Petition to establish the

Wanapum Village

American Viticultural Area

Grant County, Washington

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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 "Wanapum Village" (figure 1). It is submitted on behalf of the Zirkle Fruit Company, and Tom Merkle and Craig Young, owners of the two vineyards within the proposed AVA, which is situated entirely within the boundaries of the 17,600 sq. mi. Columbia Valley AVA.

As proposed, the Wanapum Village AVA encompasses 2415 acres (3.77 sq. mi.) on generally south-southwest-facing slopes above the confluence of Crab Creek and the Columbia River. Within the proposed AVA are currently 538 acres of vineyards, divided between the 508 acre Beverly Vineyard, owned by the Zirkle Fruit Company and the 30 acre TC Vineyard owned by Tom Merkle and Craig Young. Together these vineyards occupy 22 percent of the area of the proposed AVA (figure 2, appendix 1).

The proposed AVA has viticultural characteristics, based largely on its soils and climate, which are distinctive from the surrounding area. They derive from distinctive characteristics of the geology and geography of the proposed AVA, which lies at the intersection of major pathways for catastrophic ice-age floods that repeatedly swept the area, and in close proximity to Sentinel Gap, a major topographic break in the Saddle Mountains. 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 "Wanapum Village", a place that lies entirely within its proposed boundaries. Wanapum Village designates a group of homes and administrative buildings built in the early 1960's to house personnel associated with the construction and operation of the nearby Wanapum Dam on the Columbia River. In 2010, the Grant County Public Utility District (PUD), owners of Wanapum Village, declared the property to be surplus, eventually offering it for sale. In 2016, the property was purchased by the Zirkle Fruit Company, owners of Beverly Vineyard (appendix 1). The name Wanapum Village appears on USGS topographic maps of scale 1:24000 (Beverly Quadrangle) published in 1965, 2011, 2014, and 2107, and on the 1:100000 scale Priest Rapids map published in 1979 (appendix 1, figures 2 and 3). Evidence of the current usage of the name for the location can be found on street signs and in recent references to Wanapum Village in media coverage of the sale of the property and a large wildfire that burned a nearby area (appendix 1).

Boundary Evidence

The boundary for the proposed AVA was devised to encompass a relatively low elevation (<950 ft.) region of south and southwest-facing slopes underlain by gravelly soils, that has viticultural characteristics that are distinct from the surrounding areas. The northern boundary of the proposed AVA corresponds to the southern limit of federal land that stretches south from Wanapum Dam, and steep rocky terrain unsuited for viticulture. The eastern boundary coincides with section lines that form the western boundary of federal lands as well as the western and southern boundaries of the proposed Royal Slope AVA. The southern boundary coincides with federal lands boundaries and the northern limit of the small town of Schwana. The western boundary coincides with Washington Highway 243, which separates the proposed AVA from federal lands that lie along and east of the Columbia River.

Geography

The proposed AVA occupies gentle to moderately sloping hillsides and low rolling hills where the south- and west-facing slopes of the Frenchman Hills meet the Columbia River at its confluence with Crab Creek (figures 3 and 4). The Columbia River and its relatively narrow flood plain provides a natural geographic boundary for the AVA on its western side. Northeast of the proposed AVA, the land rises toward the crest of the Frenchman Hills in a gentle incline known as the Royal Slope. North of the proposed AVA, the Columbia River enters a steep-walled rocky gorge where it has incised its channel through the Frenchman Hills. South of the proposed AVA the Columbia has carved a dramatic 1500 ft. deep, 1.5 mile wide, cliff-walled notch through the Saddle Mountains known as Sentinel Gap (figure 3 and 4). This rugged canyon creates a pronounced geographic separation between the proposed AVA and gently sloping terrain on the south side of the Saddle Mountains that has been incorporated into the Wahluke Slope AVA (figures 1 and 3). The gap is also responsible for creating a windier climate in the proposed AVA through its acceleration of south-southwesterly winds, via the Venturi effect. Elevations within the proposed AVA range from 950 ft. along the northeast boundary to 515 ft. along its western boundary near the Columbia River (figure 2). The average elevation is approximately 600 ft. The maximum and average elevations of the proposed AVA are considerably lower, 815 ft. and 500 ft. respectively, than that of the adjacent proposed Royal Slope AVA, which has a significant affect on its viticultural climate, as detailed in the climate section of this petition.

Geology

The bedrock of the proposed AVA consists of dense dark-colored basalt of the Columbia River Basalt Group (figure 5). The rock originated as extensive lava flows that were erupted approximately 15 million years ago from huge volcanic fissure systems in southeastern Washington and northeastern Oregon. The basaltic bedrock crops out or is a relatively shallow depths in a band along the steeper slopes that

trend northwest to southeast through the proposed AVA (figures 5 and 6a). Throughout most of the area of the proposed AVA the bedrock lies buried beneath thick deposits of gravel and sand, so it has little influence on viticulture (figure 5).

Since they were erupted, the lava flows of the Columbia River Basalt bedrock have been faulted and folded upward by tectonic compression into parallel east-west trending ridgelines. The proposed AVA lies at the base of the southern slopes of one of these ridgelines, known as the Frenchman Hills, and 1 mile north of the base of another, more prominent ridge called the Saddle Mountains (figure 3). Erosion by the Columbia River kept pace with the slow incremental rise of the ridges over the last 15 million years. This process created a prominent notch in the Saddle Mountains known as Sentinel Gap, which lies just 2 miles south of the proposed AVA (figure 3 and 4). Sentinel Gap has had a profound impact on the climate and soils of the proposed AVA through its local effects on the movement of water and air.

The basalt bedrock of the proposed AVA is covered in most areas with a substantial thickness of sand and gravel derived directly or indirectly from catastrophic glacial outburst floods that occurred repeatedly between 10,000 and 20,000 years ago (figure 6b). The floods resulted from the failure of a 2000 ft thick glacial ice dam that formed Glacial Lake Missoula in what is now western Montana. Another lobe of ice blocked the Columbia River at the present day site of Grand Coulee Dam, creating a lake known as Glacial Lake Columbia and rerouting the Columbia River down Grand Coulee and into the present-day Crab creek drainage, which forms the southern boundary of the proposed AVA (figure 7a)(Waitt, 2017). Floods derived from Glacial Lake Missoula flowed into Glacial Lake Columbia and spilled out across the basin to the south and west, returning by multiple routes to the main channel of the Columbia River. At the site of the proposed AVA, floodwaters coming down the re-routed Columbia River through the Crab Creek drainage converged with floodwaters that had poured through Potholes and Frenchman coulees into the old Columbia River channel (figure 8). The combined floodwaters were slowed by the constriction of Sentinel Gap, which caused gravel and sand suspended in the water to settle out, forming huge gravel bars. This flood-derived sand and gravel covers 1900 acres, or 80% the area of the proposed AVA and forms the foundation for its soils (figure 5).

Around 15,000 years ago, the Columbia River suddenly reoccupied its old channel when the ice dam that had blocked the river at Grand Coulee collapsed, draining Glacial Lake Columbia (figure 7b)(Waitt, 2017). This flood created huge gravel bars along the Columbia River at bends and constrictions in its channel where the velocity of the water was reduced. A longitudinal (parallel to stream flow) gravel bar, known as Beverly Bar was deposited just upstream of Sentinel Gap (Bjornstad, et al., 2007)(figure 9, appendix 2). Beverly Bar was deposited on top of the earlier gravel bars and is less extensive. It occupies 870 acres (36%) of the area within the proposed AVA.

The surficial soils throughout much of the AVA consist of a mixture of flood-deposited sand and gravel and wind-deposited sand. Prevailing south-southwesterly winds are accelerated as they blow northward through Sentinel Gap. Strong winds blowing through the gap carry sand that is deposited on its north side

as the wind decelerates. Although the wind weakens enough to allow sand to deposit within the proposed AVA, it is often remains strong enough to entrain and transport silt and very fine sand, which are deposited further downwind.

Soils

The soils of the proposed AVA are developed in sand and gravel deposited by ice age floods mixed with wind-deposited sand (figure 10a). The maximum elevation reached by the ice-age floodwaters was 1250 ft. so all of the area within the proposed AVA was repeatedly inundated and received sediment deposited directly from suspension in the floodwaters. As described in the previous geology section, the proposed AVA was at the intersection of major floodwater channels. The water in these channels had a relatively high velocity, so the deposited sediment is more coarse-grained than sediment that was deposited in a slackwater setting farther from the main channels and at higher elevations. The floodwaters at the site of the proposed AVA retained enough velocity so that most clay and silt remained in suspension and was carried farther downstream. The soils are thus dominated by sand and gravel and are significantly more coarse-grained than the soils of the adjacent proposed Royal Slope AVA, which are largely developed in wind-deposited silt and fine sand. The Royal Slope petitioners describe the soils in their proposed AVA as formed primarily in fine-grained slackwater sediments overlain by wind-deposited silt (loess). On Figure 7 and Table 3 of the Royal Slope petition, the soils of this proposed AVA are divided into 6 soil units (appendix 2). Unit 3 is described as "very deep (>60") soils from outburst sands and gravels with smaller areas of sand dunes". This unit is the most similar to the dominate soil of the proposed Wanapum Village AVA, but is listed as present in only 1.8% of the area of the proposed Royal Slope AVA.

The soils of the proposed Wanapum Village AVA have been divided by the USDA NRCS into 4 series, the Burbank, Winchester, Schawana, and Quincy (figure 11). With the exception of the Quincy Series, which occupies only a very small part (80 acres) of the proposed AVA, the descriptions of the series include coarse-grained materials such as coarse sand, pebbles, gravel, and cobbles (appendix 3). All of the series are described as excessively, or somewhat excessively well-drained. In the proposed AVA, soils on ice-age gravel bars with a relatively thin surface layer of mixed gravel and wind-deposited material was assigned to the Burbank series. Soils in areas where the wind-deposited layer above the flood gravels is relatively thicker were assigned to the Winchester series. Thin coarse-textured soils developed in mixed flood gravel and wind-deposited sediment overlying basalt bedrock were classified as Schawana series. Quincy series soils in the proposed AVA are mapped in areas where soils are developed in relatively thick accumulations of wind-deposited sand.

Surface soil samples were obtained from Stillwater Creek vineyard, a flagship vineyard in the proposed Royal Slope AVA (Adkins soil series), and the Beverly Vineyard in the proposed Wanapum Village AVA (Winchester soil series) to conduct a textural comparison. Samples weighing 0.2 kg (figure 12) were passed through

three sieves of 2mm, 0.5 mm, and 0.125mm. The resulting particle size distributions are displayed graphically in figure 13. Only 1% of the weight of the Royal Slope sample consisted of medium to coarse grains as compared to 46% of the Wanapum Village sample.

Coarse-grained, excessively well drained soils such as those common to the proposed Wanapum Village AVA require more irrigation water and more easily instigate vine stress than finer grained soils. Grapevines planted in coarse-textured soils tend to root deeper since water has a greater tendency to move vertically through the profile (Jackson, 2008). Coarse textured soils are less erodible than soils formed in silt and fine sand, so cover crops are not as critical, and are not currently cultivated in the vineyards of the proposed AVA (figure 10b). Vineyards with bare coarse textured soils warm faster than those with cover crops, promoting earlier onset of phenological stages, such as bud break and veraison (Gladstones, 1994).

The soils of the proposed AVA are similar to those in the lower elevation parts of the Wahluke Slope AVA, which contains extensive areas of the Burbank, Quincy, and Winchester Series. The proposed AVA is not distinguished from The Wahluke Slope AVA by its soils, but by its geographic separation from the Wahluke Slope by Sentinel Gap. The cliffs and steep slopes of Sentinal gap are mapped as "rubble land – rock outcrop complex" (Gentry, 1984) and classified as unsuited for agriculture (land capability class 8).

Climate

Four years (2015-2018) of data from a weather station maintained by the Zirkle Fruit Company in their Beverly Vineyard (Beverly) was compared with data from three weather stations in the proposed Royal Slope AVA (Royal Slope, Royal City East, Royal City West) and three stations in the Wahluke Slope AVA (Wahluke Slope, Desert Aire, Mattawa) that are part of the AgWeatherNet operated by Washington State University (figure 14, Table 1). The warmer and windier climate of the proposed AVA clearly distinguishes it from the adjacent proposed Royal Slope AVA. The Beverly station has a higher average growing season (Apr. 1 - Oct. 31) temperature (GST) and accumulates more growing degree days (GDD) than any of the stations located within the proposed Royal Slope AVA. Comparing the four-year average of the Beverly station with the 4-year average of the four Royal Slope stations, the Beverly GST was 2.7° warmer and it accumulated 535 more GDD (Table 2).

Due to its proximity to Sentinel Gap, the average and maximum wind speeds in the proposed Wanapum Village AVA are significantly greater than in the adjacent proposed Royal Slope AVA. The average daily wind speed (Apr. 1 – Oct. 31) at the Beverly station over 4 years was 7.7 mph and the average daily maximum wind speed was 23.7 mph (Table 2). None of the stations in the proposed Royal Slope AVA recorded wind speed values as high as the Beverly station, and the average for all 4 Royal Slope stations was 2.8 mph slower for average daily wind speed and 5.6 mph slower for average daily maximum wind speed. The higher relative wind speed in the proposed AVA reduces mildew pressure and promotes vine stress. Vines planted

in windier regions have grapes that tend to be smaller, have thicker skins, and have more open clusters (Keller, 2010).

Of the AgWeatherNet stations used for comparison, the Desert Aire station in the Wahluke Slope AVA recorded temperature data that was the most similar to the data from the Beverly station (Table 2). The petitioners for the proposed Royal Slope AVA compared 8 years (2009-2016) of data from the Royal Slope stations to the Desert Aire station (appendix 4) to highlight the much warmer growing conditions of the lower elevations that lie outside of their proposed boundaries. They noted that GDD values greater than 3500 pushed the Wahluke Slope into Winkler Region IV viticultural zone, characterized as "very warm to hot". The proposed Royal Slope, with an average of 2972 GDD falls into cooler Winkler Region II. Average GDD values from the Beverly station indicate that the proposed Wanapum Village AVA also lies in Winkler Region IV.

Based on the data presented above, the climate of the proposed Wanapum Village AVA is significantly warmer than in the adjacent proposed Royal Slope AVA. The warmer climate produces a longer growing season and enables viticultralists to plant warmer-climate cultivars that require more heat to ripen. Cooler climate varieties planted in the proposed Wanapum Village AVA will ripen sooner and accumulate more sugar than those planted in the adjacent proposed Royal Slope AVA.

Temperature data recorded at the Beverly and Desert Aire stations indicate that parts of the Wahluke Slope AVA have a climate that is quite similar to that of the proposed AVA. However, the area of the proposed AVA is not part of, or contiguous with the geographically defined Wahluke Slope and is separated from it by Sentinel Gap, an area characterized by rocky slopes and cliffs that is inhospitable to viticulture.

Boundary description

The boundary of the proposed Wanapum Village viticultural area falls within the Beverly, Washington (2017) 1:24,000 scale United States Geological Survey topographic map.

The proposed Wanapum Village viticultural area is located in Grant County, Washington. The boundary is described below:

(1) The beginning point is the intersection of the boundary between Township 15 North and Township 16 North with Washington Highway 243 just north of Schwana. From the beginning point, proceed northeast following Highway 243 to its intersection with a road on the north side of Wanapum Village, near the center of section 21, Township 16 North, Range 23 East.

(2) From this intersection, proceed in a straight line for 2450 feet due east to the 600 ft. topographic contour line. Follow the 600 ft. contour line south and east for approximately 1500 ft. to its intersection with an unimproved local road, then

proceed north and east along the this road for 3000 ft. to its intersection with another unimproved local road.

