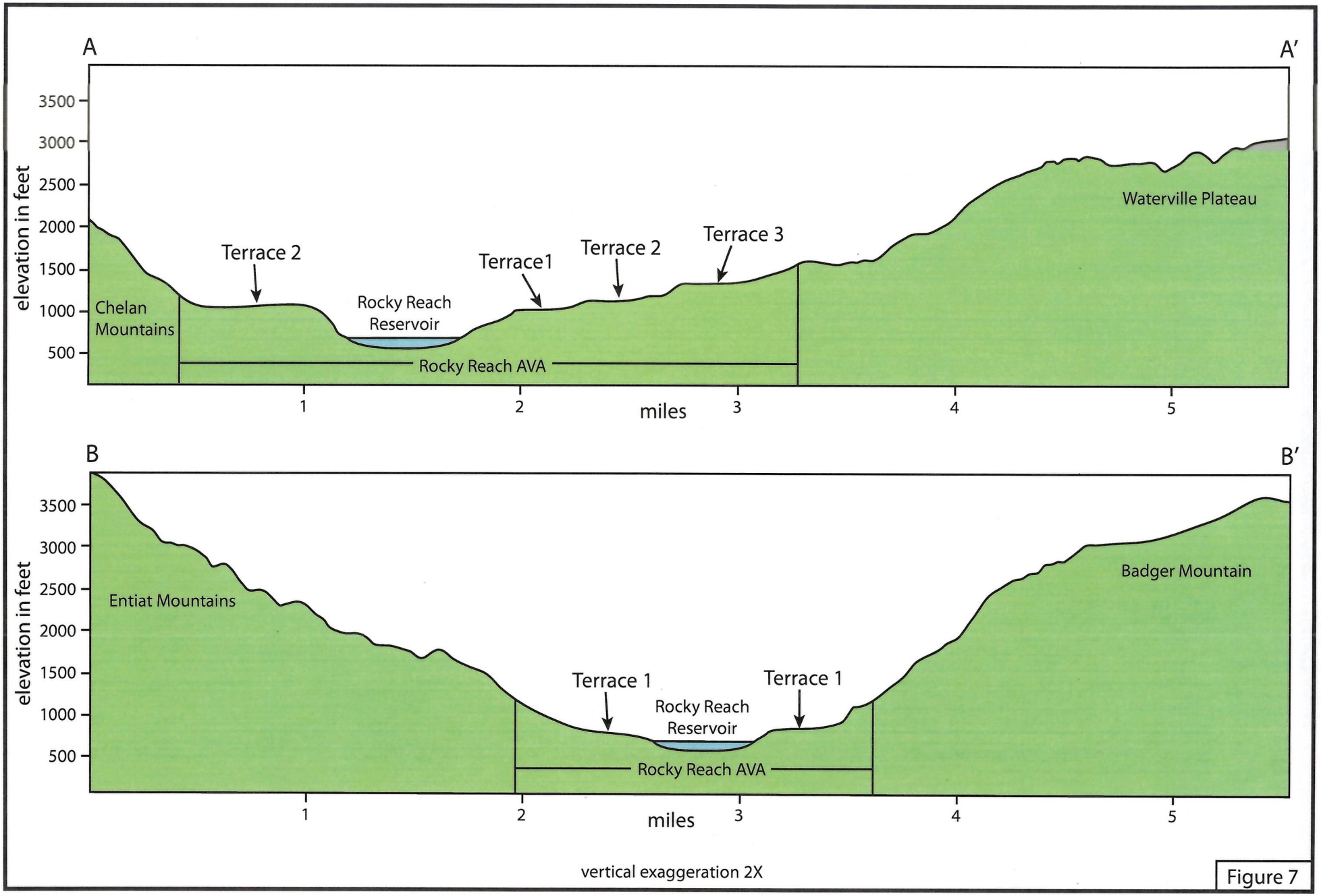
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Waterville Plateau
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elevation in feet
Entiat Mountains
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Rocky Reach Reservoir
Terrace 1
Badger Mountain
Rocky Reach AVA
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Figure 7