(3) From this intersection, proceed in a straight line 500 ft. north-northeast to the intersection of an unimproved local road with Beverly Burke Road. Follow Beverly Burke Road north and east to its intersection with the corner shared by Sections 14, 15, 22, and 23, Township 16 North, Range 23 East.

(4) Proceed south for one mile along the boundary between sections 22 and 23, Township 16 North, Range 23 East, to the corner shared by Sections 22, 23, 26, and 27, Township 16 North, Range 23 East.

(5) Proceed east for one mile along the boundary between sections 23 and 26, Township 16 North, Range 23 East, to the corner shared by Sections 23, 24, 25, and 26, Township 16 North, Range 23 East.

(6) Proceed south, following the boundary between Sections 25 and 26 to its intersection with 540 ft contour line, then follow the contour line west and south to its intersection with the boundary between sections 26 and 35, Township 16 North, Range 23 East.

(7) Follow the boundary between sections 26 and 35 to the west to its intersection with the corner shared by sections 26, 27, 34, and 35, Township 16 North, Range 23 East.

(8) Proceed south for one mile along the boundary between sections 34 and 35 to the boundary between Township 15 North and Township 16 North, then follow the boundary west for 0.5 mile to the beginning point.

Shared and Contrasting attributes of the Columbia Valley and Proposed Wanapum Village American Viticultural Areas

Attributes of the Proposed Wanapum Village AVA Consistent with the Columbia Valley AVA

According to the petitioner, the 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 (Clore, 1982, appendix 4). All of these criteria apply to the area included within the boundaries proposed for the Wanapum Village AVA.

Distinctions Between the Proposed Wanapum Village AVA and the Columbia Valley AVA

Most of the vineyards within the Columbia Valley AVA are planted in fine-grained soils derived from wind-deposited silt and fine sand. In the original petition for the Columbia Valley AVA its definitive "appellation conditions" included "two or more feet of such soil types as silt loam, fine sandy loam, sandy loam, and loamy sands" (Clore, 1982, appendix 4). The soils of the proposed Wanapum Village AVA are more coarse textured than those described as typical of the Columbia Valley AVA and are primarily formed from sand and gravel bars deposited by water, not wind, and classified are as sand and stony loamy sand.

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Figures and Tables

Figure Captions

Figure 1 – Map showing location of the proposed Wanapum Village AVA in relation to neighboring proposed and established AVAs.

Figure 2 – Topographic map of the proposed Wanapum Village AVA showing areas with planted vineyards.

Figure 3 – Google Earth perspective image looking north through Sentinel Gap showing the location of the proposed AVA relative to major geographic features.

Figure 4 – Digital elevation model showing relative regional elevations near the area of the proposed AVA.

Figure 5 – Geologic map of the area of the proposed AVA, from Grolier and Bingham (1971).

Figure 6 – a) Photograph from the proposed AVA showing ice age flood gravels overlying Columbia River Basalt bedrock; b) Photograph of road cut in the proposed AVA showing thick layer of ice age flood gravels.

Figure 7 – a) Map showing path of Columbia River and ice age floods at the time og the maximum glacial advance, when the Columbia River was diverted by the Okanogan glacial lobe; b) Map showing route of floods that resulted from the release of water from Glacial Lake Columbia upon retreat of the Okanogan glacial lobe.

Figure 8 – Map showing the areas that were repeatedly inundated by ice age floodwaters during the latest ice age glaciation.

Figure 9 – Map showing the location of Beverly Bar, a late-stage ice age gravel bar, relative to the boundaries of the proposed AVA.

Figure 10 – a) Photograph from the proposed AVA of wind deposited sand drifting onto ice age flood gravels of the Beverly Bar; b) Photograph of the typical soil surface conditions in Beverly Vineyard, showing the bare gravelly sandy soils.

Figure 11 – Soil map of the proposed AVA, from Gentry (1984)

Figure 12 – Photograph of 0.2 kg samples used for textural comparison between soils of the proposed Royal Slope and proposed Wanapum Village AVAs.

Figure 13 – Graph of a grain size analysis of representative soil samples of the proposed Royal Slope and proposed Wanapum Village AVAs.

Figure 14 – Google Earth image showing locations of weather stations used for comparative analysis.

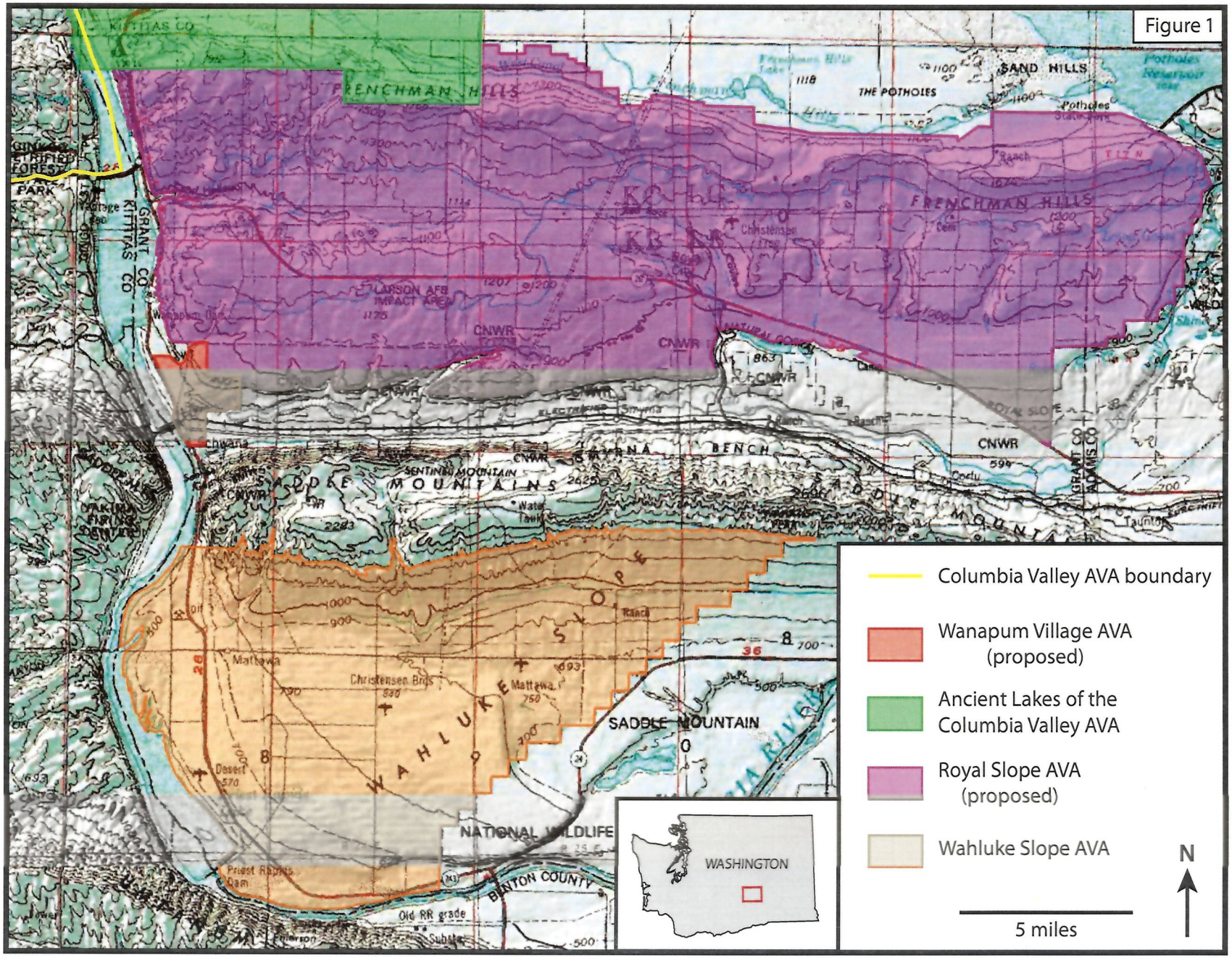


Figure 1
FRENCHMAN HILLS
THE POTHOLES
SAND HILLS
LARSON AFB IMPACT AREA
CNWR
SADDLE MOUNTAINS
SENTINEL MOUNTAIN
WAHLUKE SLOPE
SADDLE MOUNTAIN
NATIONAL WILDLIFE
BENTON COUNTY
GRANT CO
KITTITAS CO
WASHINGTON
Columbia Valley AVA boundary
Wanapum Village AVA (proposed)
Ancient Lakes of the Columbia Valley AVA
Royal Slope AVA (proposed)
Wahluke Slope AVA
N
5 miles

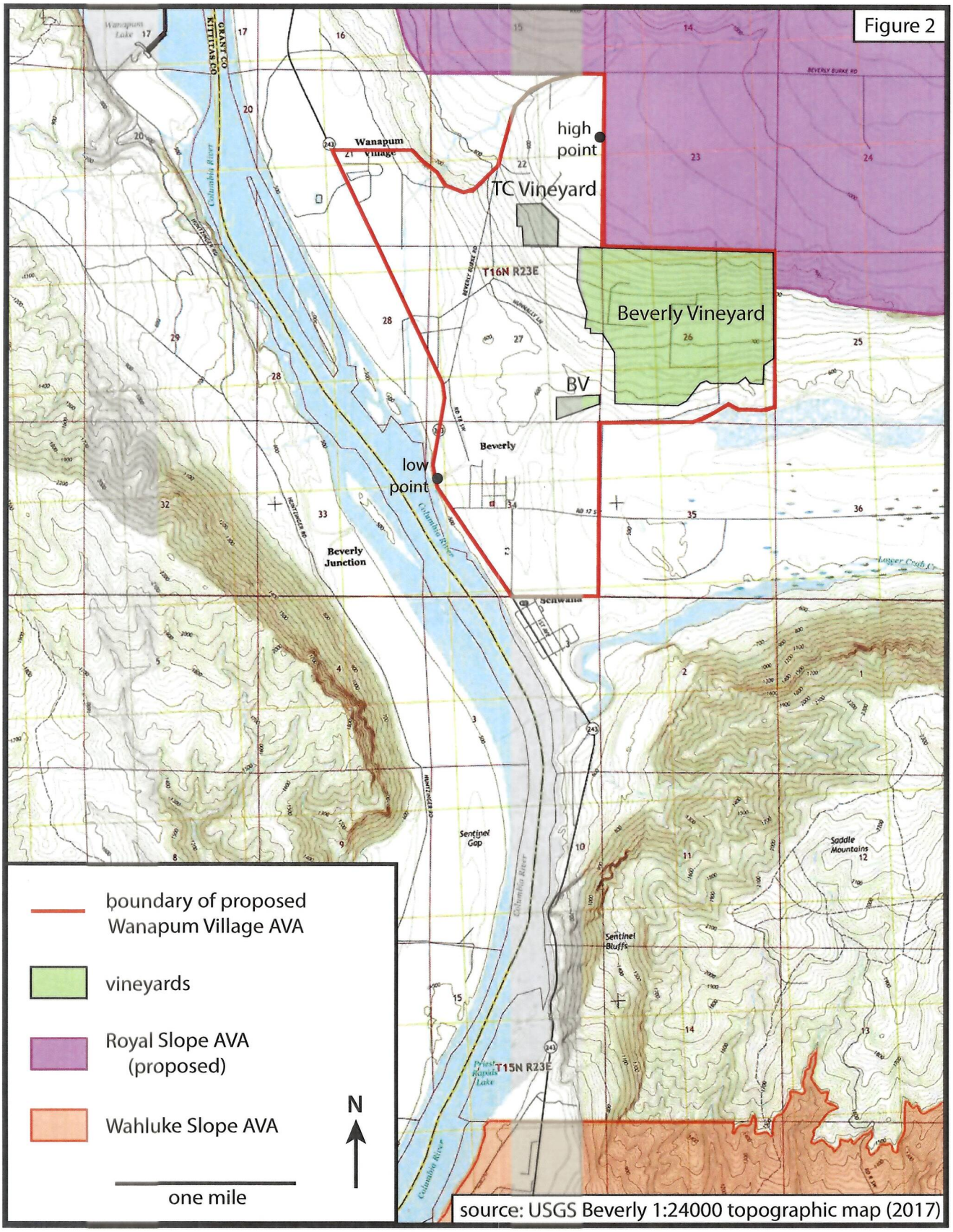


Figure 2
high point
TC Vineyard
Beverly Vineyard
BV
low point
T16N R23E
T15N R23E
Wanapum Village
Beverly
Beverly Junction
Columbia River
Sentinel Gap
Sentinel Bluffs
Saddle Mountains
boundary of proposed Wanapum Village AVA
vineyards
Royal Slope AVA (proposed)
Wahluke Slope AVA
one mile
N
source: USGS Beverly 1:24000 topographic map (2017)


Figure 3
Frenchman Hills
Royal Slope
Wanapum dam
Wanpum
Lake
proposed AVA
Crab Creek Coulee
Saddle Mountains
Saddle Mountains
Sentinel
Gap
Columbia River
Wahluke
Slope

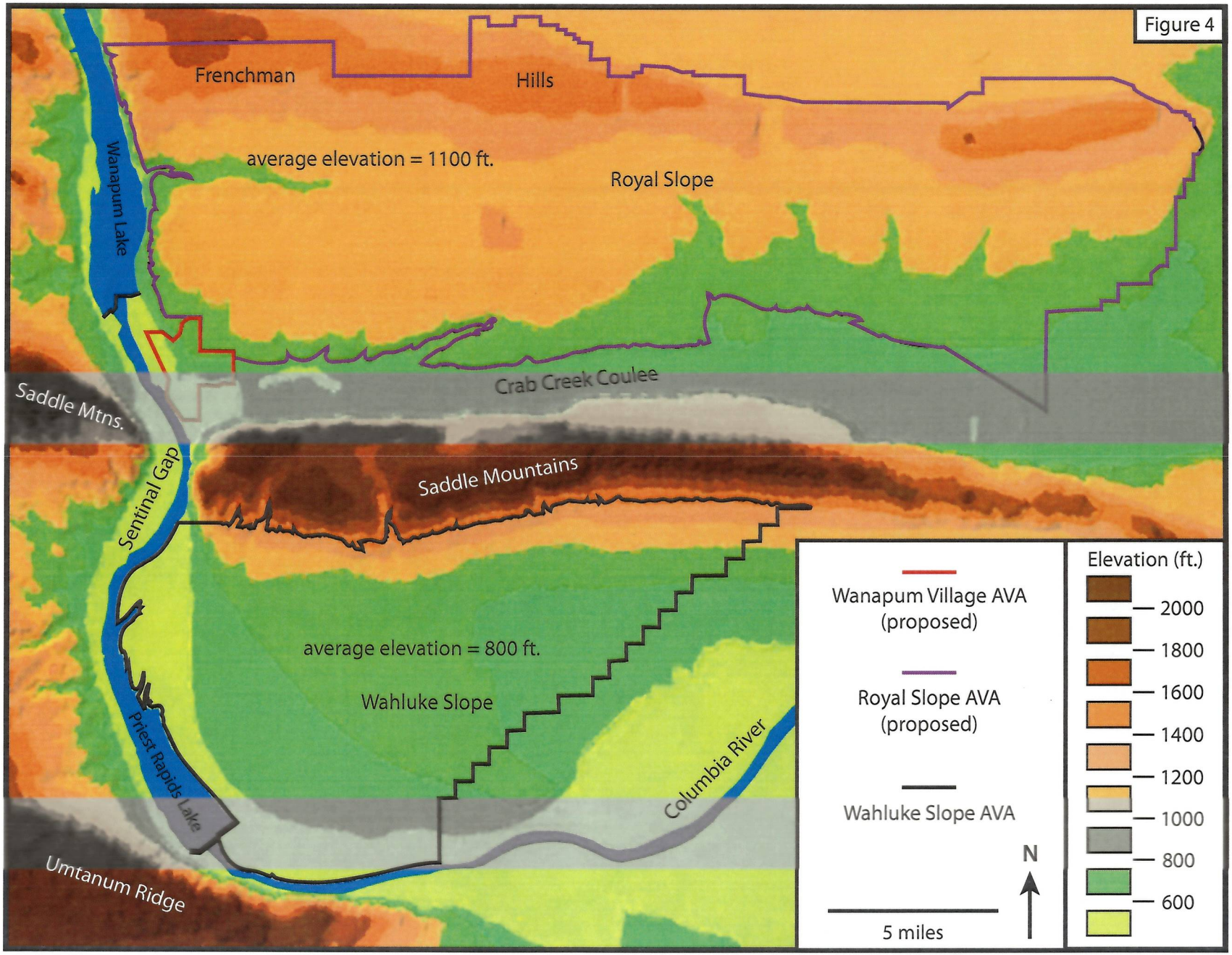


Figure 4
Frenchman
Hills
average elevation = 1100 ft.
Royal Slope
Wanapum Lake
Crab Creek Coulee
Saddle Mtns.
Saddle Mountains
Sentinal Gap
average elevation = 800 ft.
Wahluke Slope
Priest Rapids Lake
Columbia River
Umtanum Ridge
Wanapum Village AVA (proposed)
Royal Slope AVA (proposed)
Wahluke Slope AVA
N
5 miles
Elevation (ft.)
2000
1800
1600
1400
1200
1000
800
600

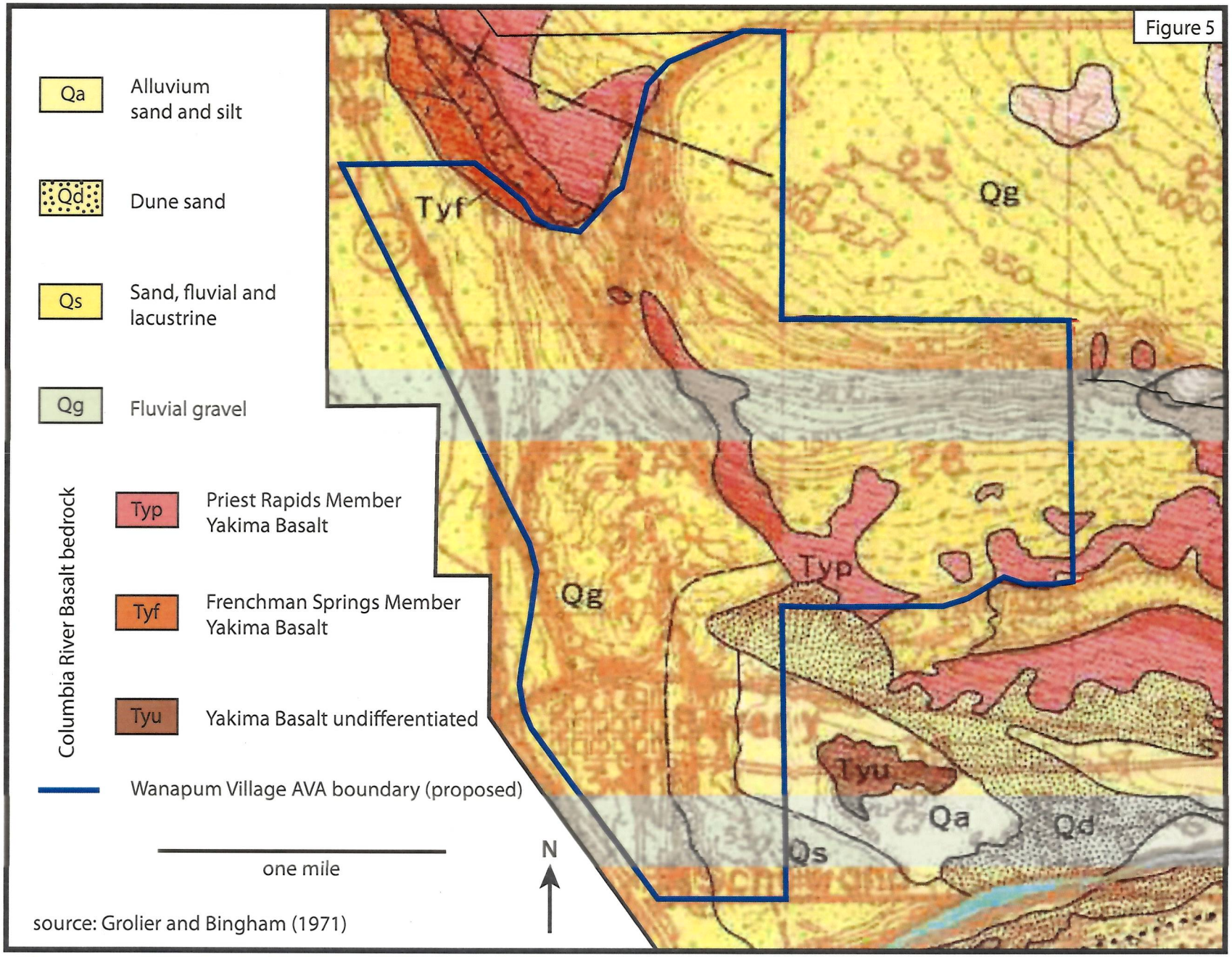


Figure 5
Qa
Alluvium
sand and silt
Qd
Dune sand
Qs
Sand, fluvial and
lacustrine
Qg
Fluvial gravel
Columbia River Basalt bedrock
Typ
Priest Rapids Member
Yakima Basalt
Tyf
Frenchman Springs Member
Yakima Basalt
Tyu
Yakima Basalt undifferentiated
Wanapum Village AVA boundary (proposed)
one mile
N
source: Grolier and Bingham (1971)
Tyf
Qg
Typ
Qg
Tyu
Qa
Qd
Qs


Figure 6a

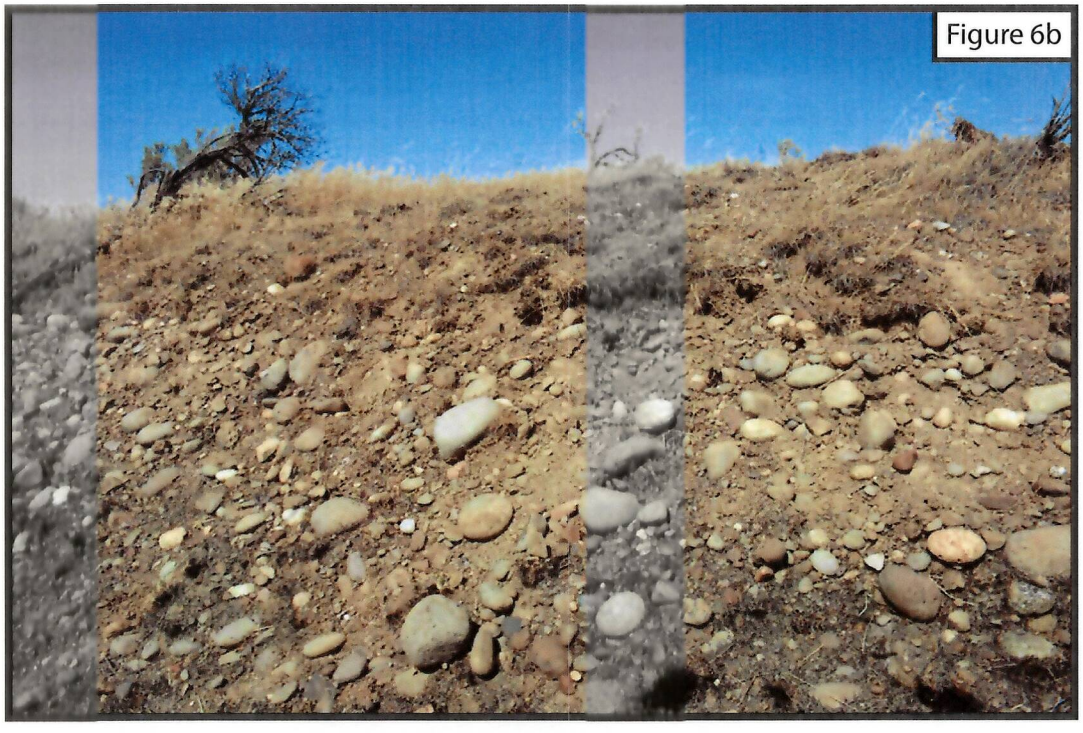


Figure 6b

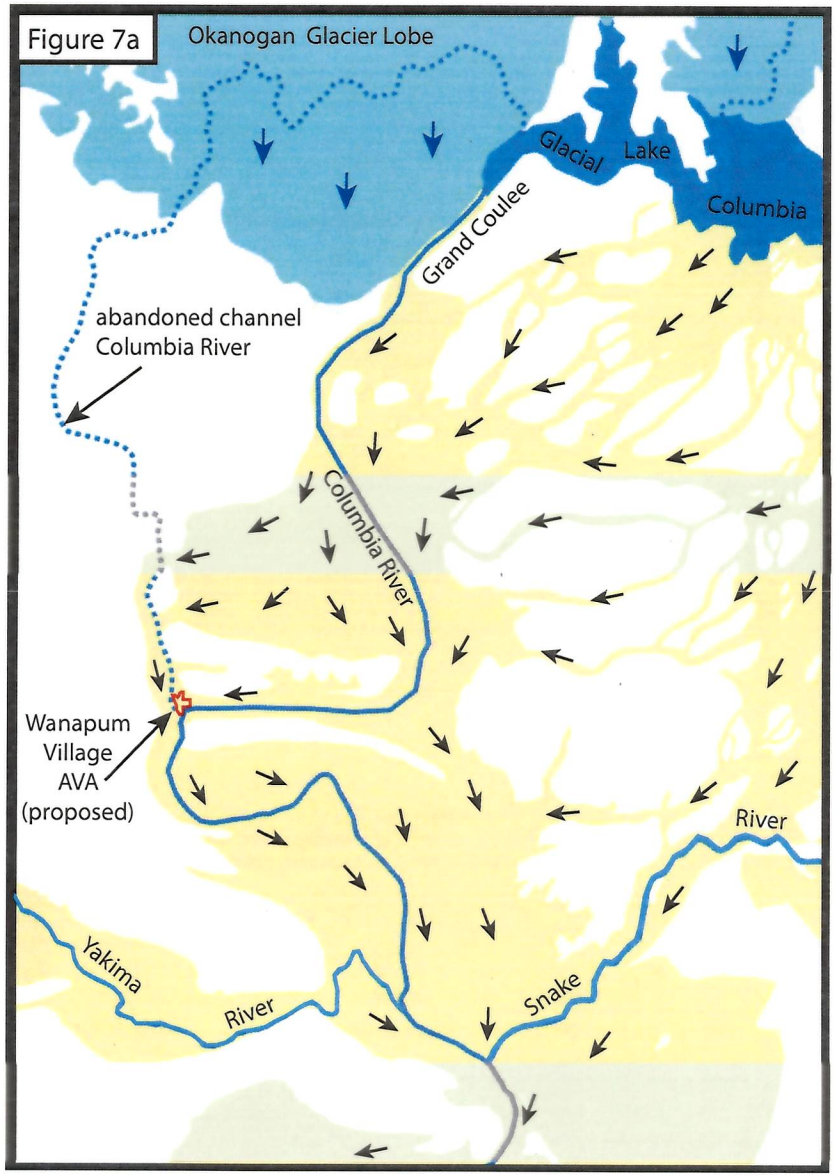


Figure 7a
Okanogan Glacier Lobe
Glacial
Lake
Columbia
Grand Coulee
abandoned channel
Columbia River
Columbia River
Wanapum
Village
AVA
(proposed)
River
Yakima
River
Snake

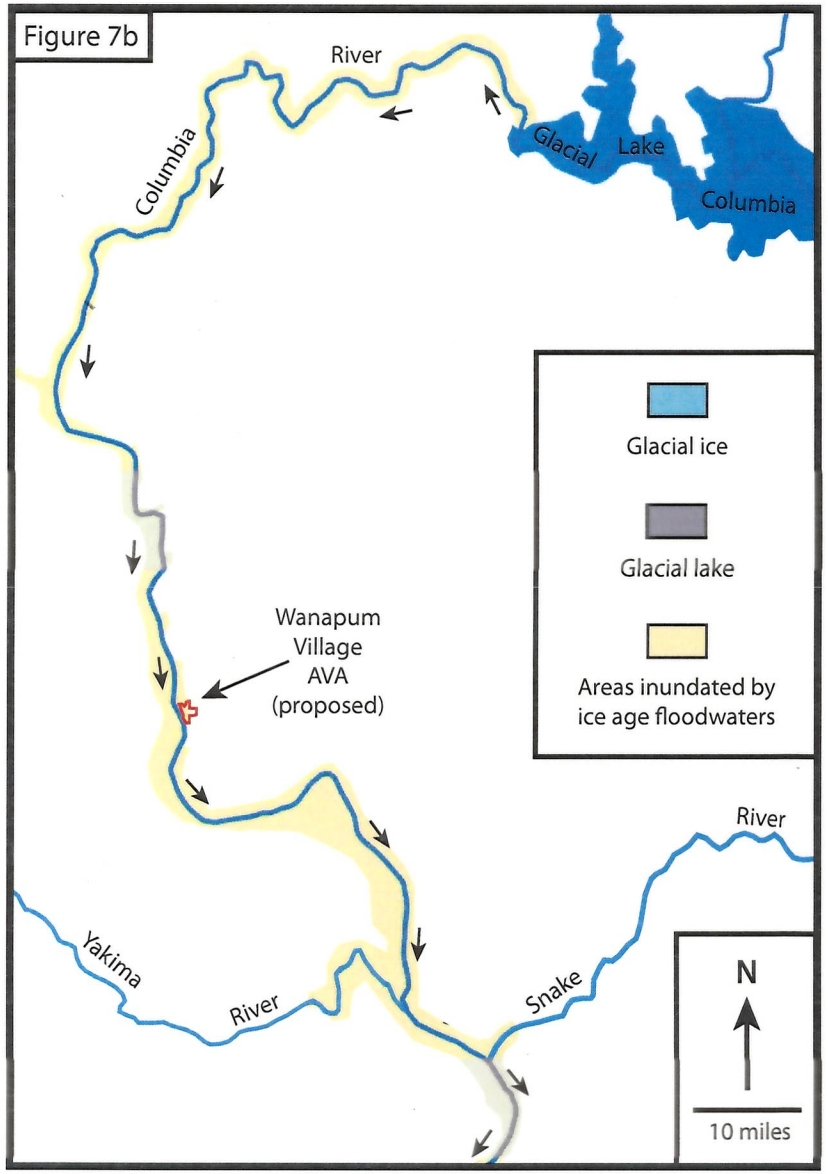


Figure 7b
River
Columbia
Glacial
Lake
Columbia
Glacial ice
Glacial lake
Areas inundated by
ice age floodwaters
Wanapum
Village
AVA
(proposed)
River
Yakima
River
Snake
N
10 miles