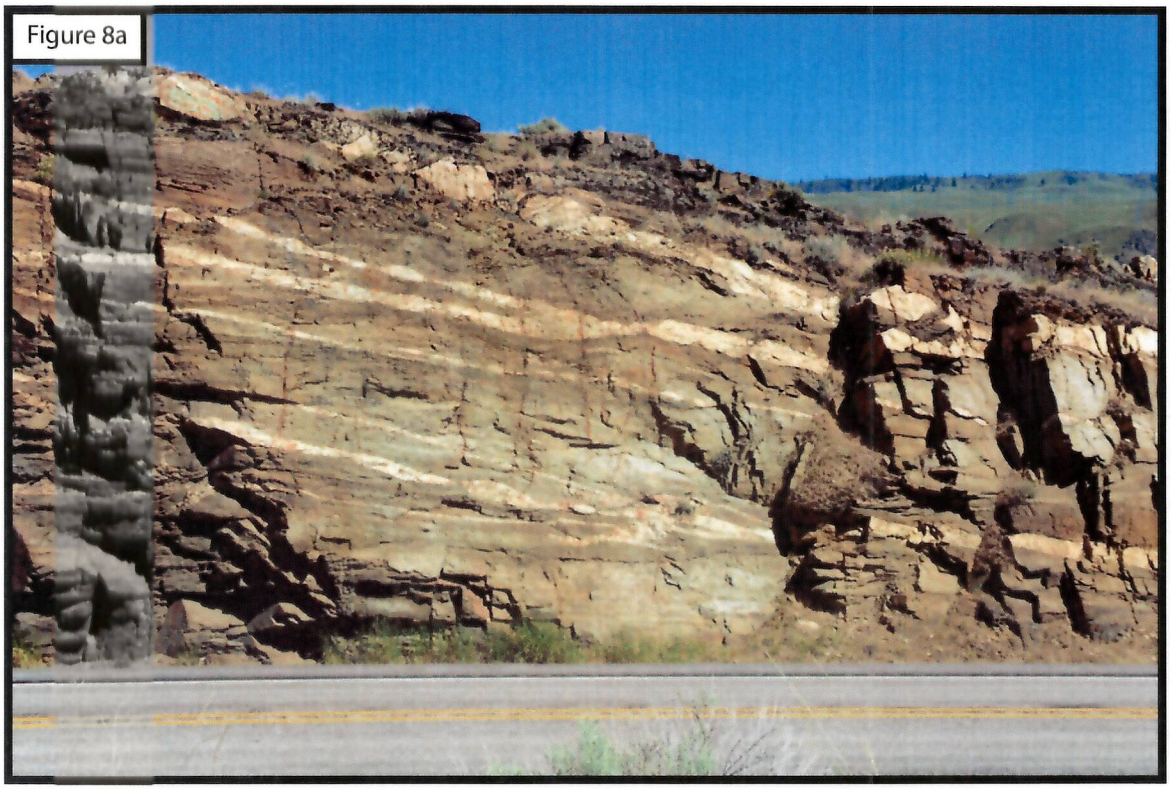


Figure 8a

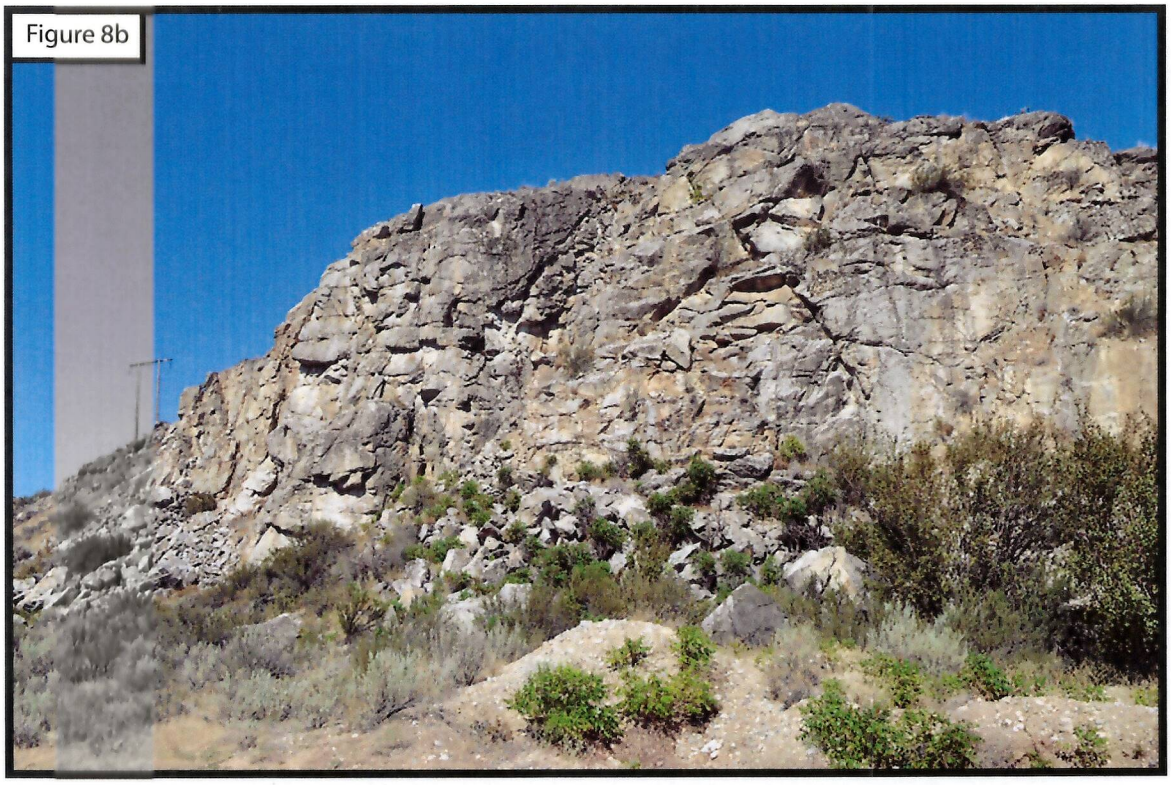


Figure 8b

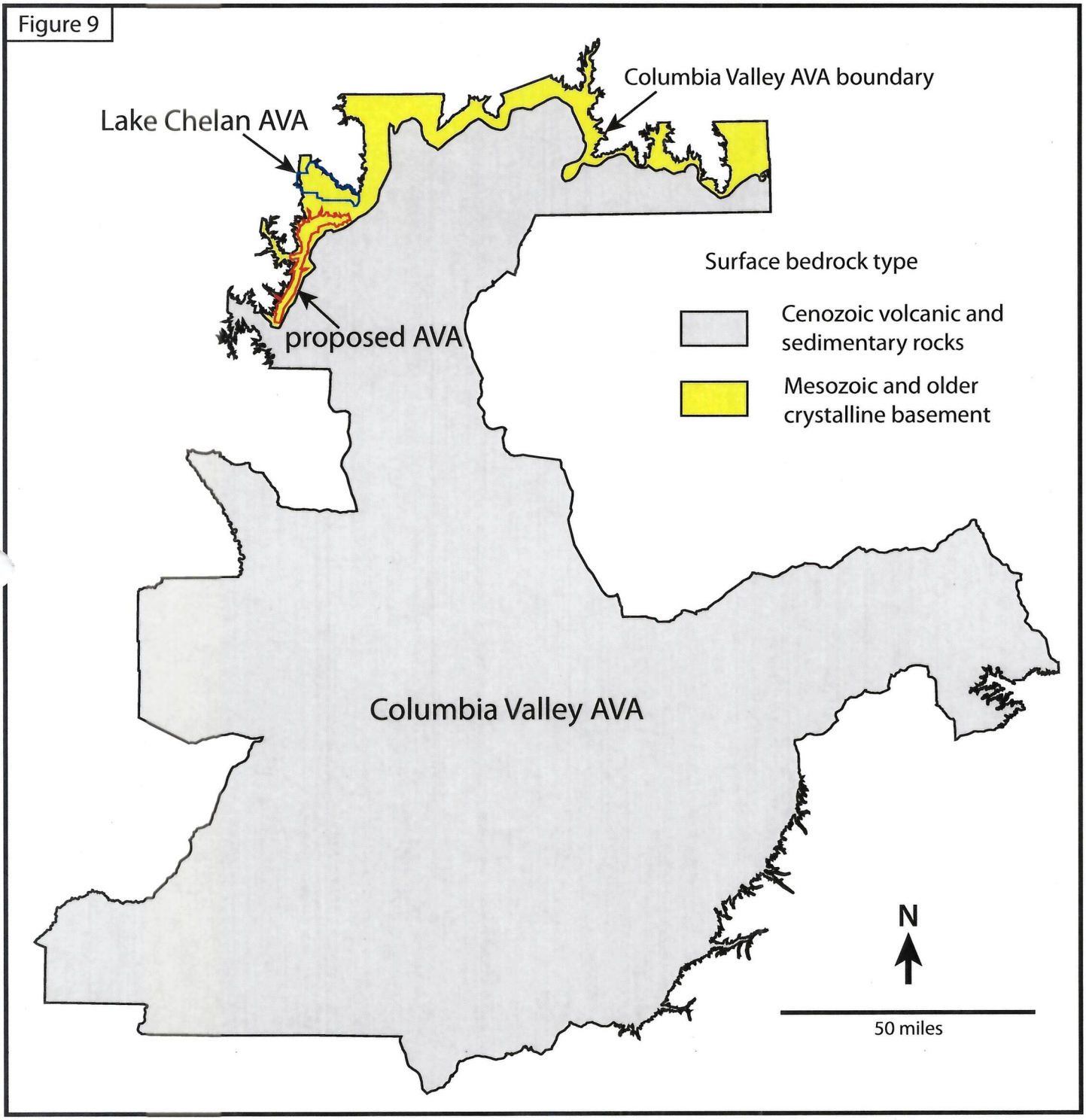


Figure 9
Columbia Valley AVA boundary
Lake Chelan AVA
proposed AVA
Surface bedrock type
Cenozoic volcanic and sedimentary rocks
Mesozoic and older crystalline basement
Columbia Valley AVA
N
50 miles