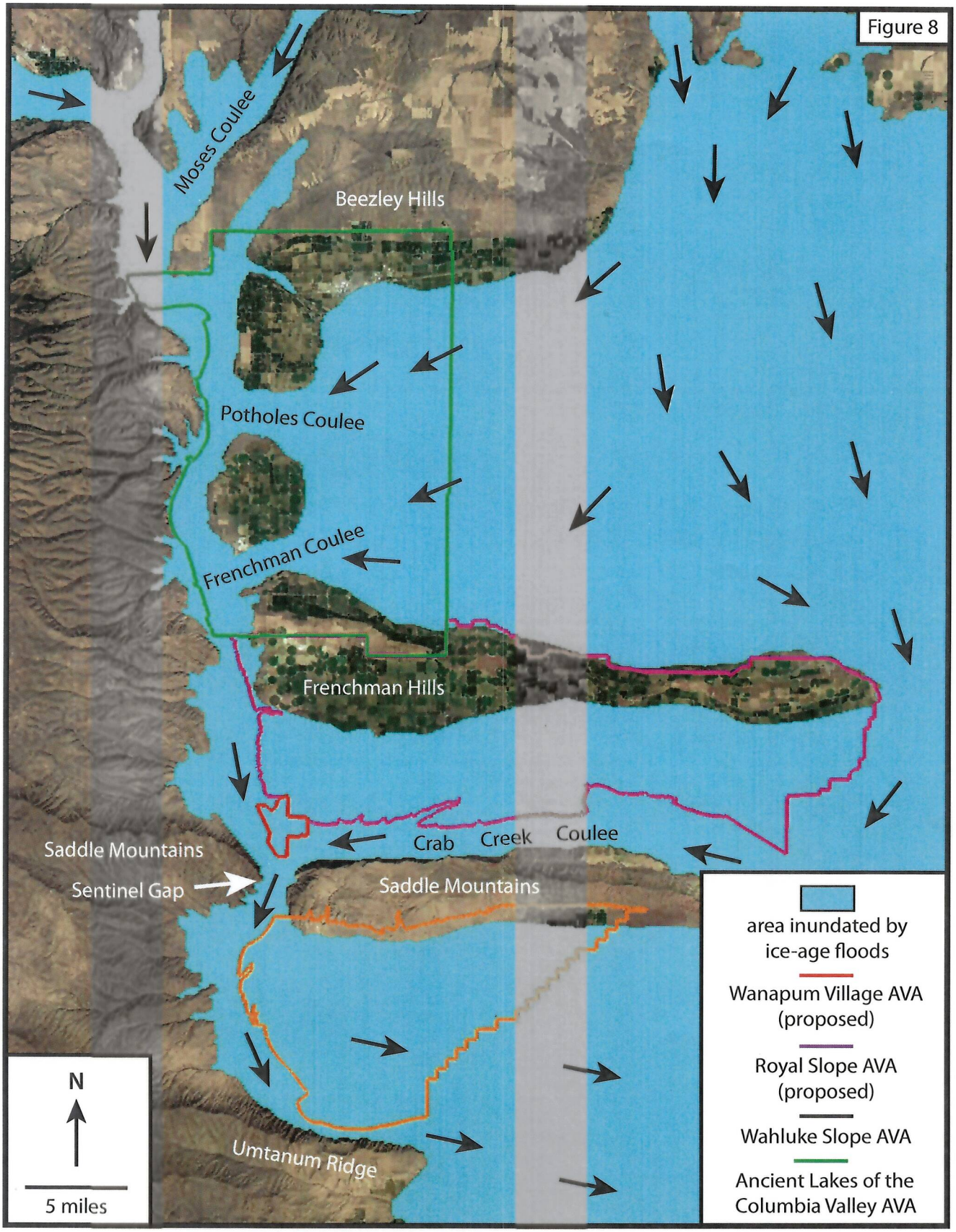


Figure 8
Moses Coulee
Beezley Hills
Potholes Coulee
Frenchman Coulee
Frenchman Hills
Crab Creek Coulee
Saddle Mountains
Sentinel Gap
Saddle Mountains
Umtanum Ridge
N
5 miles
area inundated by ice-age floods
Wanapum Village AVA (proposed)
Royal Slope AVA (proposed)
Wahluke Slope AVA
Ancient Lakes of the Columbia Valley AVA

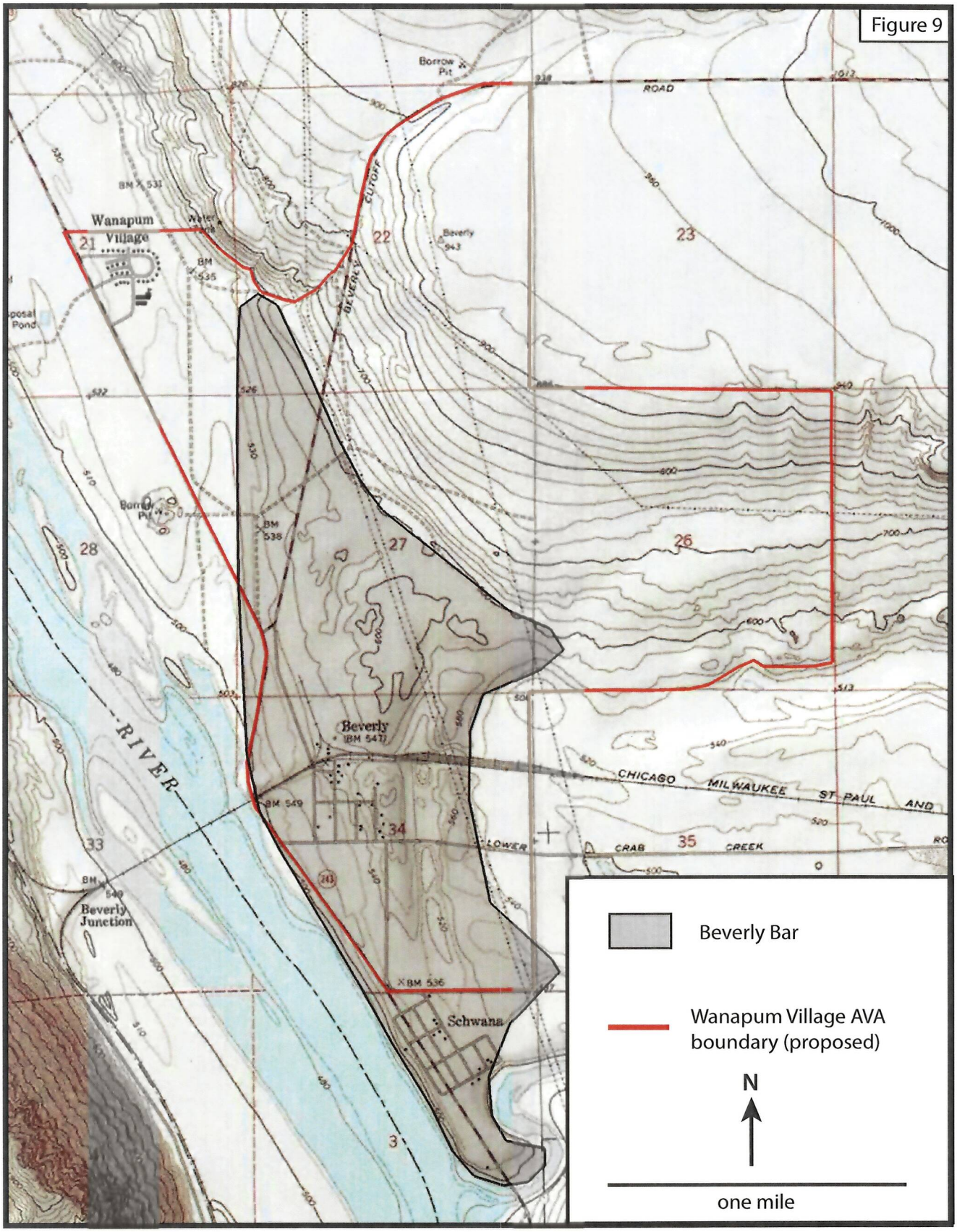


Figure 9
Wanapum Village
Beverly
Beverly Junction
Schwana
RIVER
CUTOFF
ROAD
CHICAGO MILWAUKEE ST PAUL AND
LOWER CRAB CREEK
Beverly Bar
Wanapum Village AVA boundary (proposed)
N
one mile

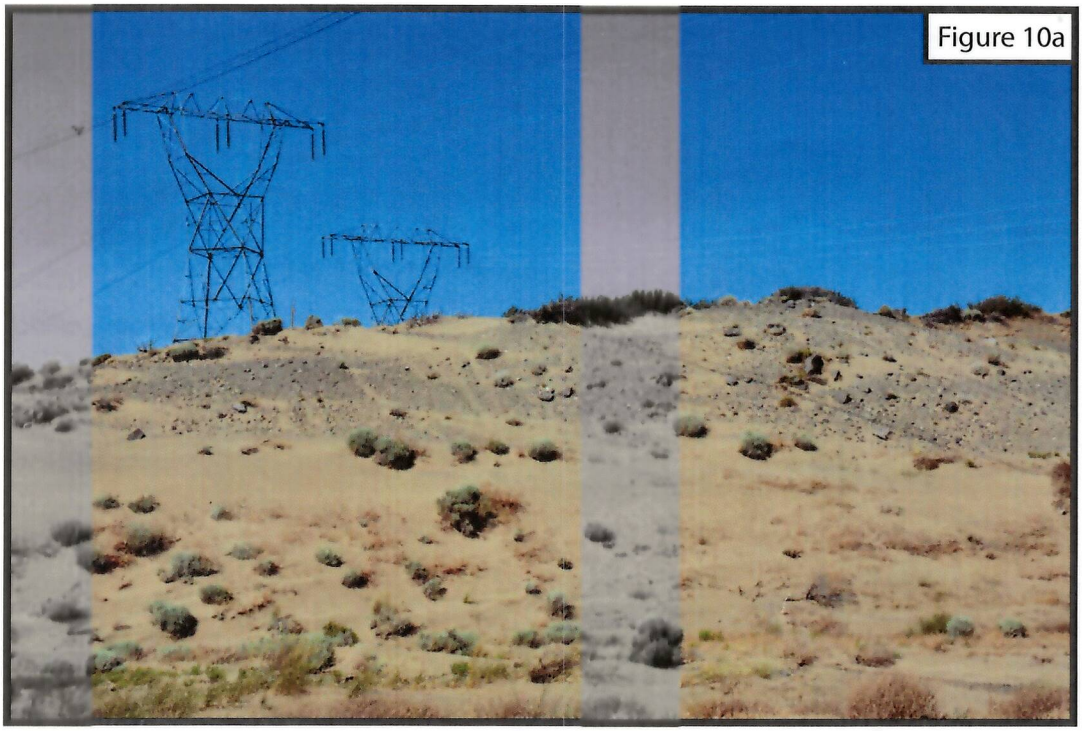
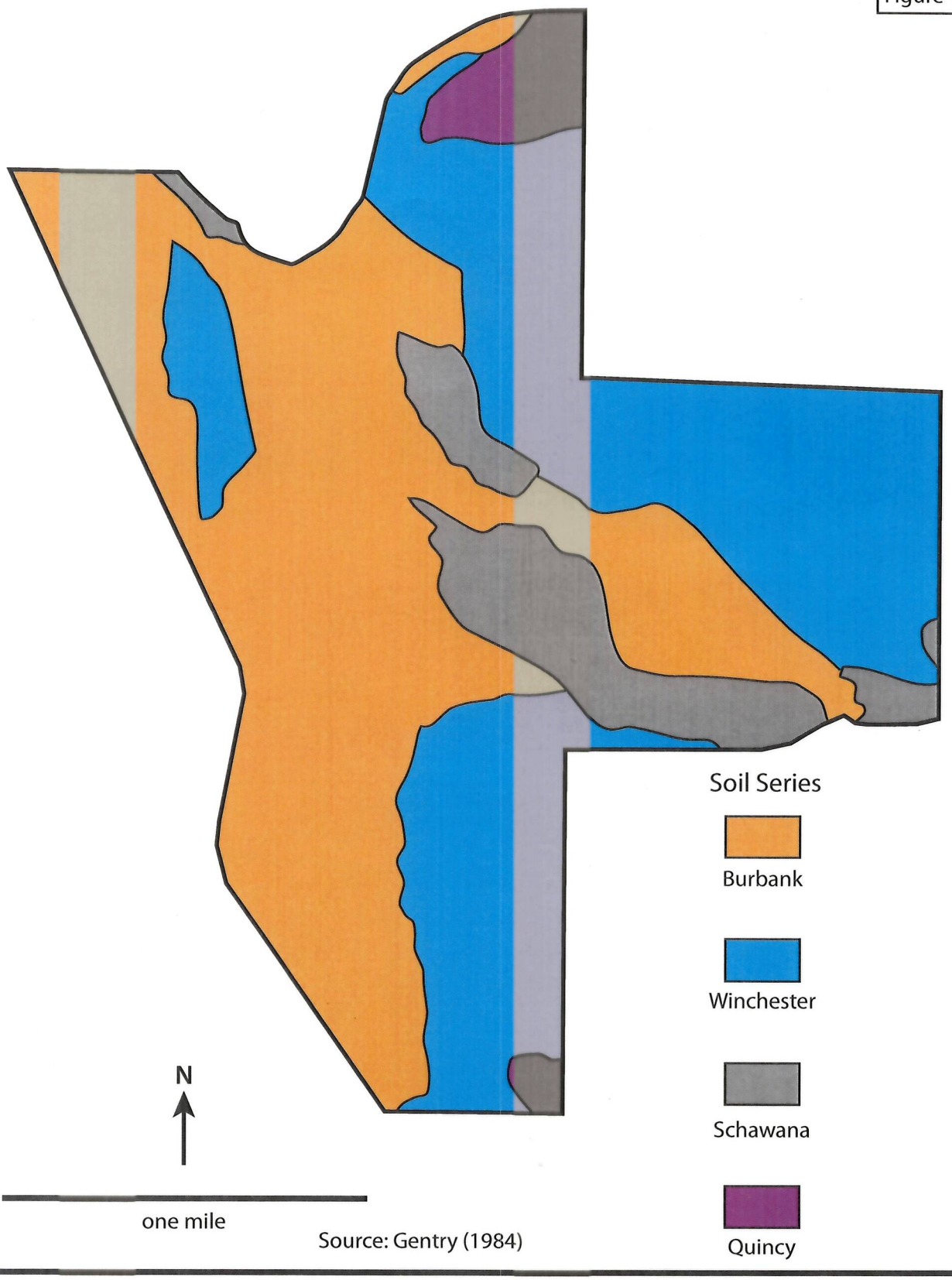


Figure 10a

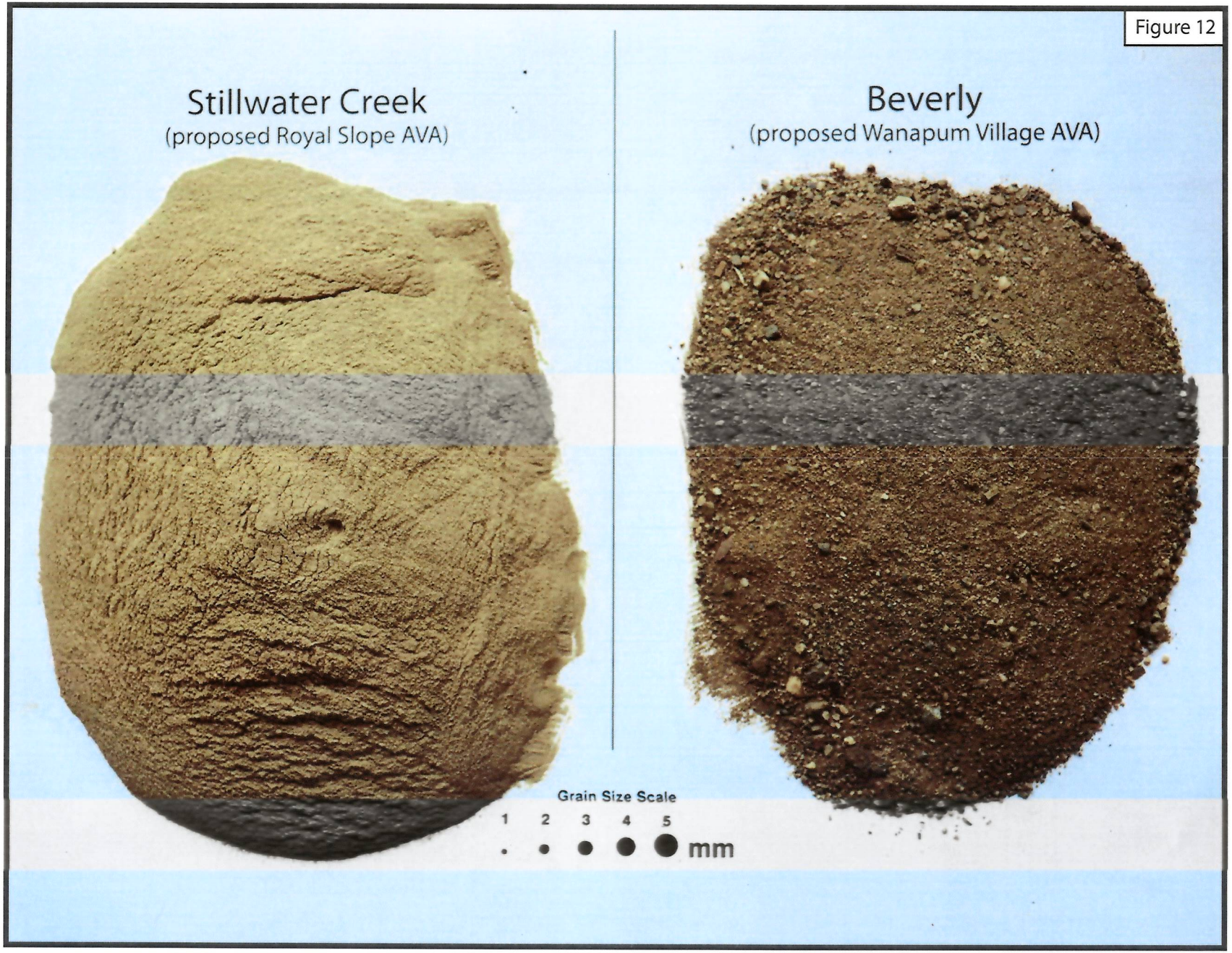

Figure 10b

Figure 11



Source: Gentry (1984)

Figure 12


Stillwater Creek
(proposed Royal Slope AVA)
Beverly
(proposed Wanapum Village AVA)
Grain Size Scale
1 2 3 4 5
mm

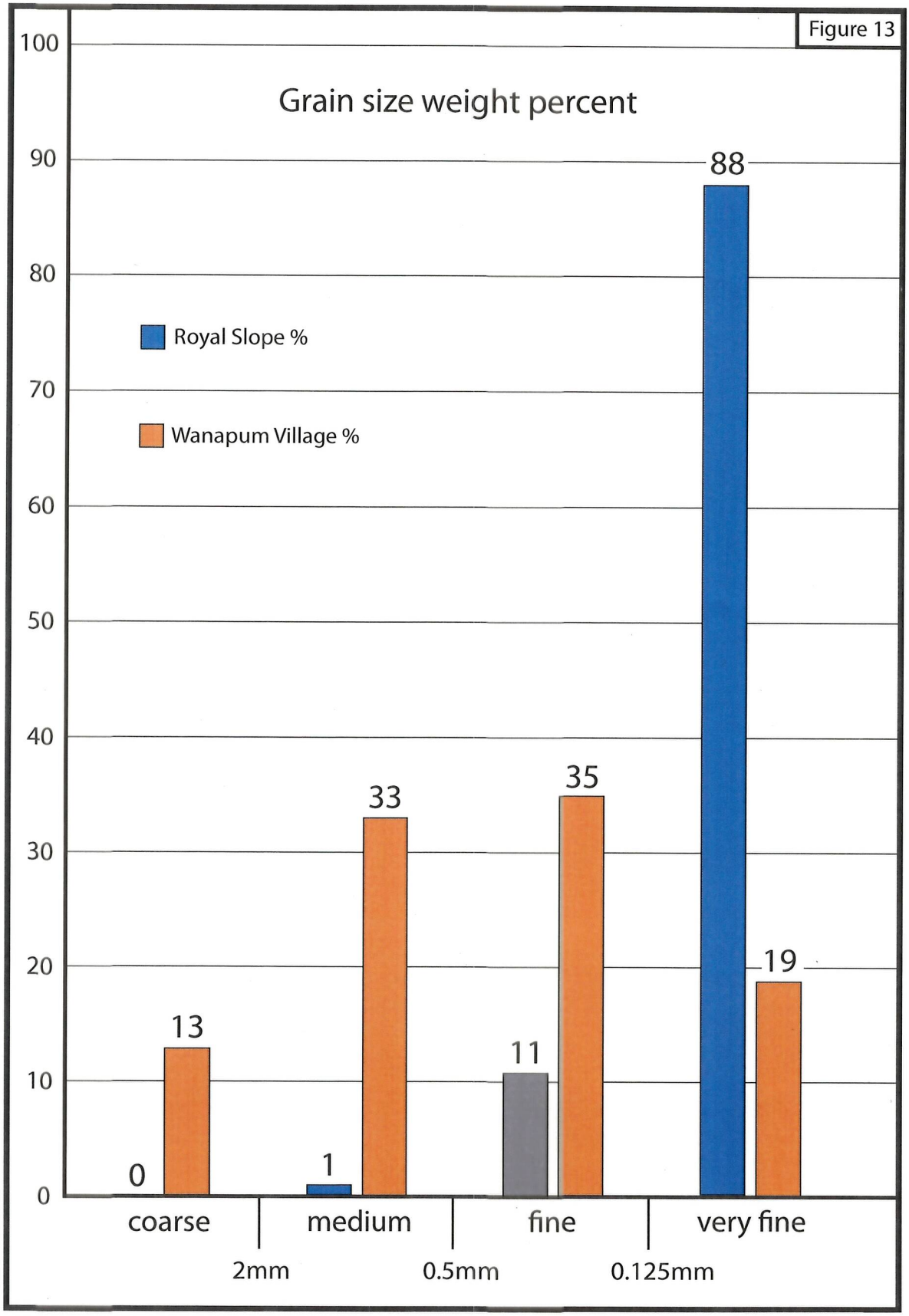


Figure 13
Grain size weight percent
100
90
80
70
60
50
40
30
20
10
0
Royal Slope %
Wanapum Village %
0
13
1
33
11
35
88
19
coarse
medium
fine
very fine
2mm
0.5mm
0.125mm

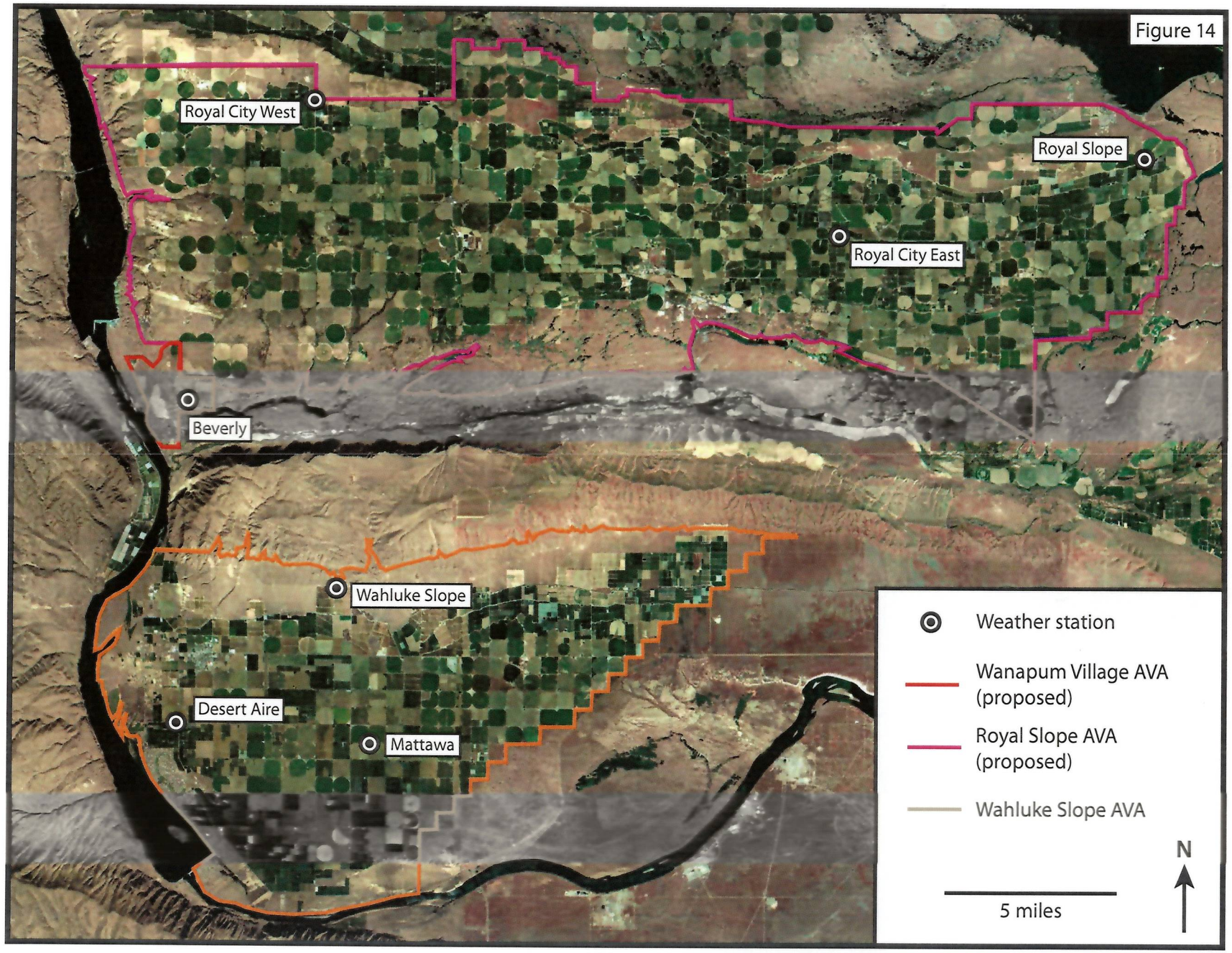


Figure 14
Royal City West
Royal Slope
Royal City East
Beverly
Wahluke Slope
Desert Aire
Mattawa
Weather station
Wanapum Village AVA (proposed)
Royal Slope AVA (proposed)
Wahluke Slope AVA
N
5 miles

TABLE 1

Station	Year	Elev	Avg GST	Avg Max	Avg Wind	Avg Max Wind	GDD
Beverly	2015	680	71.8	85.9	7.1	27.3	2816
Beverly	2016	680	66.7	80.6	7.6	28.2	3593
Beverly	2017	680	66.1	78.6	7.6	26.8	3514
Beverly	2018	680	65.8	78.2	7.8	16.0	3415
Beverly avg			66.2	79.1	7.7	23.7	3507
Royal City East	2015	1120	67.0	80.4	3.6	12.3	2194
Royal City East	2016	1120	62.8	75.1	4.0	14.5	2784
Royal City East	2017	1120	62.5	75.4	2.7	13.7	2777
Royal City East	2018	1120	62.8	75.8	2.8	13.4	2817
Royal City East avg			62.7	75.4	3.2	13.9	2793
Royal City West	2015	1529	69.0	81.4	5.5	16.1	2461
Royal City West	2016	1529	64.0	76.2	5.4	16.1	3034
Royal City West	2017	1529	63.6	76.3	5.1	15.5	3022
Royal City West	2018	1529	64.0	76.6	5.2	15.6	3079
Royal City West avg			63.8	76.4	5.3	15.8	3045
Royal Slope East	2015	1350	68.5	79.3	5.5	16.0	2396
Royal Slope East	2016	1350	64.0	74.2	6.3	17.5	3041
Royal Slope East	2017	1350	64.0	74.5	6.2	17.6	3092
Royal Slope East	2018	1350	64.2	74.5	6.2	17.1	3099
Royal Slope East avg			64.1	74.4	6.3	17.4	3077
Desert Aire	2015	608	71.3	84.7	4.7	16.6	2750
Desert Aire	2016	608	67.1	79.7	5.2	17.5	3669
Desert Aire	2017	608	66.2	79.8	4.9	16.8	3519
Desert Aire	2018	608	66.6	79.9	5.0	17.0	3569
Desert Aire avg			66.6	79.8	5.1	17.1	3586
Mattawa	2015	851	69.2	83.2	4.5	16.1	2406
Mattawa	2016	851	65.0	78.0	5.6	18.2	3229
Mattawa	2017	851	64.3	78.4	5.0	16.7	3148
Mattawa	2018	851	64.8	78.3	5.5	18.0	3226
Mattawa avg			64.7	78.2	5.4	17.6	3201
Wahluke Slope	2015	1185	72.4	81.7	7.6	22.7	2885
Wahluke Slope	2016	1185	66.9	76.4	7.9	22.9	3637
Wahluke Slope	2017	1185	66.9	76.5	7.4	22.1	3667
Wahluke Slope	2018	1185	67.0	76.6	8.0	22.8	3675
Wahluke Slope avg			67.0	76.5	7.8	22.6	3660

TABLE 2 4 Year Averages

Station	Elev	Avg GST	Avg Max	Avg Wind	Avg Max Wind	GDD
Beverly	680	66.2	79.1	7.7	23.7	3507
Royal City East	1120	62.7	75.4	3.2	13.9	2793
Royal City West	1529	63.8	76.4	5.3	15.8	3045
Royal Slope East	1350	64.1	74.4	6.3	17.4	3077
Royal slope avg	1333	63.5	75.4	4.9	15.7	2972
Desert Aire	608	66.6	79.8	5.1	17.1	3586
Mattawa	851	64.7	78.2	5.4	17.6	3201
Wahluke Slope	1185	67.0	76.5	7.8	22.6	3660
Wahluke slope avg	881	66.1	78.2	6.1	19.1	3482