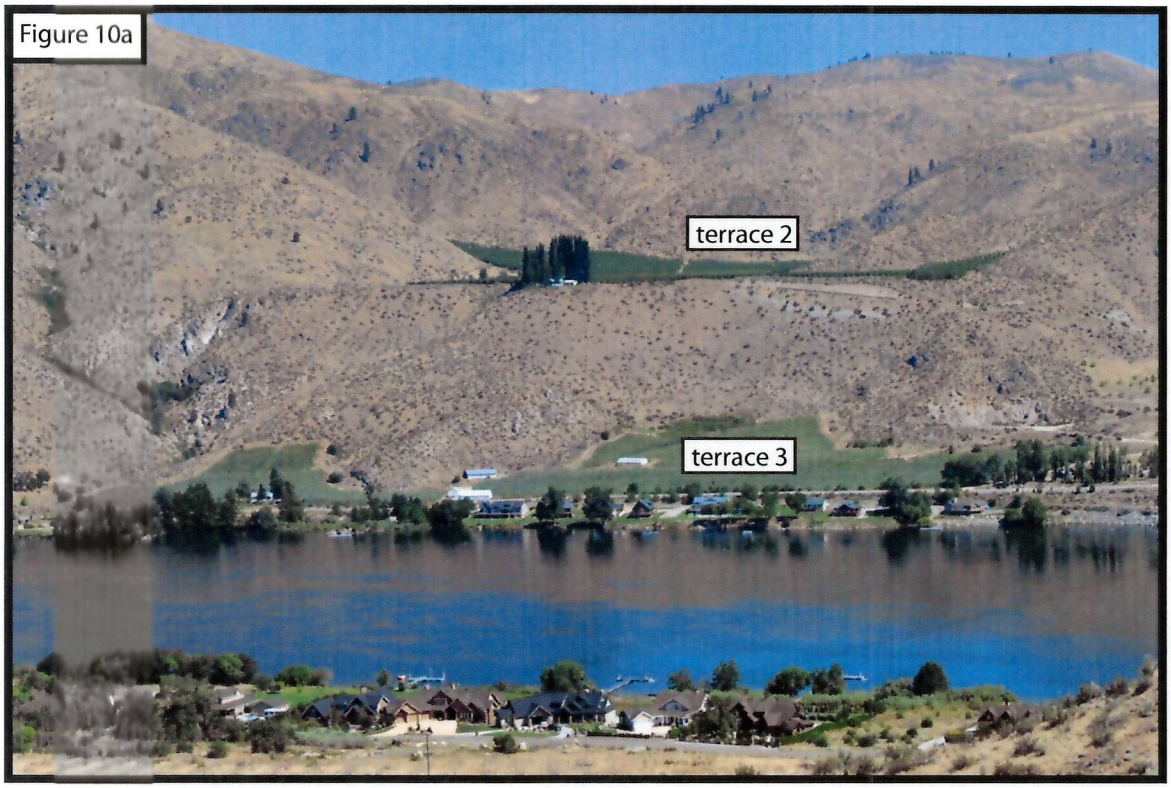


Figure 10a
terrace 2
terrace 3

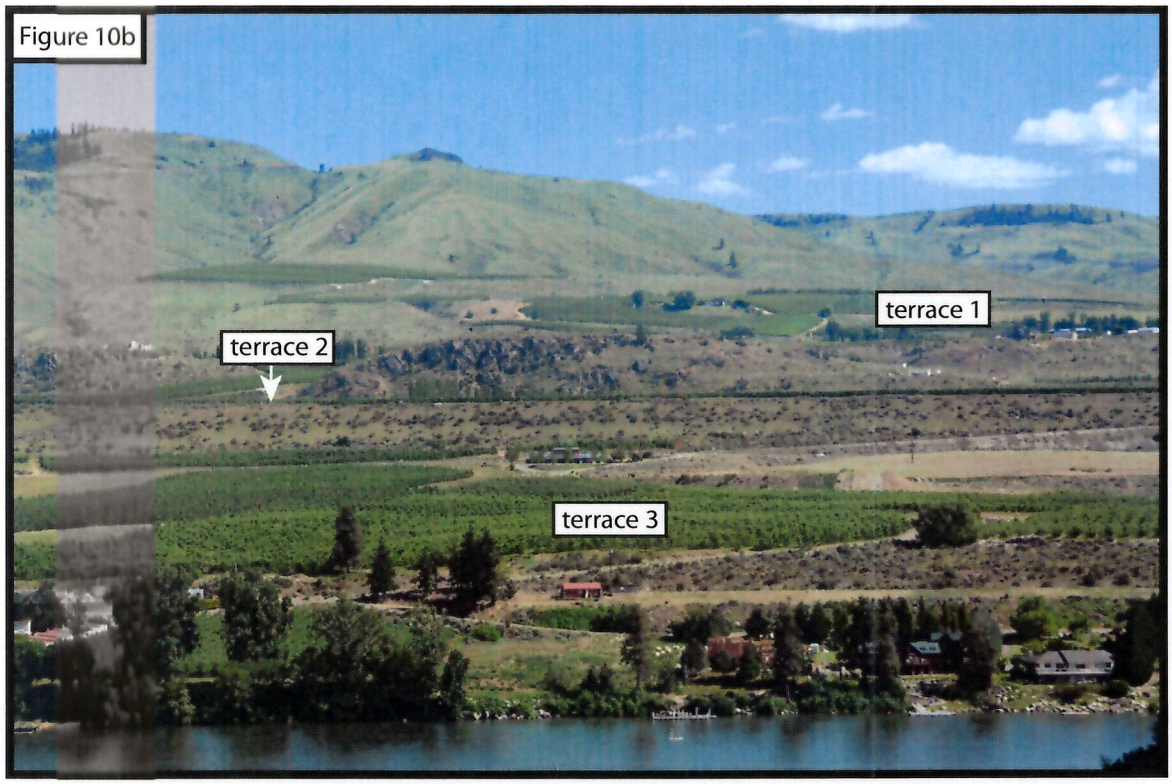


Figure 10b
terrace 1
terrace 2
terrace 3

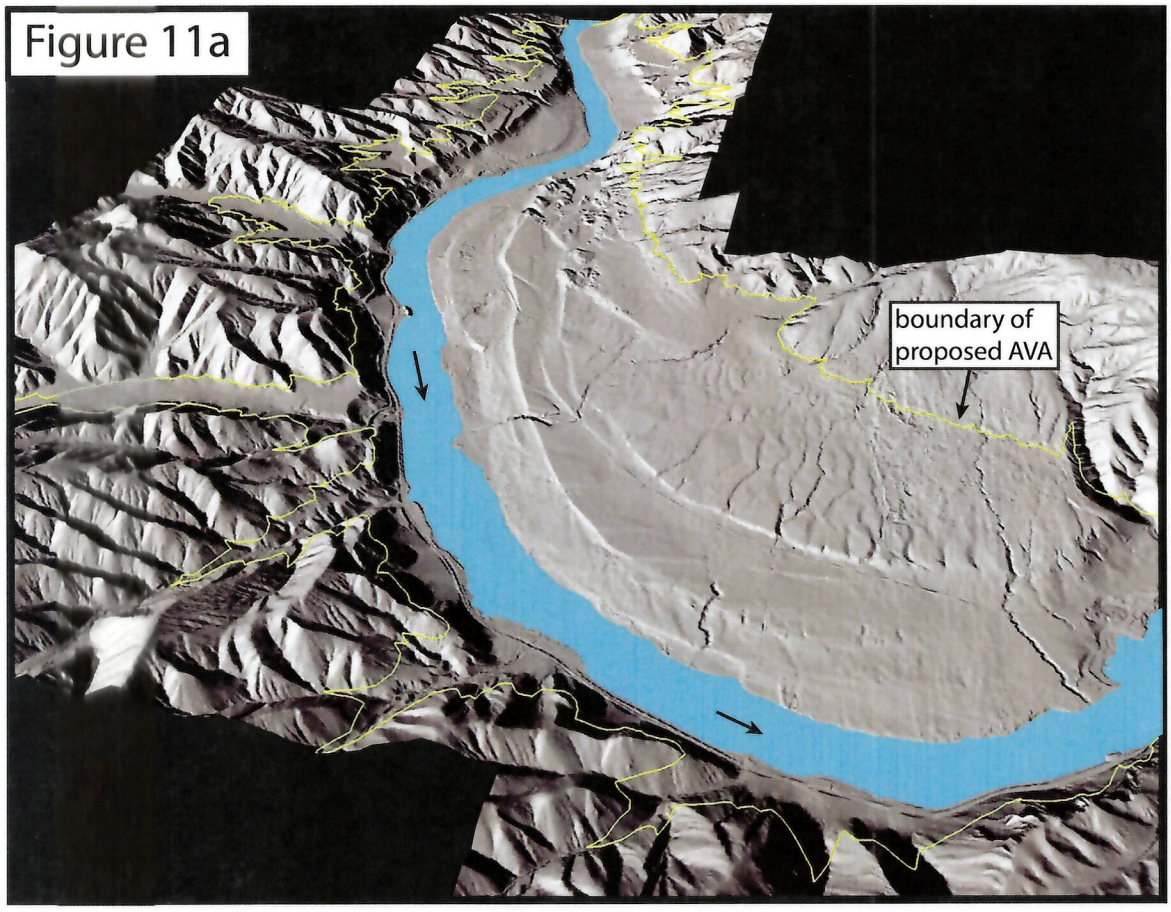


Figure 11a
boundary of proposed AVA

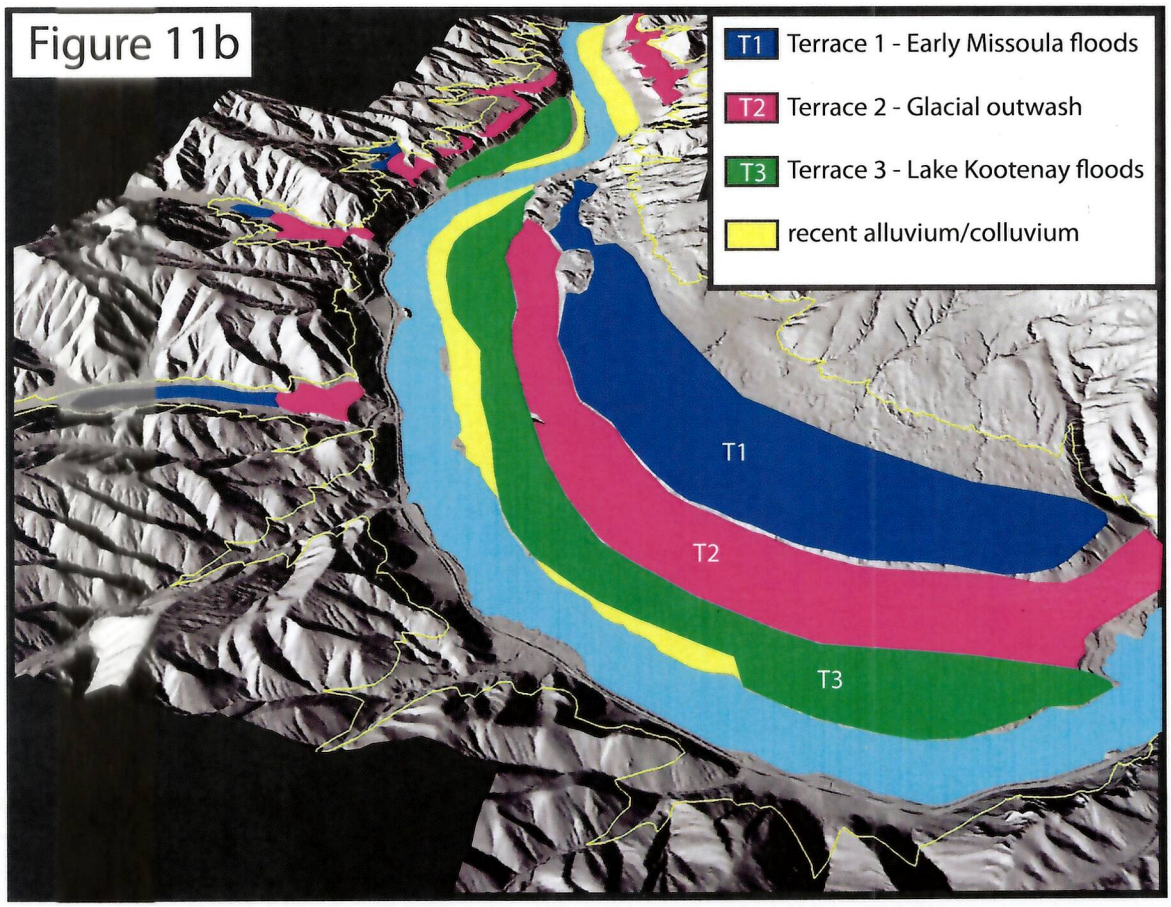


Figure 11b
T1 Terrace 1 - Early Missoula floods
T2 Terrace 2 - Glacial outwash
T3 Terrace 3 - Lake Kootenay floods
recent alluvium/colluvium
T1
T2
T3

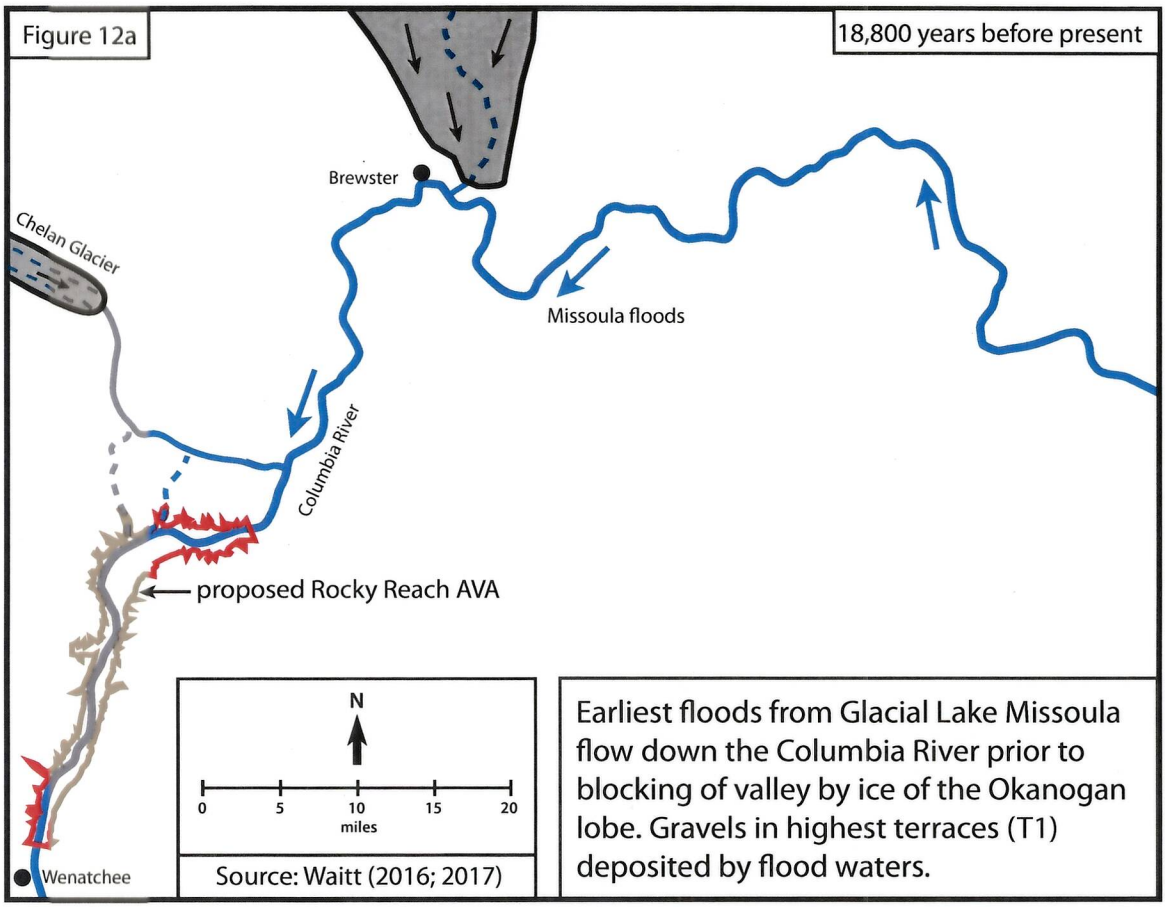


Figure 12a
18,800 years before present
Brewster
Chelan Glacier
Missoula floods
Columbia River
proposed Rocky Reach AVA
N
0
5
10
15
20
miles
Wenatchee
Source: Waitt (2016; 2017)
Earliest floods from Glacial Lake Missoula flow down the Columbia River prior to blocking of valley by ice of the Okanogan lobe. Gravels in highest terraces (T1) deposited by flood waters.