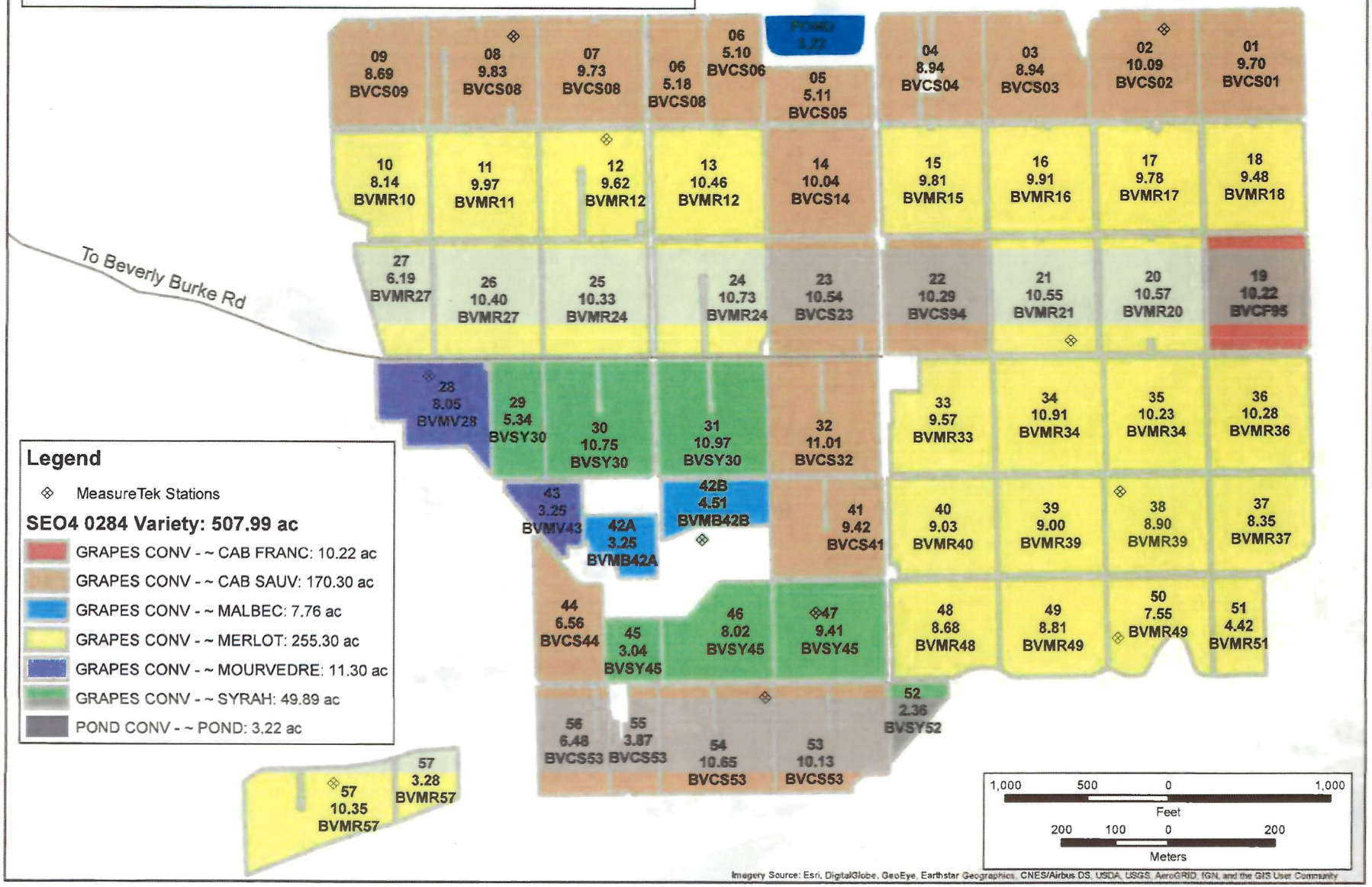
Appendices

Appendix 1

Zirkle FRUIT COMPANY

Beverly (Soaring Eagle 4)
17005 Beverly Burke Rd
Mattawa, WA 99349

N W E S
Date: 1/8/2018



Legend

- MeasureTek Stations

SEO4 0284 Variety: 507.99 ac

- GRAPES CONV - ~ CAB FRANC: 10.22 ac
- GRAPES CONV - ~ CAB SAUV: 170.30 ac
- GRAPES CONV - ~ MALBEC: 7.76 ac
- GRAPES CONV - ~ MERLOT: 255.30 ac
- GRAPES CONV - ~ MOURVEDRE: 11.30 ac
- GRAPES CONV - ~ SYRAH: 49.89 ac
- POND CONV - ~ POND: 3.22 ac

Appendix 1

Source:

https://www.statesmanexaminer.com/content/wildire-burning-southeast-vantage-near-wanapum-village

Wildfire burning southeast of Vantage, near Wanapum Village

By:
Roger Harnack
Publisher
publisher@statesmanexaminer.com
Tuesday, June 4, 2019

A wildfire that started about 8:53 p.m. Monday has grown to more than 3,000 acres and prompted evacuation warnings.

According to the Grant County Sheriff's Office, state fire assistance has been mobilized to assist with the "Highway 243 Fire."

The fire is burning in dry grass and sagebrush above Wanapum Village, a small housing are along state Highway 243 near Wanapum Dam.

On Monday night, a Level 3 fire evacuation notice was issued for residents of the Beverly-Burke Road area between the towns of Beverly and George. A Level 1 notice was also issued for Wanapum Village.

Level 1 and 2 notices remain in effect near the fire area.

This morning, the Sheriff's Office reported the fire was moving toward Royal City.

Washington State Patrol Chief John Batiste authorized the mobilization of state firefighting resources at 12:45 a.m. today at the request of Grant County Fire District No. 10 Chief Eric Linn.

The blaze is threatening homes, crops and infrastructure; the fire cause is under investigation.

A Type 3 incident management team has been assigned to manage the blaze and State Fire Marshal's Office personnel are en route.

Appendix 1

Source: https://fox28spokane.com/level-1-evacuation-for-wanapum-village-due-to-wildfire/

Level 1 Evacuation for Wanapum Village due to wildfire

by Fox 28 Spokane | @ | June 3, 2019 9:45 pm

WANAPUM VILLAGE – Grant County Sheriff's Office has issued a level 1 evacuation alert because of a wildfire.

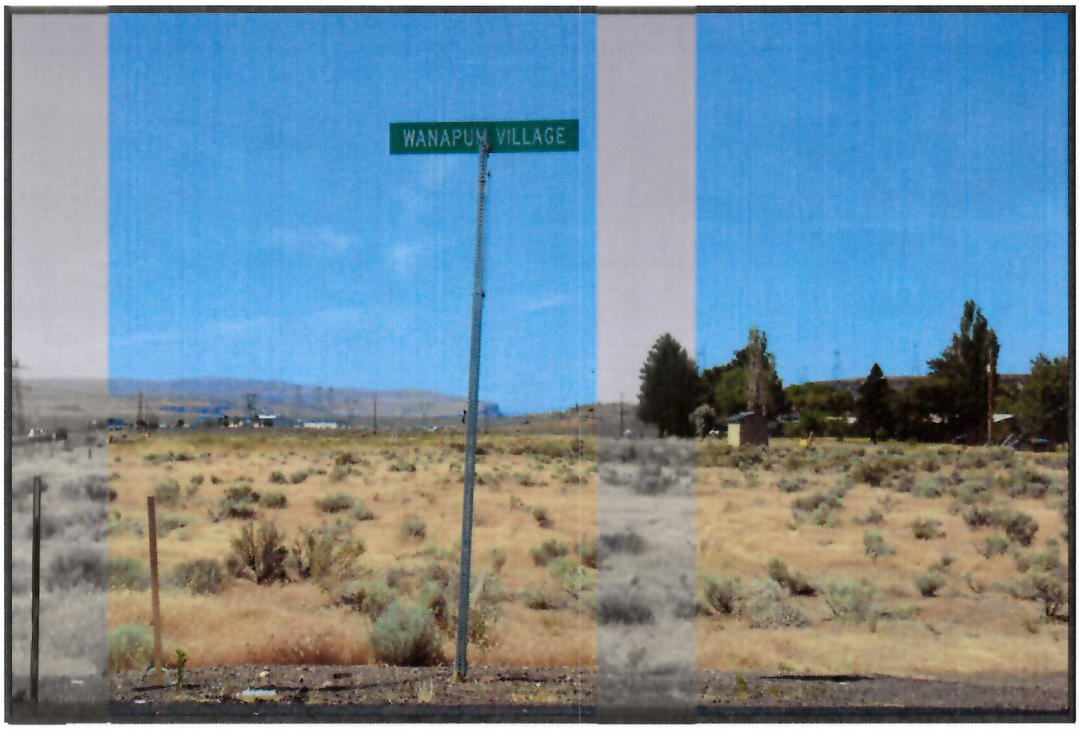
There is no immediate danger, but now is the time to get ready in case there is.

To prepare for a higher level evacuation, you should assemble the following emergency supplies:

- Clothing for your family for several days
- Bedding, pillows, and towels
- Prescription medicines & spare eyeglasses
- Soap and toiletries
- Baby food and diapers
- Your address book or list of important telephone numbers
- Your checkbook, credit cards, and cash
- Your driver's license and identification cards
- A portable radio and flashlight.

More information, including updates, can be found on the Grant County Sheriff's Office website.

Appendix 1



Appendix 1

Zirkle buying Wanapum Village

- Dan Wheat
- Nov 17, 2016

Wanapum Village, north of Beverly, Wash., on Nov. 16, is being sold by Grant County PUD to Zirkle Fruit Co., possibly for farmworker housing.

Dan Wheat/Capital Press

https://www.capitalpress.com/state/washington/zirkle-buying-wanapum-village/article_0a3451e8-2b06-57b7-bc62-3338c5ee234a.html

BEVERLY, Wash. — One of the largest tree fruit companies in Washington, Zirkle Fruit Co., Selah, is buying Wanapum Village from Grant County Public Utility District for $4 million.

PUD commissioners approved the sale Oct. 25, pending approval of the Federal Energy Regulatory Commission, which is likely by the end of November, said Chuck Allen, PUD spokesman.

Mark Zirkle, president of Zirkle Fruit Co., declined comment on the company's plans for the village, but Mattawa-area orchardists believe it will be used for farmworker housing.

Wanapum Village consisted of a school and employee housing built in 1960 when Wanapum and Priest Rapids dams were under construction, Allen said.

It is north of the town of Beverly, about a mile south of Wanapum Dam and consists of 75 acres, 30 vacant modest single-family homes and a 17,600-square-foot former school that was used as an office building, Allen said. It includes a water system but the sewer system is not on the property so the new owner will have to build a new one, he said.

The office housed engineers for the dam but the PUD built a new office for them closer to the dam and decided to sell the village last January, Allen said.

The property was listed for sale in June, four offers were received and after negotiations the PUD accepted Zirkle's offer, an Oct. 5 PUD memorandum states.

Zirkle Fruit Co. owns orchards throughout much of Central Washington. The company hired 2,889 H-2A visa foreign guestworkers in 2015, according to the U.S. Department of Labor. Employers who hire H-2A workers are required to provide housing.

Zirkle said he expects to hire about the same number of H-2A workers next year or slightly more.

Appendix 1

Wildfire Incident Information

Back to fire map

Wanapum Village

FIRE

30 mi

NE of Yakima, WA

29.0

acres

4 months ago

reported

Fire Status:	CONTROLLED
Last Updated:	3 months ago
Incident #:	2021-WASPD-000278
Fire Start:	Wednesday, June 30, 2021 1:05 PM PDT
Fuels:	Grass, Shrub
Dispatch Notes:	Contain: 06/30/21 2030 | Control: 07/01/21 1554

Primary Fire Agency
Bureau of Land Management — Spokane District

Current Weather

No current weather available

Fire Growth Potential

Multiple Fires In Wanapum Area May Be Intentional

- Kyle Lamb
- June 30, 2021

Crews from the Bureau of Land Management, US Fish and Wildlife and the DNR battle three separate fires in the same relative area Wednesday.

Central Washington Incident Command Center Assistant Manager of Operations Josh Gibbs said the first incident, titled the Wanapum Village Fire, burned about two acres south of Wanapum Village.

“Once they got on scene they discovered that there was another fire.” Gibbs stated, “That one they called the Village Fire. It was approximately two acres as well.”

The Village Fire was located directly west of Wanapum Village.

Further south crews were challenged once again by the Beverly Fire. That blaze grew to about 5 acres before it was contained.

According to our news partner iFIBER ONE, authorities believe the fires were human-caused with the points of ignition occurring just off the highway. A trailer in the Beverly area appeared to be on fire on the side of the road based on a photo taken by the Grant PUD.

https://www.kpq.com/multiple-fires-in-wanapum-area-may-be-intentional/

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D. C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 2114-285 – Washington
Priest Rapids Hydroelectric Project
Public Utility District No. 2 of Grant County, Washington

November 10, 2016

Mr. Kevin Nordt
General Manager
Public Utility District No. 2 of Grant County
P.O. Box 898
Ephrata, WA 98823

Mr. Rex Buck, Jr.
Priest Rapids Band of Wanapum Indians
Wanapum Heritage Center
14352 Highway 243S
Beverly, Washington 99321

Mr. Guy Moura
Tribal Historic Preservation Officer
Confederated Tribes of the Colville Reservation
P.O. Box 150
Nespelem, WA 99155

Mr. Johnson Meninick
Cultural Resources Program Manager
Confederated Tribes and Bands of the Yamaka Nation
P.O. Box 151
Toppenish, WA 98948

Subject: Executed Memorandum of Agreement

Dear Messrs. Nordt, Buck, Moura, Meninick:

Enclosed is the executed Memorandum of Agreement (MOA) for the Priest Rapids Hydroelectric Project No. 2114. The Public Utility District No. 2 of Grant County (Grant PUD) plans to remove 75.59 acres from the project boundary, which

includes the Wanapum Village Housing Development, a contributing feature to the Wanapum Village, which is eligible for listing in the National Register of Historic Places. The Wanapum Village includes 30 middle-century homes and a schoolhouse, which are components of the Priest Rapids Hydroelectric Project. The Priest Rapids Project is located on the mid-Columbia River in portions of Grant, Yakima, Kittias, Benton, and Chelan counties, Washington, and includes the Wanapum and Priest Rapids developments. The project occupies federal lands managed by the Bureau of Reclamation, the Bureau of Land Management, the U.S. Department of the Army, U.S. Fish and Wildlife Service, and the U.S. Department of Energy.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470f), and its implementing regulations at 36 C.F.R § 800.5(a)(2)(vii), we have determined that this Undertaking would have an adverse effect on the historic property since it would be removed from the Commission's oversight. Grant PUD and the Washington State Historic Preservation Office (Washington SHPO), in conjunction with the Commission, have consulted and developed a plan to mitigate the adverse effect to the historic property and have included it in the enclosed MOA. In addition, Grant PUD has consulted and included the following Tribes as concurring parties to the MOA: Priest Rapids Band of Wanapum Indians, the Confederated Tribes of the Colville Reservation, and Confederated Tribes and Bands of the Yamaka Nation.

The Commission reviewed the MOA and forwarded it on October 14, 2016 to the Advisory Council on Historic Preservation (Council) notifying the Council of the adverse effect and requested that the Council notify us if they wished to participate within 15 days. The Council has not replied. Therefore, we have determined that the Council has no comments and the MOA can be executed. On November 2, 2016, the Washington SHPO filed a copy of the MOA with the Commission that they signed on October 24, 2016. The Commission then executed the MOA, by signature, on November 10, 2016. By this letter, we are now inviting all concurring parties to sign the MOA. Once we have received all signatures from the concurring parties, we will forward you a copy of the final executed MOA for your files.

The Commission strongly encourages electronic filing. Please file the requested information using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426. The first page of any filing should include docket number P-2114-285.

In order to permit the licensee to begin mitigation work in a timely fashion, we also ask that you either fax the signature page to Jennifer Polardino at (202) 219-2732 or sign, scan, or e-mail the signature page to Jennifer Polardino at

jennifer.polardino@ferc.gov. If you have any questions concerning this matter, please contact Jennifer Polardino at (202) 502-6437.