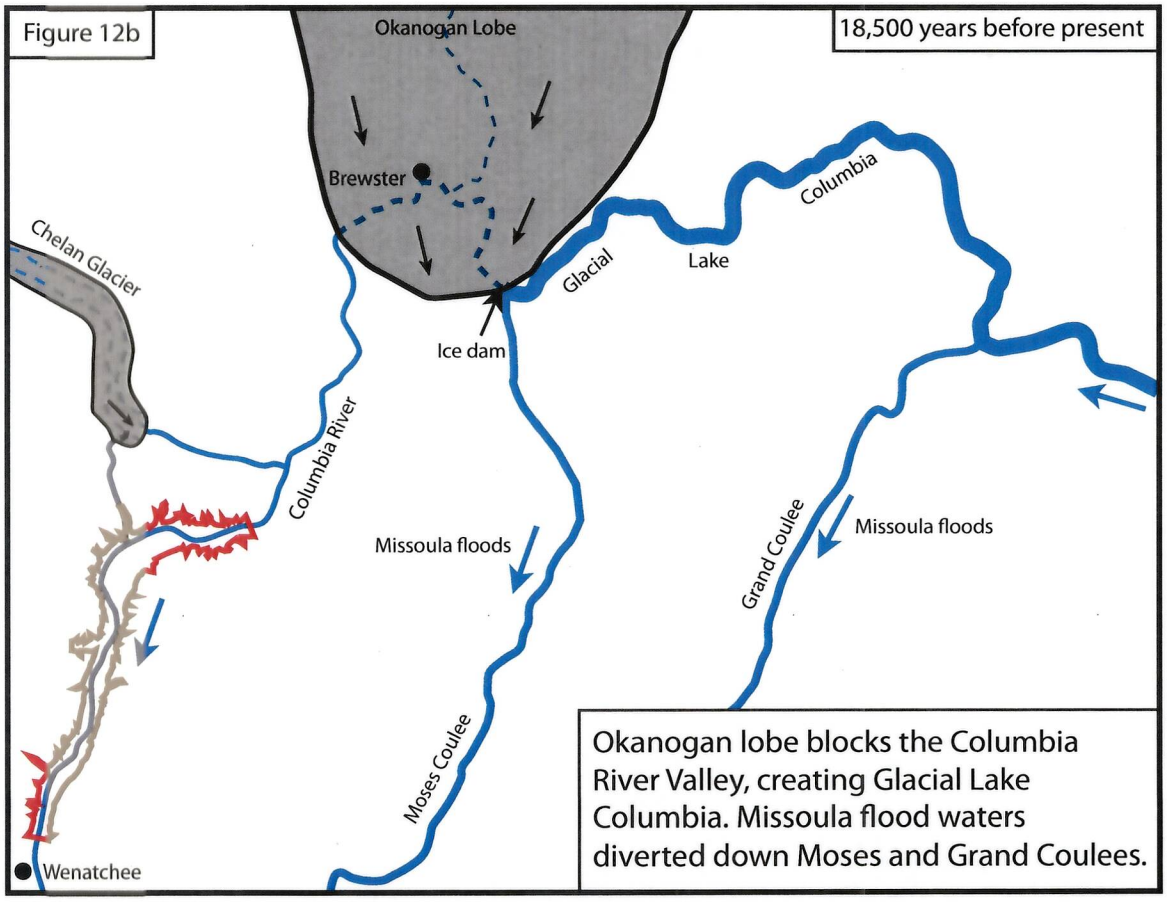


Figure 12b
18,500 years before present
Okanogan Lobe
Brewster
Chelan Glacier
Columbia
Glacial
Lake
Ice dam
Columbia River
Missoula floods
Grand Coulee
Missoula floods
Moses Coulee
Wenatchee
Okanogan lobe blocks the Columbia River Valley, creating Glacial Lake Columbia. Missoula flood waters diverted down Moses and Grand Coulees.

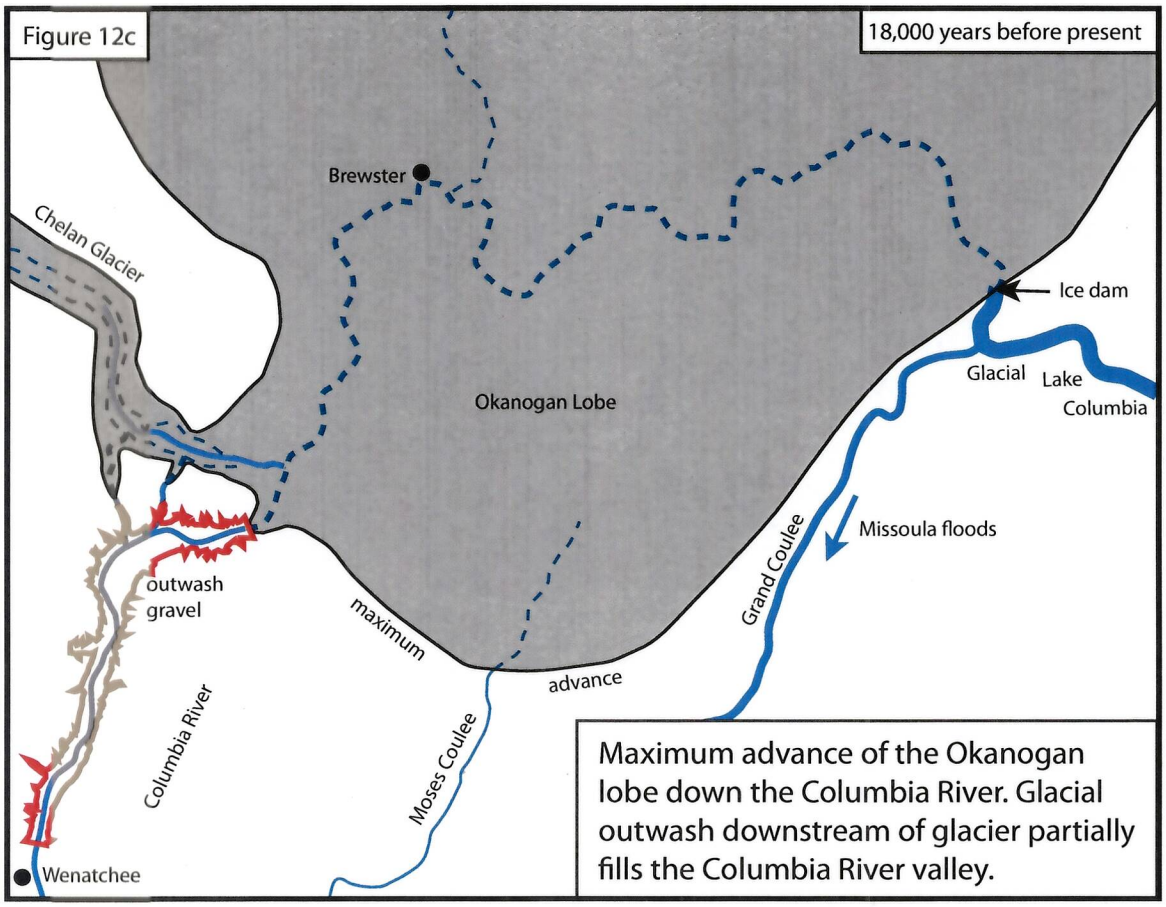


Figure 12c
18,000 years before present
Brewster
Chelan Glacier
Okanogan Lobe
Ice dam
Glacial
Lake
Columbia
Missoula floods
Grand Coulee
outwash
gravel
maximum
advance
Columbia River
Moses Coulee
Wenatchee
Maximum advance of the Okanogan lobe down the Columbia River. Glacial outwash downstream of glacier partially fills the Columbia River valley.

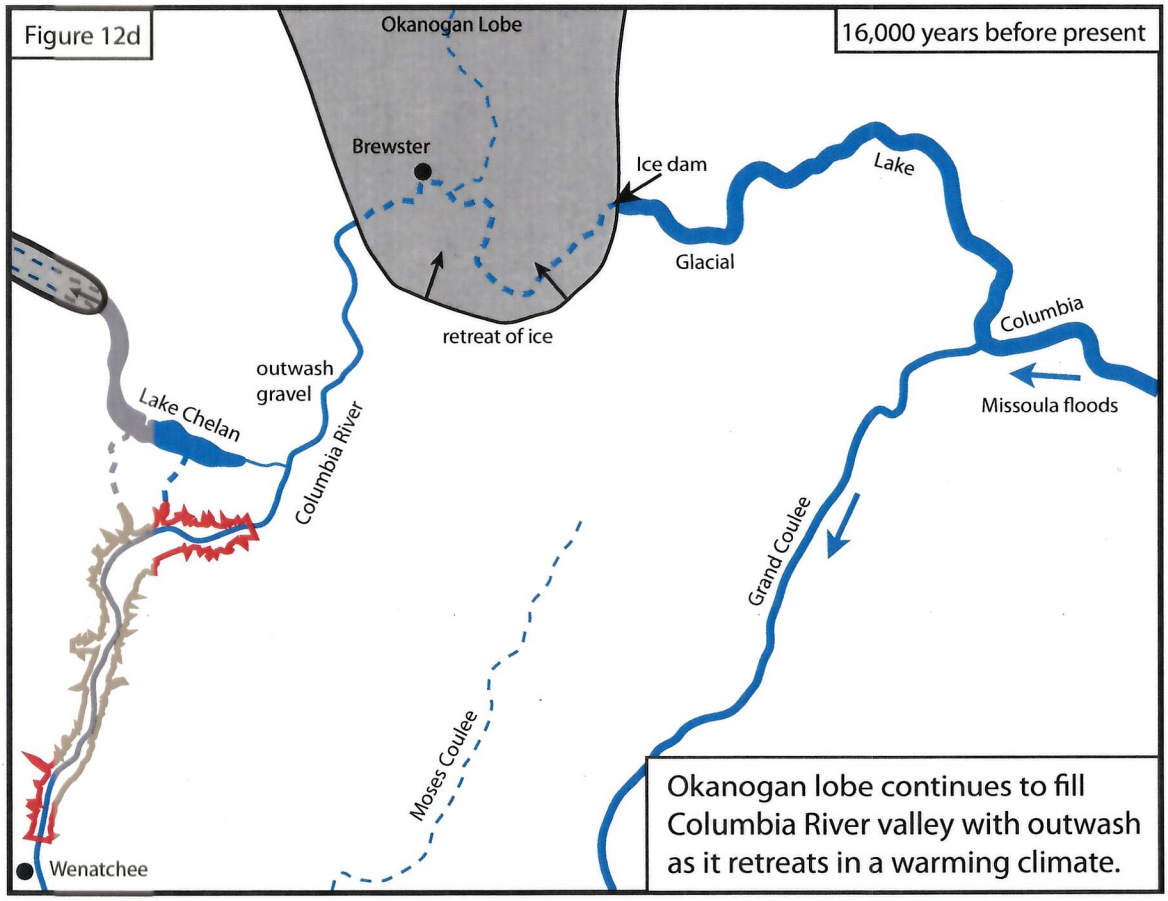


Figure 12d
Okanogan Lobe
16,000 years before present
Brewster
Ice dam
Lake
Glacial
Columbia
retreat of ice
outwash
gravel
Lake Chelan
Columbia River
Missoula floods
Grand Coulee
Moses Coulee
Wenatchee
Okanogan lobe continues to fill Columbia River valley with outwash as it retreats in a warming climate.

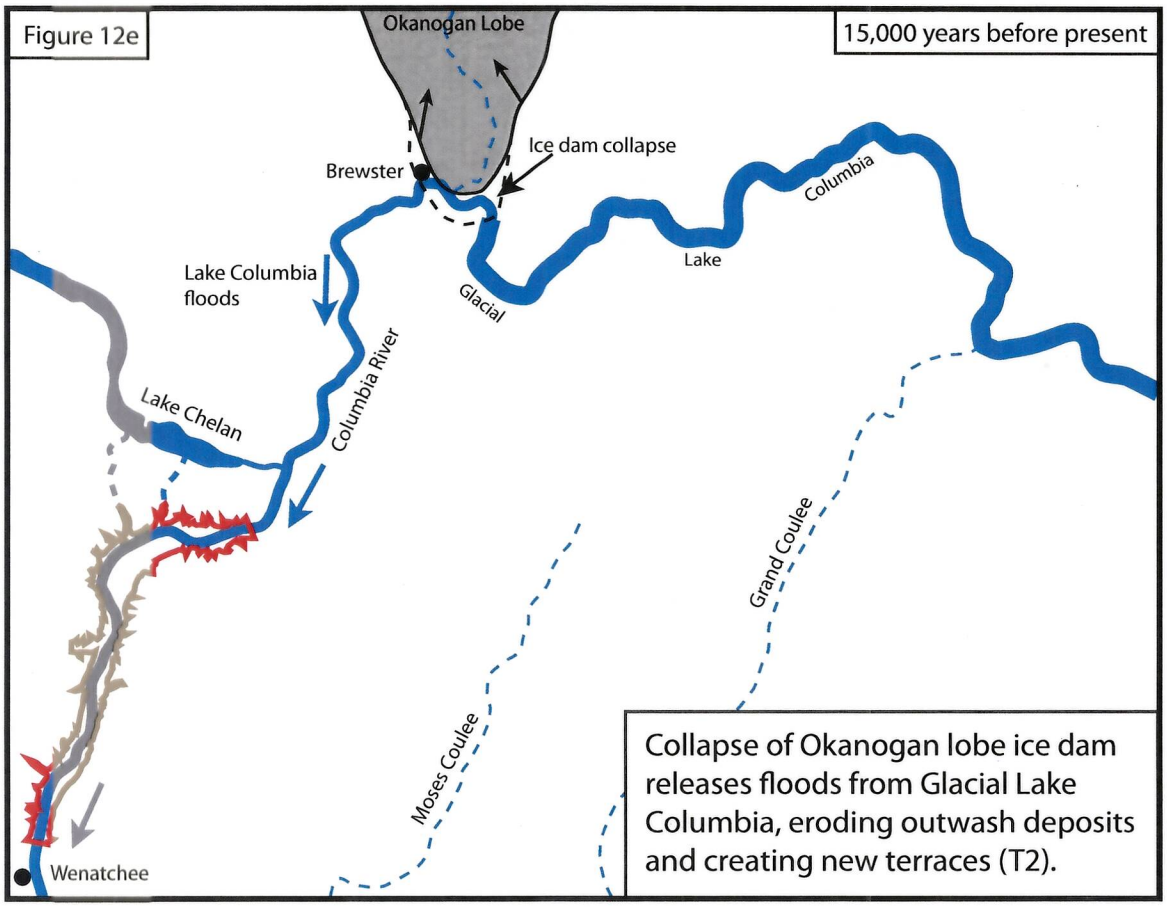


Figure 12e
15,000 years before present
Okanogan Lobe
Ice dam collapse
Brewster
Lake Columbia floods
Glacial
Lake
Columbia
Columbia River
Lake Chelan
Grand Coulee
Moses Coulee
Wenatchee
Collapse of Okanogan lobe ice dam releases floods from Glacial Lake Columbia, eroding outwash deposits and creating new terraces (T2).

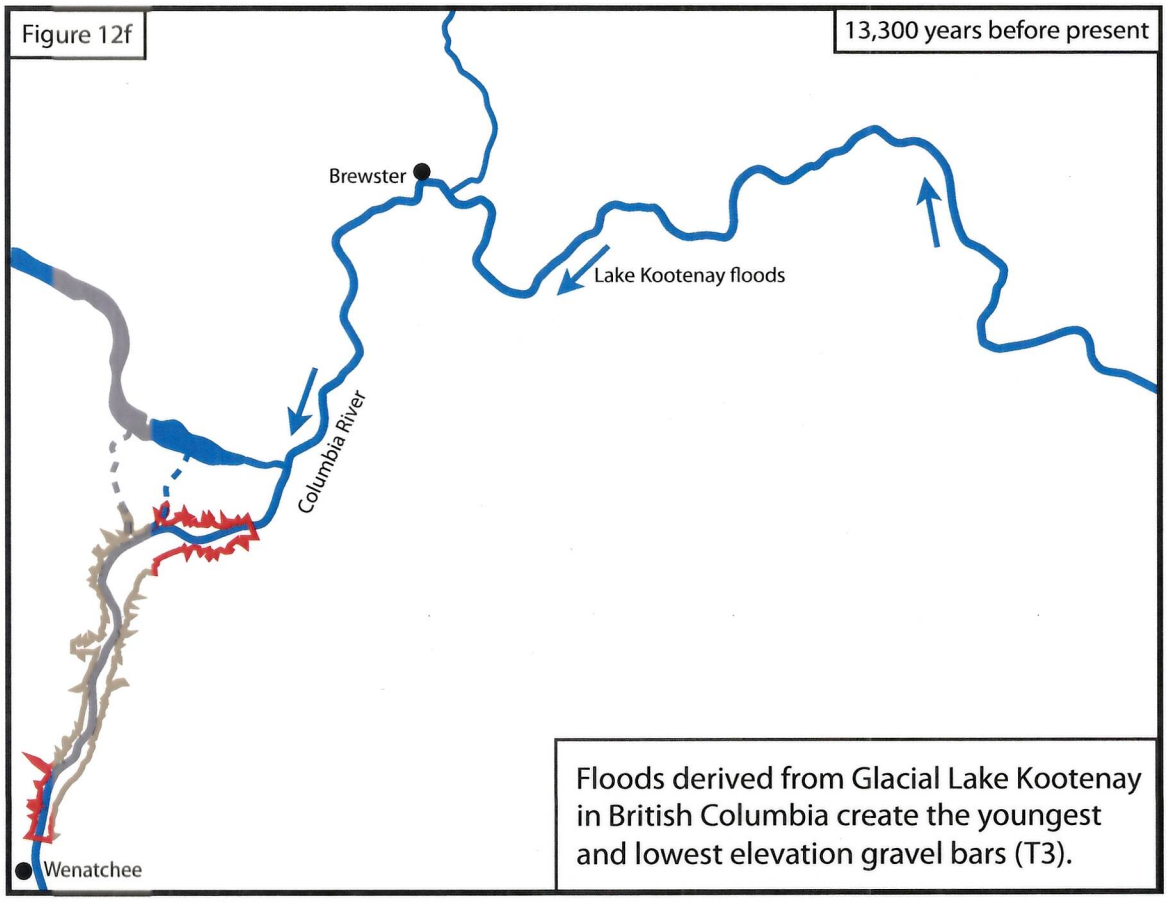


Figure 12f
13,300 years before present
Brewster
Lake Kootenay floods
Columbia River
Wenatchee
Floods derived from Glacial Lake Kootenay in British Columbia create the youngest and lowest elevation gravel bars (T3).