Sincerely,

Jennifer Hill

Jennifer Hill
Director
Division of Hydropower Administration
and Compliance

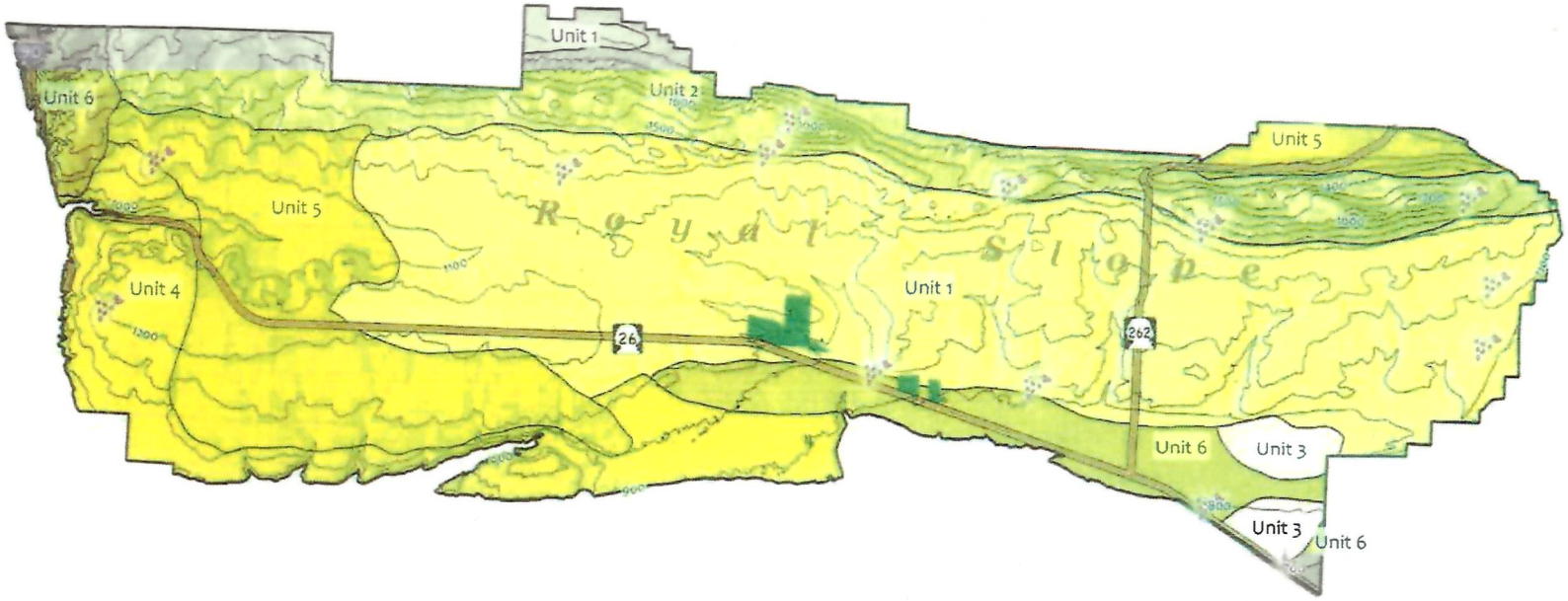
Enclosure: Executed Memorandum of Agreement

Cc:

Ms. Allyson Brooks, Ph.D
Washington State Historic Preservation Officer
Department of Archaeology and Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

Mr. Ross Hendrick
License Compliance Manager
Public Utility District No. 2 of Grant County
P.O. Box 898
Ephrata, WA 98823

Figure 7. Proposed Royal Slope AVA Soils



0 10 20 30 miles N

Vineyard
Winery
100 ft Contours
AVA Boundary

Roads
City
County
Highways

Royal City

Soil Units

1. Very deep (> 60") soils from loess over layered sands and silts from outburst floods
2. Very deep (> 60") soils from mixed eolian sediments; a few soils have a substratum of layered outburst-flood sands, silts, or gravels
3. Very deep (> 60") soils from outburst-flood sands and gravels with smaller areas of sand dunes
4. Very shallow (< 10") soils from eolian sands over basalt bedrock with small areas of deep eolian sands
5. Shallow to moderately deep (10" - 40") soils from eolian sand, sandy to silty alluvium or loess over a cemented hardpan
6. Very shallow to moderately deep (< 10" - 40") soils on hillslopes from loess and colluvium over basalt bedrock with areas of basalt outcrop

Scale: 1:210,000
Map Projection: Universal Transverse Mercator (NAD 1983)
Map prepared by Richard Rupp, Palouse Geospatial
February 2017

Busacca and Rupp (2017)

Soil map units were derived from the Digital General Soil Map of the U.S. produced by the U.S. Department of Agriculture, Natural Resources Conservation Service. Background map is from the U.S. Geological Survey TNM Topo Base Map.

Appendix 2

Table 3. Acreages and Percentages of Soil Association Units and of General Soil Map Units in Figure 7

General Soil Map Unit in Figure 7	Component Soil Series in Soil Association Units Grouped into General Soil Map Units of Figure 7 with STATSGO2 Map Unit Symbol in parentheses	Dominant Soil Order of Named Series in STATSGO2 Soil Association Units	Acres in Each Soil Series Group	Percentage of Soil Association Unit in Proposed AVA	Total Acres in General Soil Map Unit	Percentage of General Soil Map Unit in Proposed AVA
1. Very deep (> 60") soils from loess and loess over layered sands and silts from outburst floods	Schawana-Quincy (s8445)	Entisol	18.2	0.01	68960.3	44.1
	Starbuck-Rock outcrop-Prosser-Bakeoven (s8444)	Aridisol	84.4	0.05		
	Warden-Prosser-Neppel (s8428)	Aridisol	1765.3	1.13		
	Quincy-Hezel-Burbank (s8383)	Entisol	15.6	0.01		
	Warden-Sagemoor-Kennewick (s8435)	Aridisol	67076.8	42.89		
2. Very deep (> 60") soils from mixed eolian sediments; a few of the soils have a substratum of layered outburst flood sands, silts, or gravels	Adkins (s8448)	**Aridisol**	24748.8	15.83	**25698.3**	**16.4**
	Quincy-Hezel-Burbank (s8383)	Entisol	915.1	0.59		
	Koehler-Ekrub (s8441)	**Aridisol**	**34.4**	0.02		
3. Very deep (> 60") soils from outburst-flood sands and gravels with smaller areas of sand dunes	Malaga-Ephrata (s8439)	Aridisol	1259.2	0.81	2834.3	1.8
	Timmerman-Taunton-Quincy (s8436)	Aridisol	1575.1	1.01		
4. Very shallow (< 10") soils from eolian sands over basalt bedrock with small areas of deep eolian sands	Quincy-Hezel-Burbank (s8383)	Entisol	10.2	0.01	**18955**	**12.1**
	Schawana-Quincy (s8445)	Entisol	18925.2	12.10		
	Water (s8369)		19.6	0.01		
5. Shallow to moderately deep (10" - 40") soils from eolian sand, sandy to silty alluvium or loess over a cemented hardpan	Koehler-Ekrub (s8441)	Aridisol	18719.4	11.97	26360.8	16.9
	Taunton-Scoon (s8440)	Aridisol	7641.4	4.89		
6. Very shallow to moderately deep (< 10" - 40") soils on hillslopes from loess and colluvium over basalt bedrock with areas of basalt outcrop	**Starbuck-Rock outcrop-Prosser-Bakeoven (s8444)**	Aridisol	13521.4	8.65	13580.4	8.7
	Schawana-Quincy (s8445)	Entisol	59	0.04		
Totals			**156389.1**	**100.00**	**156389.1**	**100.0**

Busacca and Rupp (2017)

Appendix 2

Appendix 2

41. Beverly Bar

"The Beverly bar is defended by scabland at the upstream angle between the Columbia River and Crab Creek and originally made a dam across the mouth of the creek valley."

Bretz, Smith and Neff (1956)

Feature: Giant flood bar

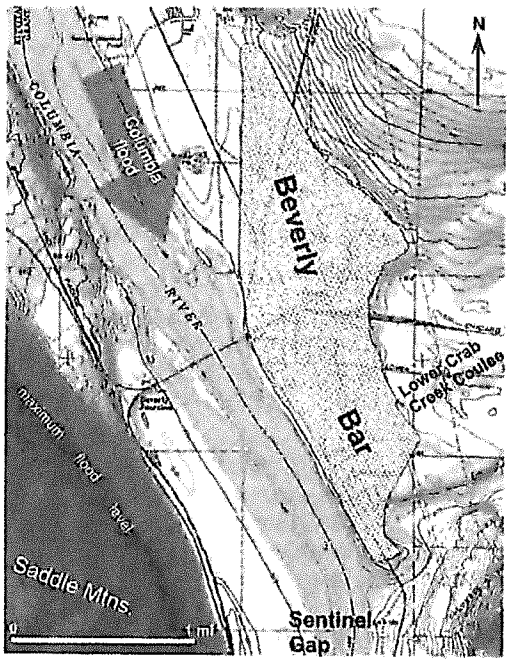
Best Observation Points:

Automobile: Along Lower Crab Creek Road, at Beverly, 0 to 2 miles east of intersection with SR 243

Aircraft: Leg 3 of Othello-Quincy Cataracts-Columbia River Aerial Tour (see Chapter 9)

Elevation: 475-600 feet

Beverly Bar is a longitudinal flood bar that parallels the east side of the Columbia River (Figure 4-20). The last Ice Age flood coming down the Columbia Valley formed this bar. The bar built up across the mouth of Lower Crab Creek Coulee and therefore must be younger than the last Scabland flood coming down this coulee from the east. If a Scabland flood had occurred after the flood that formed Beverly Bar, the bar surely would have been destroyed by such a flood coming down Lower Crab Creek Coulee (No. 40).



Basemap created with TOPO!© www.nationalgeographic.com/topo.

Figure 4-20. Beverly Bar at the mouth of Lower Crab Creek Coulee. It formed from a late flood confined to the Columbia River Valley, sometime after the last Missoula flood.

The tallest part of Beverly Bar is 125 feet at its north end and gently slopes southward. Silt deposits blanket older coarse-grained flood deposits in the lower Crab Creek, indicating the area behind the bar was a quiet-water area during the last flood(s) that backflooded the valley from the west. Lower Crab Creek has since cut a narrow 40-foot-deep ravine across the southern end of Beverly Bar (Figure 4-20).

Likely, the same flood that created the West Bar Giant Current Ripples (No. 30), 30 miles upriver, also created Beverly Bar. Both features formed after the last Missoula flood during a time when the

source: Bjornstad, 2006

132.8 (213.8) Lower Crab Creek drains the Othello Basin, which lies between the Frenchman Hills and the Saddle Mountains (Bretz et al., 1956; Bjornstad, 2006). Notice that, unlike the Quincy Basin, no steep, receding cataract canyons exist here where Crab Creek joins the Columbia River. This is because Crab Creek, and periodically the Columbia River during the Pleistocene, have occupied the valley. As a result, lower Crab Creek Valley descends gradually along its length, ultimately joining the river just north of Sentinel Gap. A single underfit stream exists. The stream is flanked by some remarkable scabland stretching eastward up to Drumheller Channels and beyond.

Scabland floods alone scoured out lower Crab Creek Coulee. Like the Frenchman Hills to the north, the Saddle Mountains were too high for the floods to go over; water was forced to flow laterally along the north side of the ridge. As floodwater rushed to Sentinel Gap, it scoured and stripped clean the steep, north side of the Saddle Mountains, especially at the far west end (Fig. 19).

Between Scabland floods, when the Okanogan ice lobe blocked the Columbia River and formed glacial Lake Columbia, the river was diverted through Grand Coulee and lower Crab Creek (Fig. 6). After the Okanogan lobe retreated, the Columbia stopped flowing through Grand Coulee, returning to its current path through the Okanogan highlands and south through Wenatchee.

Cumulative Miles (km)	*Description*
134.8 (217.0)	**Beverly Bar** is a longitudinal flood bar that parallels the east side of the Columbia River (Bretz et al., 1956; Atwater, 1987; Bjornstad, 2006). The bar was formed by the last Ice Age flood coming down the Columbia Valley. The bar built up *across* the mouth of lower Crab Creek Coulee and consequently must be younger than the last Scabland flood coming down the coulee from the east (Fig. 20). If a Scabland flood had occurred after the flood that formed Beverly Bar, the bar surely would have been truncated or destroyed.

Likely, the same flood that created the West Bar giant current ripples (Stop 1-4), 50 km upriver, created Beverly Bar. Both features formed after the last Missoula flood during a time when the Okanogan ice lobe had retreated northward and no longer diverted floodwaters onto the Channeled Scabland. Such a flood most likely occurred during the sudden draining of glacial Lake Columbia during breakup of the Okanogan lobe, which at last allowed floodwaters to drain directly down the Columbia Valley instead of across the Channeled Scabland (Bretz, 1969; Waitt, 1994; Bjornstad, 2006) (Fig. 6).

Source: Bjornstad et al., 2007

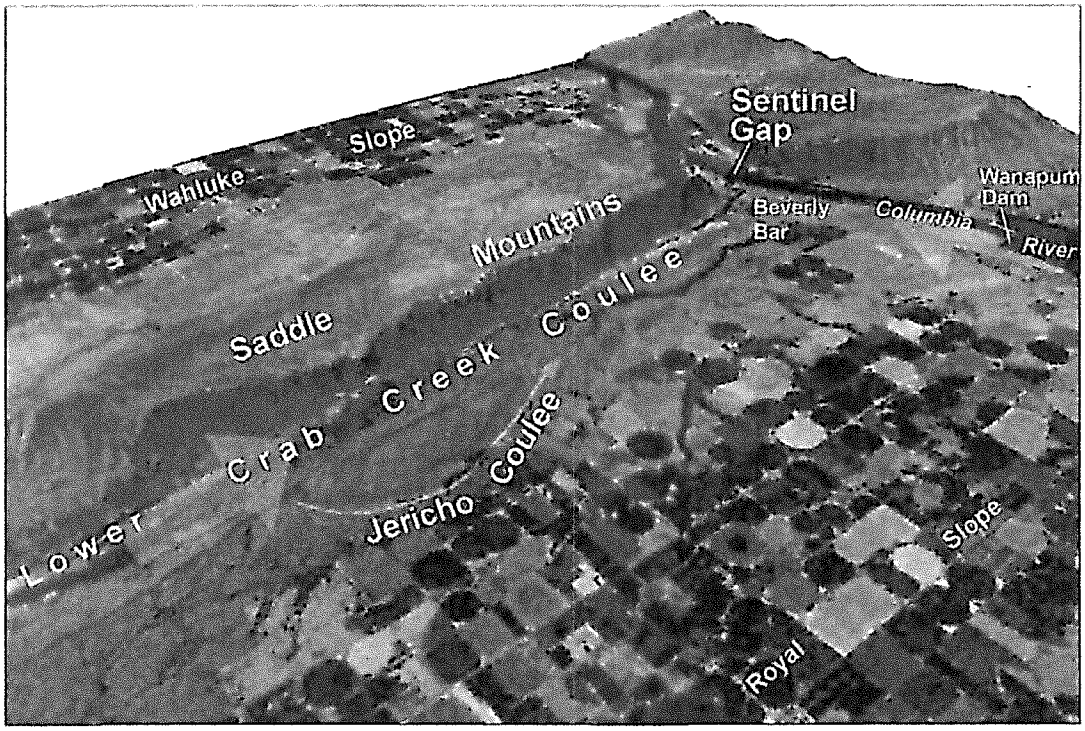


Figure 19. Lower Crab Creek Coulee and nearby features, looking southwest. Ice Age floods coming down the Columbia River Valley and off the Scabland escaped through Sentinel Gap.

Appendix 3

BURBANK SERIES

source: https://soilseries.sc.egov.usda.gov/OSD_Docs/B/BURBANK.html

The Burbank series consists of very deep, excessively drained soils formed in basaltic glacial outwash or alluvium. Burbank soils are on terraces and terrace escarpments. Slopes are 0 to 60 percent. The mean annual precipitation is about 7 inches and the mean annual temperature is about 53 degrees F.

TAXONOMIC CLASS: Sandy-skeletal, mixed, mesic Xeric Torriorthents

TYPICAL PEDON: Burbank loamy sand - grassland. (Colors are for dry soil unless otherwise noted.)

A--0 to 5 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; single grained; loose; many roots; 5 percent pebbles; slightly alkaline (pH 7.4); gradual wavy boundary. (0 to 5 inches thick)

Bw--5 to 16 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; single grained; loose; few roots; 10 percent gravel; slightly alkaline (pH 7.6); gradual wavy boundary. (10 to 24 inches thick)

Bk1--16 to 30 inches; light brownish gray (10YR 6/2) very gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; single grained; loose; few roots; about 45 percent pebbles, some with lime-silica coatings on the lower side; strongly effervescent; slightly alkaline (pH 7.8); abrupt wavy boundary. (10 to 20 inches thick)

Bk2--30 to 35 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose; about 85 percent pebbles and cobbles, some completely coated with lime-silica; violently effervescent; moderately alkaline (pH 8.3); gradual wavy boundary. (4 to 20 inches thick)

Bk3--35 to 60 inches; dark gray (10YR 4/1) extremely gravelly sand, very dark gray (10YR 3/1) moist; single grained; loose; about 85 percent pebbles and cobbles; some coated with lime-silica on lower side; strongly effervescent; slightly alkaline (pH 7.8).

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 52 to 56 degrees F. These soils are usually dry when the soil temperature is above 41 degrees F., and are moist during the winter and spring. The particle-size control section (10 to 40 inches) is coarse sand to loamy fine sand and averages 35 to 75 percent coarse fragments. Dark colors are inherited from

the basaltic parent materialand organic matter content is less than 1 percent throughout. Reaction is slightly alkaline or moderately alkaline.

GEOGRAPHIC SETTING: Burbank soils are on terraces and terrace escarpments at elevations of 300 to 1,300 feet. Slopes are 0 to 60 percent. The soils formed in basaltic gravelly and cobbly glacial outwash alluvial deposits mantled by a mixture of alluvium and eolian sand. The climate is arid; summers are hot and dry and winters are cool and moist. The mean annual precipitation is 6 to 9 inches. The average January temperature is 30 degrees F. The average July temperature is 76 degrees F. The mean annual temperature is 49 to 53 degrees F. The frost-free season is 140 to 200 days.

DRAINAGE AND PERMEABILITY: Excessively drained; very slow to medium runoff; rapid permeability.

REMARKS: Diagnostic horizons and features recognized in this pedon are an ochric epipedon from 0 to 5 inches, a zone of carbonate removal from 5 to 16 inches, and a zone of carbonate and silica accumulation from 16 to 35 inches.

Appendix 3

QUINCY SERIES

source: https://soilseries.sc.egov.usda.gov/OSD_Docs/Q/QUINCY.html

The Quincy series consists of very deep, excessively drained soils formed in sands on dunes and terraces. Slopes are 0 to 65 percent. The mean annual precipitation is about 10 inches and the mean annual temperature is about 52 degrees F.

TAXONOMIC CLASS: Mixed, mesic Xeric Torripsamments

TYPICAL PEDON: Quincy fine sand-grassland. (Colors are for dry soil unless otherwise noted.)

A--0 to 15 inches; grayish brown (10YR 5/2) fine sand, dark brown (10YR 3/3) moist; single grain; loose; many fine roots; porous; moderately alkaline (pH 8.0); clear wavy boundary. (0 to 20 inches thick)

C--15 to 60 inches; grayish brown (10YR 5/2) fine sand, dark brown (10YR 3/3) moist; single grain; loose; common fine and very fine roots; porous; slightly effervescent; moderately alkaline (pH 8.2).

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 50 to 57 degrees F, and the mean summer temperature is 66 to 78 degrees F. These soils are moist in the winter and spring but are dry more than one half of the time the soil temperature exceeds 40 degrees F., about 105 to 130 consecutive days. These soils are dry in all parts between depths of 7 and 20 inches. Hue is 10YR or 2.5Y. Value is 4 to 7 dry, 3 to 5 moist and chroma is 1 to 4 moist or dry. Organic matter in the surface horizon when mixed is less than 1 percent. The 10 to 40 inch particle-size control section ranges from sand to loamy fine sand. Less than 75 percent of the sand is very coarse, coarse, and medium if the clay content is less than 5 percent. If the clay content exceeds 5 percent, more than 75 percent of the sand fraction can be in the very coarse, coarse and medium size classes. The upper 15 inches of these soils is free of lime, except for small particles brought up by insects and animals. The matrix below 15 inches is noncalcareous in some pedons. Reaction in the upper 20 inches is slightly acid to moderately alkaline, and below 20 inches it is neutral to moderately alkaline. Some pedons have unconforming materials, including coarse sand, fine sandy loam, very fine sandy loam, silt loam, very gravelly sand, very gravelly loamy fine sand, at depths below 40 inches.

GEOGRAPHIC SETTING: Quincy soils are on uplands, fan piedmonts and terraces, some having a ridged, hummocky, or dune microrelief. Slopes range from 0 to 65 percent. Many of the low rounded ridges are narrow and long. These soils formed in sands from mixed sources, but contains significant amounts of dark colored basaltic sand. Elevations are 150 to 2,800 feet in

Washington and north-central Oregon, and 2,500 to 4,500 feet elsewhere. The climate is arid or semiarid and summers are dry. The mean annual precipitation is 6 to 12 inches. The mean annual air temperature is 47 to 53 degrees F. The frost-free season is 130 to 200 days in Washington and north-central Oregon, and 100 to 150 days elsewhere.

DRAINAGE AND PERMEABILITY: Excessively drained; very slow to moderate runoff; very rapid or rapid permeability. Substratum phases range from moderate to slow permeability.

REMARKS: Diagnostic horizons or features recognized in this pedon are:
Ochric epipedon
Particle-size control section - from 10 to 40 inches that is sandy throughout
Those pedons with bedrock or duripans between 40 and 60 inches previously included within the Quincy series concept, will no longer be considered with the series concept
Aridic soil moisture regime bordering xeric

Appendix 3

SCHAWANA SERIES

source: https://soilseries.sc.egov.usda.gov/OSD_Docs/S/SCHAWANA.html

The Schawana series consists of shallow, somewhat excessively drained soils formed in eolian deposits underlain by basalt. Schawana soils are on hillsides and benches and have slopes of 0 to 65 percent. The mean annual precipitation is about 7 inches and the mean annual temperature is about 51 degrees F.

TAXONOMIC CLASS: Loamy, mixed, superactive, nonacid, mesic Lithic Xeric Torriorthents

TYPICAL PEDON: Schawana cobbly loamy fine sand, rangeland. (Colors are for dry soil unless otherwise stated.)

C1--0 to 3 inches; brown (10YR 5/3) cobbly loamy fine sand, dark brown (10YR 3/3) moist; single grained; loose; many very fine roots; 15 percent cobbles, 20 percent pebbles; slightly alkaline (pH 7.8); clear wavy boundary. (1 to 4 inches thick)

C2--3 to 12 inches; brown (10YR 4/3) gravelly very fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable; many very fine and coarse roots; 25 percent pebbles; slightly alkaline (pH 7.8); abrupt wavy boundary. (4 to 17 inches thick)

2R--12 inches; basalt.

RANGE IN CHARACTERISTICS: Depth to basalt ranges from 8 to 20 inches. The mean annual soil temperature is 54 to 56 degrees F. The soils have an aridic moisture regime but are dry for less than 3/4 of the time that the soil temperature is 41 degrees F, or higher; and are moist during the winter. The particle-size control section averages 10 to 35 percent rock fragments. It has less than 1 percent and contains 3 to 8 percent clay organic matter throughout.

GEOGRAPHIC SETTING: Schawana soils are on benches and hillsides at elevations of 500 to 2,300 feet. Slopes are 0 to 65 percent. The climate is arid or semiarid with precipitation ranging from 6 to 9 inches. The mean annual temperature is 50 to 54 degrees F, and the frost free season is 140 to 180 days.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained; slow to rapid runoff; moderately rapid permeability.

REMARKS: Diagnostic horizons and features recognized in this pedon are: an ochric epipedon from the surface to 12 inches and a lithic contact at 12 inches.

Appendix 3

WINCHESTER SERIES

Source: https://soilseries.sc.egov.usda.gov/OSD_Docs/W/WINCHESTER.html

The Winchester series consists of very deep, excessively drained soils formed in sandy alluvial and eolian sand or glacial outwash. Winchester soils are on terraces, dunes, and terrace escarpments. Slopes are 0 to 65 percent. The average annual precipitation is about 8 inches and the mean annual temperature is about 51 degrees F.

TAXONOMIC CLASS: Mixed, mesic Xeric Torripsamments

TYPICAL PEDON: Winchester sand - grassland. (Colors are for dry soil unless otherwise stated.)

A--0 to 8 inches; grayish brown (10YR 5/2) sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; few roots; slightly alkaline (pH 7.8); diffuse smooth boundary. (5 to 15 inches thick)

C1--8 to 26 inches; dark gray (10YR 4/1) coarse sand, black (10YR 2/1) moist; single grain; loose; few roots; moderately alkaline (pH 8.0); gradual wavy boundary. (15 to 35 inches thick)

C2--26 to 60 inches; gray (10YR 5/1) coarse sand, very dark gray (10YR 3/1) moist; single grain; loose; few roots; few lime lenses 1/2 to 3/4 inch thick; slightly effervescent; moderately alkaline (pH 8.3).

RANGE IN CHARACTERISTICS: The mean annual soil temperature at a depth of 20 inches ranges from 50 to 59 degrees F. These soils are usually moist in late fall, winter and early spring but are dry more than one-half of the time the soil temperature is more than 40 degrees F. These soils are usually dry in all parts between depths of 12 and 35 inches for about 105 to 130 consecutive days. The particle-size control section is coarse sand or sand and averages more than 75 percent very coarse, coarse, and medium sand, 0 to 5 percent clay and 0 to 15 percent coarse fragments. The soils are free of lime in the upper 20 to 30 inches. Reaction is slightly acid to moderately alkaline in the upper 20 to 30 inches; and neutral to moderately alkaline below.

The A horizon contains less than 1 percent organic matter. It has hue of 10YR or 2.5Y value, 4 through 7 moist, chroma of 1 through 4 dry or moist.

The C horizon has hue ranging from 7.5YR through 2.5Y, value of 4 through 7 dry, 2 through 7 moist, and chroma of 1 through 4 dry or moist. The lower part of the particle-size control section is multicolored in some pedons. The upper part of the particle-size control section is loamy coarse sand in some pedons.

GEOGRAPHIC SETTING: Winchester soils are on terraces, dunes and terrace escarpments. Some terrace surfaces are hummocky or ripple-marked. Slopes are 0 to 65 percent. The soils formed in sandy alluvial and eolian sand or glacial outwash. Sands are predominantly of basalt origin. Elevations are 350 to 1,900 feet in Washington and Oregon, and from 2,500 to 4,500 feet in Idaho. Summers are warm and dry and winters are cool. Average annual precipitation ranges from 4 to 12 inches. Average January temperature is about 27 degrees F., average July temperature is about 77 degrees F., and average annual air temperature is 49 to 53 degrees F. The frost-free season is 110 to 200 days.

DRAINAGE AND PERMEABILITY: Excessively drained; very slow and slow runoff; rapid permeability.

REMARKS: Diagnostic horizons and features recognized in this pedon are an ochric epipedon from the surface to 8 inches and a particle-size control section from 10 to 40 inches that is sandy throughout.

AMERICAN APPELLATION VITICULTURE AREA FOR EASTERN AND SOUTH CENTRAL WASHINGTON

TO BE KNOWN AS —

Appendix 4

"COLUMBIA VALLEY"

Clore (1982)

The appellation conditions of the "Columbia Valley" viticulture area are defined as follows:

150 frost free (32°F) or more growing days;

2,000 or more heat units (daily degrees above a mean of 50°F for April-October) (see Climatic Data and references 7,13,14,20,27,31,41,45);

Elevation not to exceed 2,000 feet;

Area rainfall not to exceed an annual average of 15 inches. (see Exhibit 1 - Map of Annual Precipitation & Climatic Data);

Two or more feet of such soil types as silt loam, fine sandy loam, sandy loam and loamy sands (ref. 25,35,36,37,38,43).

The viticulture area in Washington covers parts or all of the following counties: Klickitat, Yakima, Kittitas, Chelan, Okanogan, Douglas, Ferry, Stevens, Spokane, Lincoln, Grant, Adams, Whitman, Asotin, Garfield, Columbia, Walla Walla, Franklin and Benton. A narrative description of the viticulture boundaries and marked Geological Survey map (scale 1:500,000) is enclosed (Exhibit 2).

This area is distinguished by its broadly undulating or rolling surface, cut by rivers and broken by long sloping basaltic uplifts extending generally in an east-west direction, and a natural lack of native forests (ref. 5,15,18,23,24,25).

The Cascade Range borders the west side of the "Columbia Valley" keeping this area open and barren by intercepting most of the Pacific air moisture (ref. 5,25). On the north, this area is enclosed by the Okanogan Highlands, on the east, by the Greater Spokane Area, and the eastern portion of the high rolling Palouse Prairie. The south side is bordered by the Blue Mountains, Oregon and the Columbia River. The area surrounding the "Columbia Valley" viticulture area is forested, except for the immediate southside. For these bordering areas, elevations generally exceed 2,000 feet, rainfall exceeds 15 inches annually, the growing season is less than 150 frost free days and heat units fall below 2,000 degrees (see precipitation map and climatic data).

Chardonnay, Pinot gris, and Pinot noir require average GDD to be above about 2000 (the lowest value for Winkler 'Region I' areas) in order to ripen their fruit fully.

CCVSI was developed by research viticulturists at Cornell University and is the sum of the continuous number of days from the last occurrence of temperatures of 29°F or lower in the Spring until the first occurrence of temperatures of 29°F or lower in the Fall. It can be thought of as a kind of 'extended growing season' measured between hard freezes (temps <29°F) in spring and those in fall. Larger numbers of total days in this case correlate with better sites to fully mature and ripen *vinifera*, although no absolute minimum or maximum cutoff in CCVSI value is specified.

The three AWN stations within the proposed AVA have an 8-year average (2009-2016) of 2,900 GDD (Table 2), which classifies growing conditions within the AVA as being in Winkler grape climatic 'Region II' (2,501-3,000 GDD). Winkler Region II is excellent to grow and ripen consistently all but latest of late-season ripening grape varieties. In fact, interviews with grape growers in the RSAVA for this petition indicate that even late ripening varieties such as Cabernet Sauvignon, Petit verdot and others typically associated with the warmer Winkler Region III (3,001-3,500 GDD) have consistently ripened fully and produced medal-winning wines in their thirty or so years of experience.

Similarly, the average CCVSI for the three stations within the proposed AVA area indicates that there is a long season between hard freezes that averages 234 days. This means that the period from approximately early April until perhaps early November is typically devoid of hard freezes.

The proposed AVA boundary is correct when comparisons are made to GDD and CCVSI data from the nearest AWN stations to the north, east, and west of the AVA: stations to the *west* (Broadview), *east* (Othello), *and north* (Frenchman Hills) have GDDs that are about 350-900 GDD *less* than within the AVA and have CCVSI with about 30 to 70 *fewer growing-season days* on average than within the AVA (Table 2). That is, these areas are much colder and have a substantially shorter growing season. Further to the north at Quincy in the Ancient Lakes AVA the GDD and CCVSI are similar to the proposed AVA (Table 2).

The proposed AVA boundary is correct also when comparisons are made to the nearest AWN station to the *south*. This station at Desert Aire is in the Wahluke Slope AVA (Table 2) and is substantially different than within the proposed AVA, although in the opposite sense: the 8-year average GDD for Desert Aire in the Wahluke Slope AVA, about 15 miles south of the Royal Slope (Figures 1, 2) is about 600 GDD *higher or warmer* than the RSAVA and the average CCVSI is about 25 days *longer* than the proposed AVA. This classifies the Wahluke Slope AVA in the very warm to hot Winkler Region IV (3,500-4,000 GDD). The most important driver of the large differences in viticultural indices between the proposed