Figure 13a

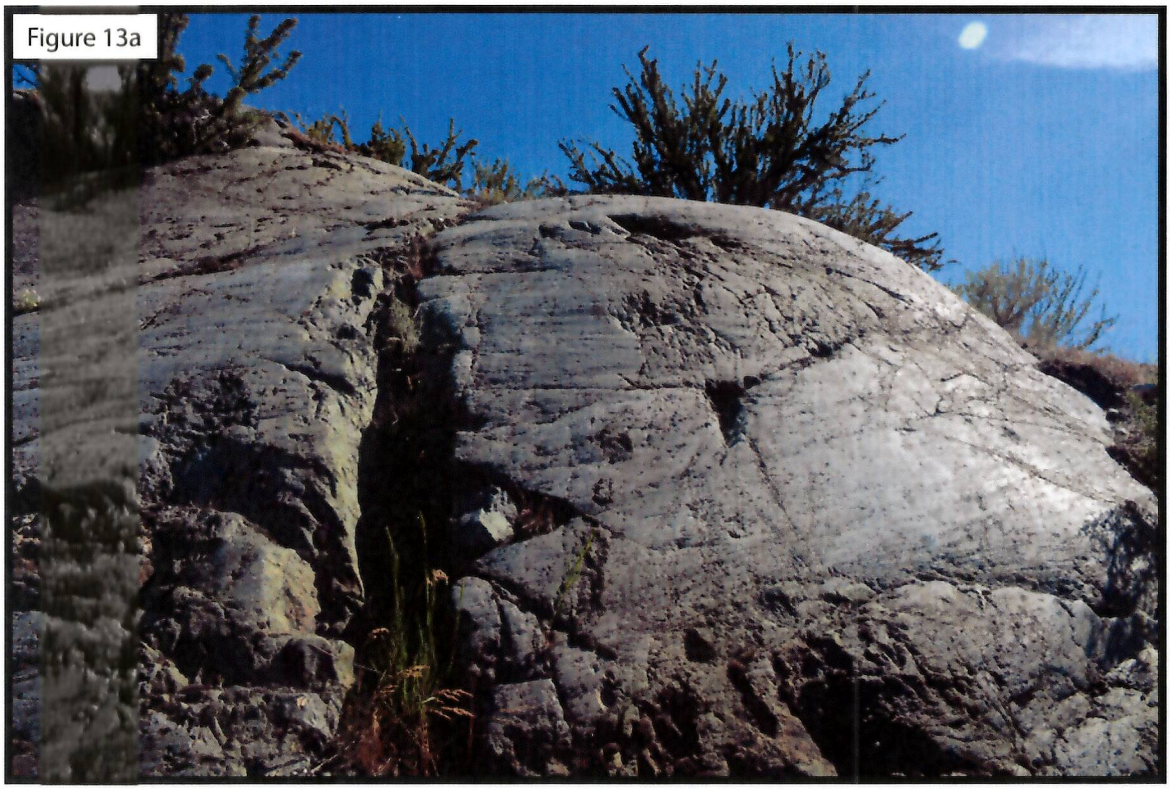


Figure 13b

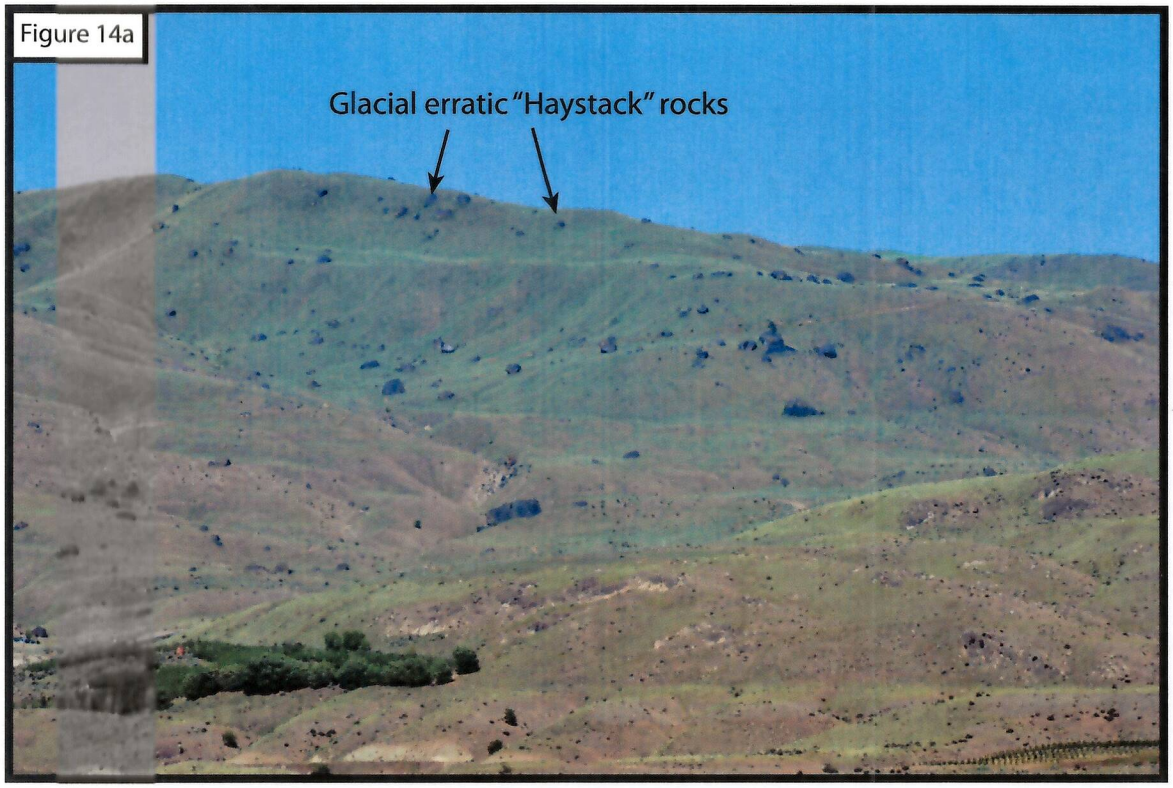


Figure 14a
Glacial erratic "Haystack" rocks

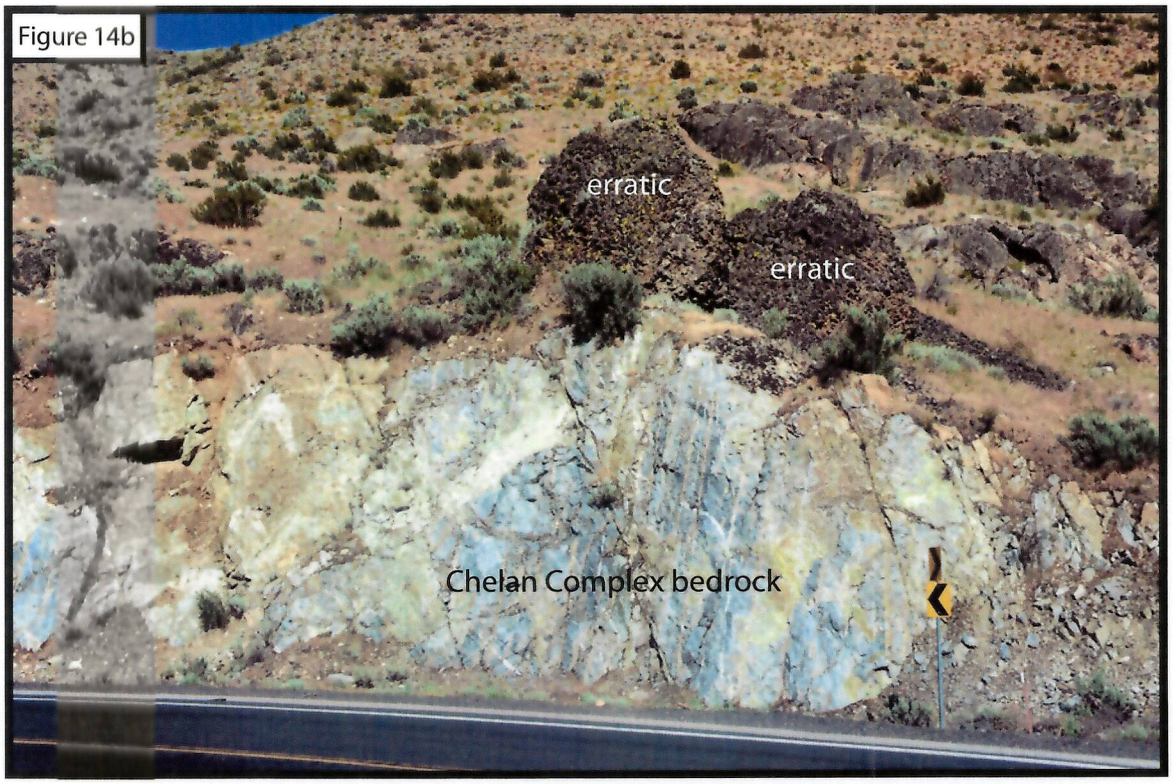


Figure 14b
erratic
erratic
Chelan Complex bedrock


Figure 15a


Figure 15b


Figure 16a


Figure 16b

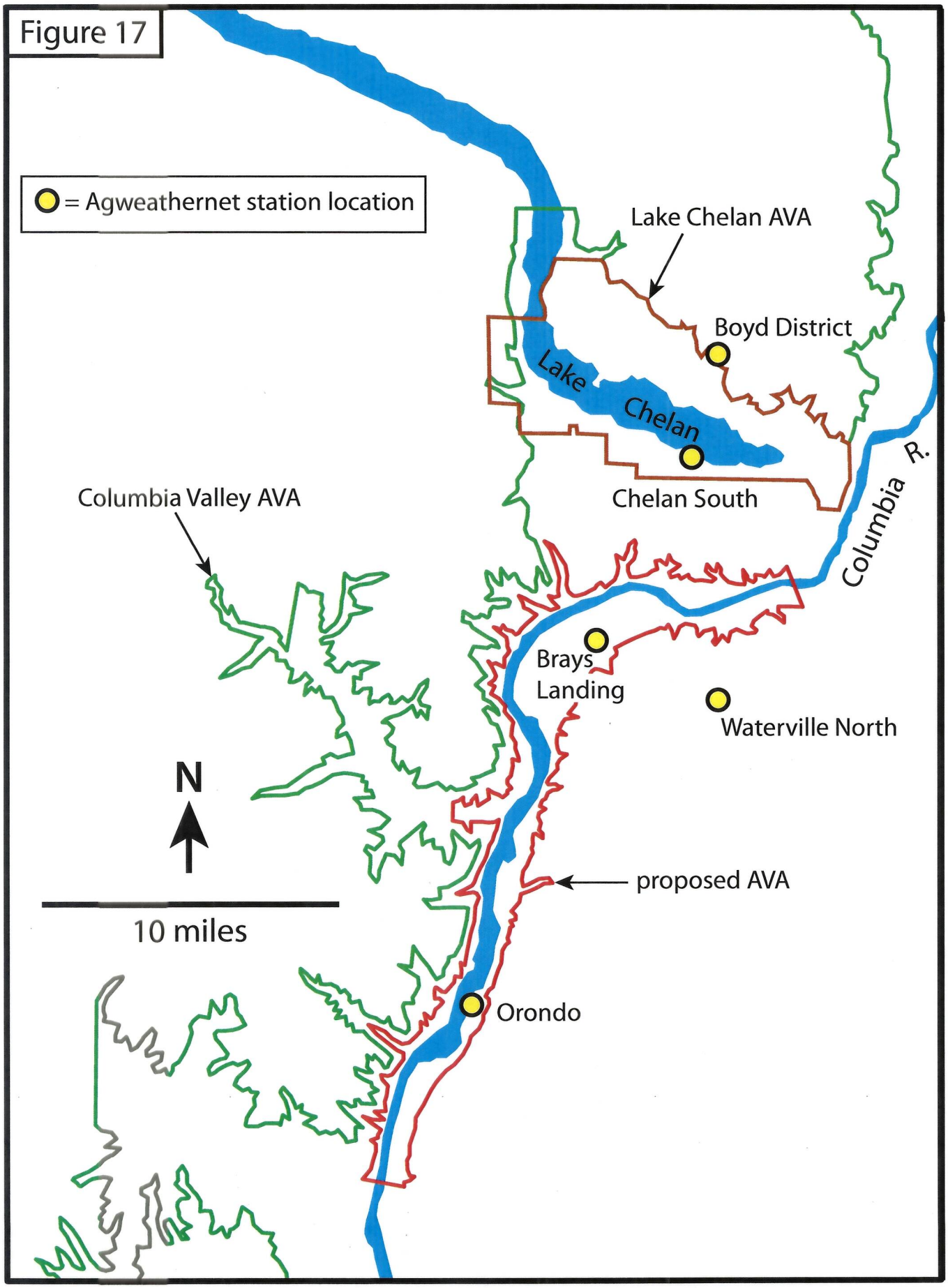


Figure 17
= Agweathernet station location
Lake Chelan AVA
Boyd District
Lake
Chelan
Chelan South
Columbia R.
Columbia Valley AVA
Brays
Landing
Waterville North
N
proposed AVA
10 miles
Orondo

Figure 18

Station	year	elevation	Extreme Min.	Avg. Min.	Avg.	Avg. Max.	Extreme Max.	Avg. Soil
Boyd District	2017	2000	29.9	48.2	60.3	73.3	100	66.1
	2016	2000	30.2	49	60.8	73	96.7	66.8
	2015	2000	31.3	50.8	62.8	75.6	105.4	68.1
Average			30.5	49.3	61.3	74.0	100.7	67.0
Chelan South	2017	1255	34.1	53.5	63.6	75	101.3	65.6
	2016	1255	34.1	54.3	64.2	75.1	100.1	65.7
	2015	1255	34.6	56.1	66.1	77.3	104.6	68.5
Average			34.3	54.6	64.6	75.8	102.0	66.6
Brays Landing*	2017	1329	29.7	49.1	62.4	75.8	102.5	66.7
	2016	1329	29.2	50.2	63	75.5	100.4	67.3
	2015	1329	32.2	51.5	64.7	77.9	107.4	69.6
Average			30.4	50.3	63.4	76.4	103.4	67.9
Orondo*	2017	890	32.5	52.7	64.9	78.3	103.5	68.9
	2016	890	35	53.7	65.7	78.6	103	69
	2015	890	34.4	54.9	67.4	81.3	108.9	71.2
Average			34.0	53.8	66.0	79.4	105.1	69.7
Waterville N	2017	3102	28.7	47.8	57.8	68.1	95.2	62.5

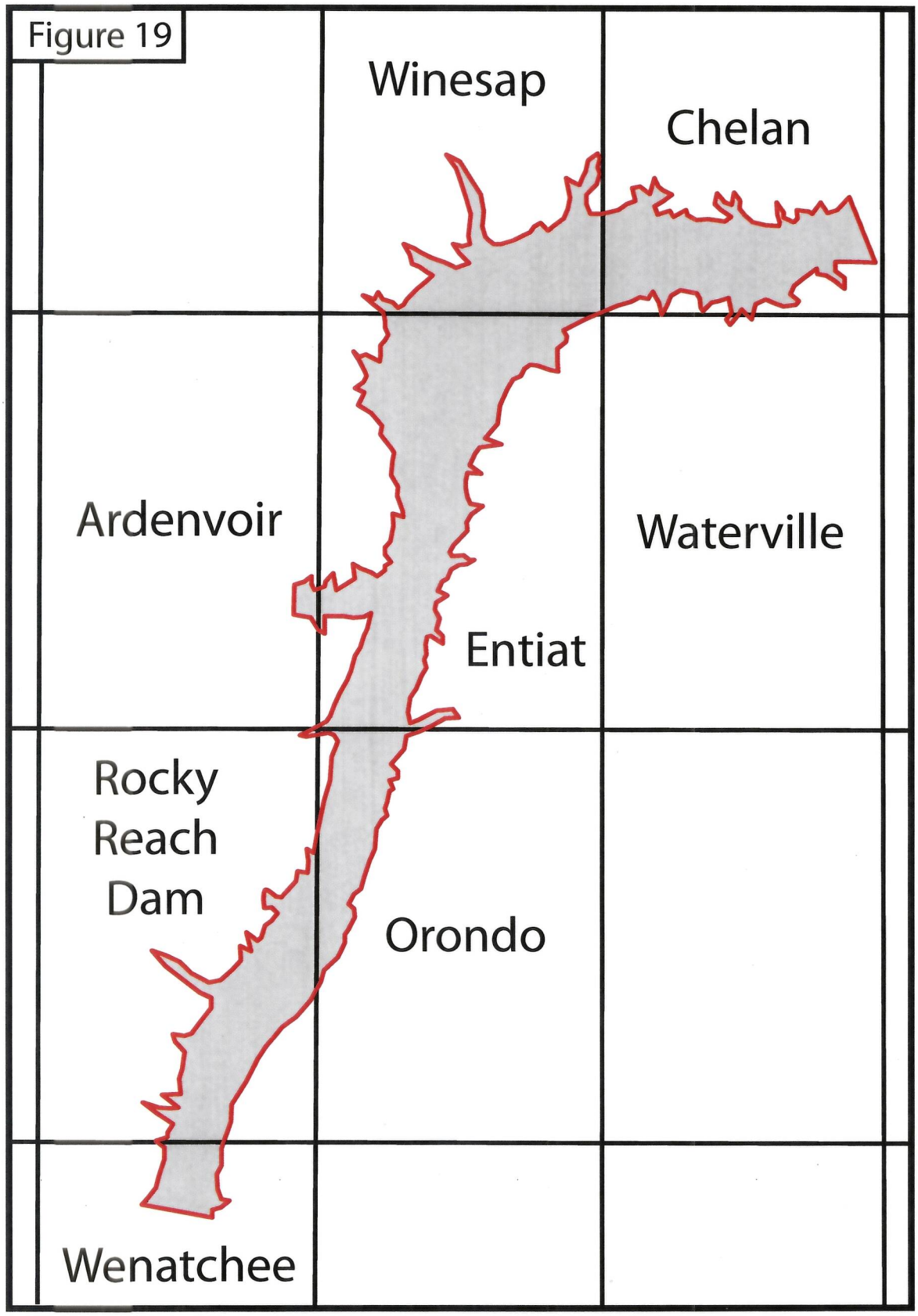


Figure 19
Winesap
Chelan
Ardenvoir
Waterville
Entiat
Rocky
Reach
Dam
Orondo
Wenatchee

Appendices

Appendix 1

Rocky Reach Vineyards

Vineyard Name	Acreage	Owner/contact
Buena Vista	10	Dovex Inc.
Double D	75	David Dufenhorst
Keystone Ranch	4	Dale Forman
Granite Rock	15	James Pierre
Numeral Mountain	3	Garrett Grubbs
Ribbon Cliff	9	Timothy Jensen
Dick Mesa	1	Garrett Grubbs

Appendix 2

Water levels challenge Memorial Day fun

Memorial Day weekend might mean the start of camping and picnic season, but high water levels on area rivers and lakes create the need for caution.

Some boat ramps and trails are closed and some of the riverside parks are dangerous.

"The water is high and fast moving, likely very cold, and people should be cautious," said Toni Droscher of the Washington State Parks.

Those sentiments were echoed by Chelan County PUD spokeswoman Suzanne Hartman.

"I would encourage people to observe whatever caution signs or tape is up to keep people out. It might look innocent enough, but the water can dangerous," she said.

The Okanogan River remains closed to recreation activities by order of the Okanogan County Sheriff's Department and Lake Osoyoos is still a no-wake zone. The orders remain in effect through Memorial Day weekend.

In the Wenatchee area, boat launches at Orondo River Park, Kirby Billingsley Hydro Park, Confluence State Park and Wenatchee Riverfront Park (near Pybus Public Market) are all closed because of the high water.

The boat launches along the Rocky Reach Reservoir are all open — as of Thursday afternoon.

To stay up to date, go to the PUD's website, under the Parks and Recreation tab, then Fishing and Boating tab. The page includes a list of public boat ramps and their status, plus a link to river flows and levels.

The Washington State Parks website lists on park closures — see the "Alerts" at the bottom of the column on the left side of the page.

As of Thursday the only state park closures listed locally are for Rocky Reach Trail, though the listing for Confluence State Park showed fields are under water and the boat ramp is closed.

Source: https://www.wenatcheeworld.com/news/2018/may/24/water-levels-challenge-memorial-day-fun/

Appendix 2

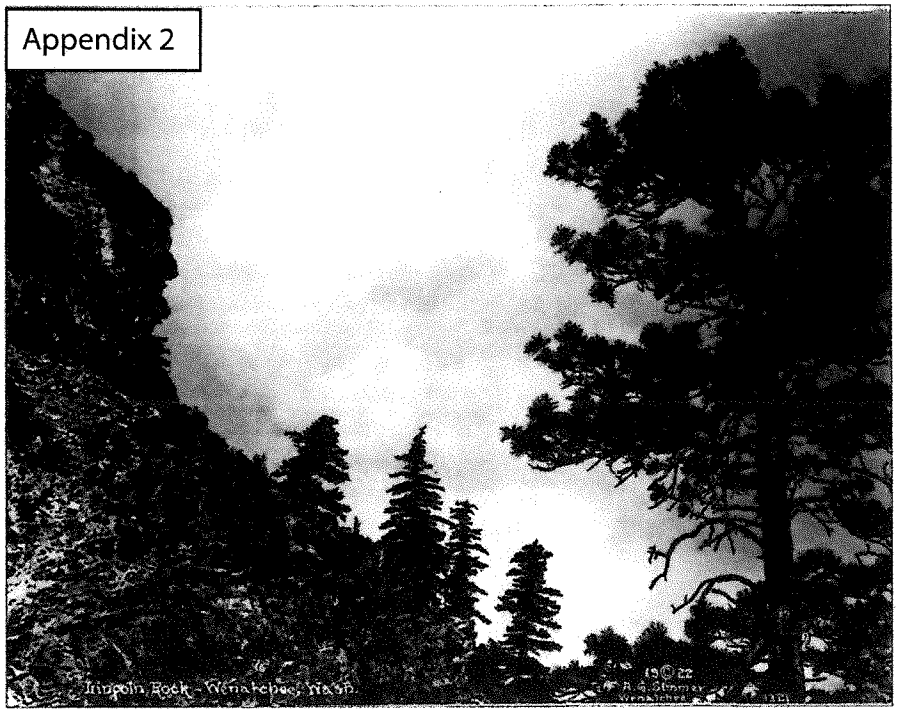
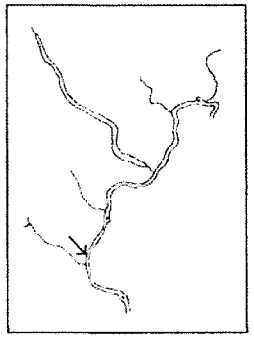


Plate 81. Lincoln Rock, on the right bank at foot of Swakane Canyon, 1922.
Harold Simmer, Wenatchee Valley Museum and Cultural Center



The river canyon at Rocky Reach is 5,000 feet wide and bordered by hills rising 2,500 feet. Over time, the river carved its way down through the overlying basalt into biotite gneiss formations thought to be over 1.6 billion years old. Colorful bands of white quartz and granite metamorphic rock intrude through the ancient rust-colored cliffs and rocks.

A shallow, rocky reef extended out from the west bank, leaving a narrow, crooked channel close to the east side of the river. Steamboat travel through the 8 mile-an-hour rapids was manageable, but required a captain who could stay in the deeper channel and dodge the rocks that at certain times of the year were just beneath the surface. In 1895, government workers improved navigation by dredging the gravel bar along the west shore that formed the reef extending into the river. In addition, large boulders near the east bank were removed to allow steamers to take advantage of the slower currents on that side.

Explorer David Thompson spent the night of July 6, 1811, camped on the large terrace on the east bank of the river.

Opposite: **Plate 82.** Rocky Reach-Caribou Trail on the Columbia's west side.
Photo postcard, Ellis 384, Author's Collection

Source: Layman (2002), page 70

Appendix 2

Rocky Reach

Source: Layman (2002), page 71

Appendix 2

P.U.D. CHELAN COUNTY

OUTAGES | PAY

MY PUD SERVICES | HYDROPOWER | PARKS AND RECREATION | ENVIRONMENT | CONSERVATION | LEARNING CENTER | ABOUT US

- Our Parks
- Fishing and Boating
- Day Use Parking Pass
- Lake Chelan Lake Levels
- Helpful Recreation Links
- Park Shelter Reservations
- Park and Trail Etiquette
- River Flows and Water Temperatures

Web Links

- Columbia River Flow Data
- Lake Chelan at Stehekin
- Stehekin River at Stehekin
- Entiat River near Ardenvoir
- Wenatchee River at Plain
- Wenatchee River at Peshastin
- Wenatchee River at Monitor
- Grant PUD Boat Launch Info
- Rocky Reach Reservoir Elevations - Hourly
- Rocky Reach Reservoir Elevations - 30 Days
- Rock Island Reservoir Elevations - Hourly
- Rock Island Reservoir Elevations - 30 Days

Home / Parks and Recreation / River Flows and Water Temperatures

River Flows and Water Temperatures

Rocky Reach Dam

Total Flow	307.42 kcfs @ (5/23/2018, 2:35:33 PM)
Water Temperature	11.95 °C / 53.50 °F @ (5/23/2018, 2:35:33 PM)
Head Water North (Range 703.0 ft to 707.0 ft)	706.66 ft @ (5/23/2018, 2:35:51 PM)
Head Water South (Range 703.0 ft to 707.0 ft)	706.76 ft @ (5/23/2018, 2:35:51 PM)
Tail Water North	629.82 ft @ (5/23/2018, 2:35:51 PM)
Tail Water South	630.07 ft @ (5/23/2018, 2:35:41 PM)

Rocky Reach Dam (Past 12 Hours)

Date / Time	Total Flow	Head Water
5/23/2018, 2:00:00 AM	327.28 kcfs	706.76 ft
5/23/2018, 3:00:00 AM	321.24 kcfs	706.75 ft
5/23/2018, 4:00:00 AM	316.59 kcfs	706.77 ft
5/23/2018, 5:00:00 AM	315.25 kcfs	706.83 ft
5/23/2018, 6:00:00 AM	325.39 kcfs	706.82 ft
5/23/2018, 7:00:00 AM	328.20 kcfs	706.75 ft

source: https://www.chelanpud.org/parks-and-recreation/river-flows-and-water-temperatures

Appendix 2

OUTAGES | PAY MY BILL

MY PUD SERVICES | HYDROPOWER | PARKS AND RECREATION | ENVIRONMENT | CONSERVATION | LEARNING CENTER | ABOUT US

- Advanced Meters
- Scam Calls
- In Your Neighborhood
- Education Programs
- Rocky Reach Discovery Center
- Public Power Benefit Program
- Issues and Interests
- Blog

Related Pages

- Discovery Center Tour Request
- PUD Parks Map
- Rocky Reach Dam Park
- Rocky Reach Dam
- Museum of the Columbia
- Nez Perce Indian Portrait Collection
- Mama D's Kitchen
- Geocaching at Rocky Reach
- Walter Graham Studio art at Rocky Reach
- Summer Science at Rocky Reach
- River Ramble

Home / Learning Center / Rocky Reach Discovery Center

Rocky Reach Discovery Center

Rocky Reach Discovery Center is located on the west side of Rocky Reach Dam, easily accessible from Highway 97A, and offers ample parking for guests, including recreational vehicles and buses.

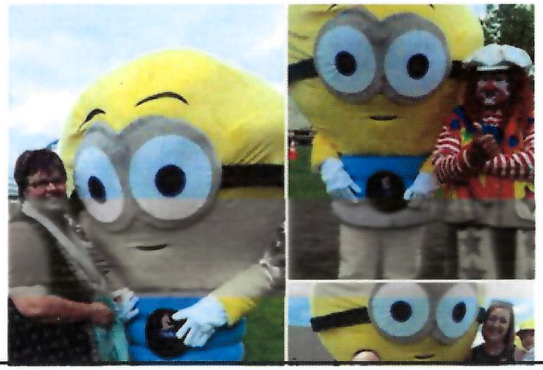
Guests will discover a museum, a café, balconies that offer panoramic views of the dam and grounds, the juvenile fish bypass system, the reservoir (Lake Entiat) and the Columbia River. A 90-seat theater shows movies throughout the day and upon request. Guided tours are available by appointment.

Visitor Center Access and Security Policy

Be the first of your friends to like this

Rocky Reach Discovery Center
on Saturday

Head down to Walla Walla Point Park for Kids Fest and meet Ellie Dee!



Address
5000 State Hwy 97A
Wenatchee, WA 98801
Get directions

Hours
Rocky Reach Discovery Center and Rocky Reach Park are open 9 a.m. to 6 p.m. daily
The Museum of the Columbia is open daily from 9 a.m. to 5:30 p.m.

For group tours, weddings in our pergola, and other event planning, please call (509) 663-7522.

Shelter reservations are required. Please click here to reserve a shelter online.

Events

- Senior Tri-Dam Tour - 09/27/2018 8:30 AM
- 2018 Fall Harvest Roundup - 10/14/2018 1:00 PM

Source: https://www.chelanpud.org/learning-center/rocky-reach-discovery-center

Appendix 2


Lincoln Rock State Park
Rocky Reach Dam
Rocky Reach Trail
Sunset Hwy
Sunnyslope
Blue Grade Rd
E Penny Rd
Apple Capital Loop Trail
Wenatchee Confluence State Park
source: http://www.rockyreachtrail.org

Appendix 2


ROCKY REACH
CHELAN COUNTY POWER


Lake Entiat
Rocky Reach Reservoir
Rocky Reach Hydroelectric Project FERC No. 2145
POWER

KXLY.COM
SPOKANE ▶ COEUR D'ALENE

Crews continue to fight Rocky Reach Fire; containment at 30%

By:

Danny Palomba (https://www.kxly.com/meet-the-team/danny-palomba/532207689)

(mailto:dannyp@kxly.com) (https://twitter.com/@dannypalomba) (https://www.instagram.com/@dannypalomba)

Posted: Jul 16, 2018 01:59 PM PDT Updated: Jul 16, 2018 01:59 PM PDT

WENATCHEE, Wash. - The Rocky Reach Fire started on the southwest flank of Burch Mountain approximately five miles northeast of Wenatchee, Washington on the evening of July 13th.

Because the fire was burning in grass and brush, rapid spread threatened a number of residences prompting Level 1 evacuation notices for the Burch Mountain and Swakane Canyon neighborhoods.

Chelan County Fire District #1, Okanogan Wenatchee National Forest and Washington Department of Natural Resources forces responded and worked through the night to fight the blaze.

Acknowledging the growing complexity of the incident, a type 3 interagency incident management team (IMT) under Incident Commander Kimiko Nalle was mobilized on July 14 to assume command of the incident.

On Sunday, the burn operations progressed as expected with overnight cooling and minimal wind. While emphasis continued on connecting the fire line around the Northwest corner an aircraft was used to scout containment opportunities and minimize danger to firefighters.

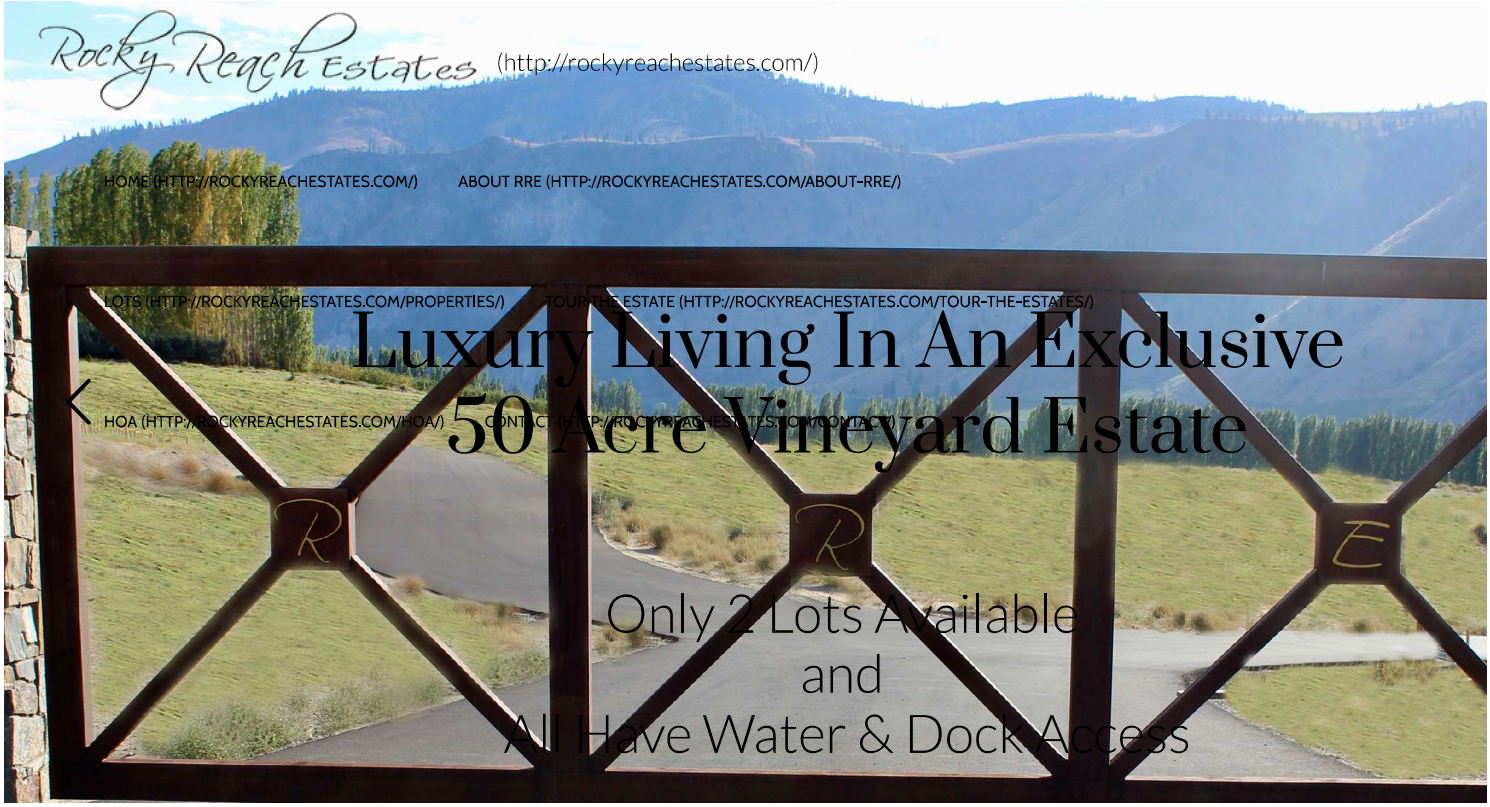
Today, as fire crews continue to secure containment lines, fire and smoke will be visible from Highway 97A. The public is asked not to call 9-1-1 to report fire within this area as this can cause dispatchers to dedicate precious time away from emergency calls. Crews are continuing to focus on the northwest corner of the fire line to secure fire spread and increase the overall fire containment.

As of noon today, the Level 1 advisory for Burch Mountain area are cancelled. The Burch Mountain Road remains closed to the public at the end of the pavement until further notice to fire personnel can access the burn area and conduct mop up operations. The Swakane area remains at a Level 1 “fire advisory” status until further notice.

As of right now, the 241 responding personnel have contained 30% of the fire. Since the fire started on Friday evening, it has burnt 3,427 acres.

Crews would like to remind the public that the air space over the fire area is closed to all aircraft below 7500 feet, including drones, except those assigned to the incident.

Please drive with caution and stay alert since fire crews are working hard along roadways. The publice should also expect smoke, debris and/or temporary traffic stops.



Luxury Living At It's Best!

Here you can achieve that amazing dream of living where a vineyard is within your reach, and having wine crafted for you from the vines right outside your door with your own label to share with friends and family.

Set amid more than fifty acres in Washington's prestigious Wine Country, Rocky Reach Estates offers wine lovers the chance to become winemakers by owning your own wine through the
Rocky Reach Reserve Club.

The Setting

Rocky Reach Estates sits on a fifty acre property and is framed on all sides by natural boundaries, defining a proportion that's perfectly suited to a fine wine estate.

With acres of vineyards, orchards, plans for a winery building, and views of the Columbia River the property is reminiscent of some of the great wine estates of Europe, many of which have been held within the same families for centuries.

Future plans included are a 8 slip boat dock.