Petition to Establish the

Royal Slope American Viticultural Area Washington State

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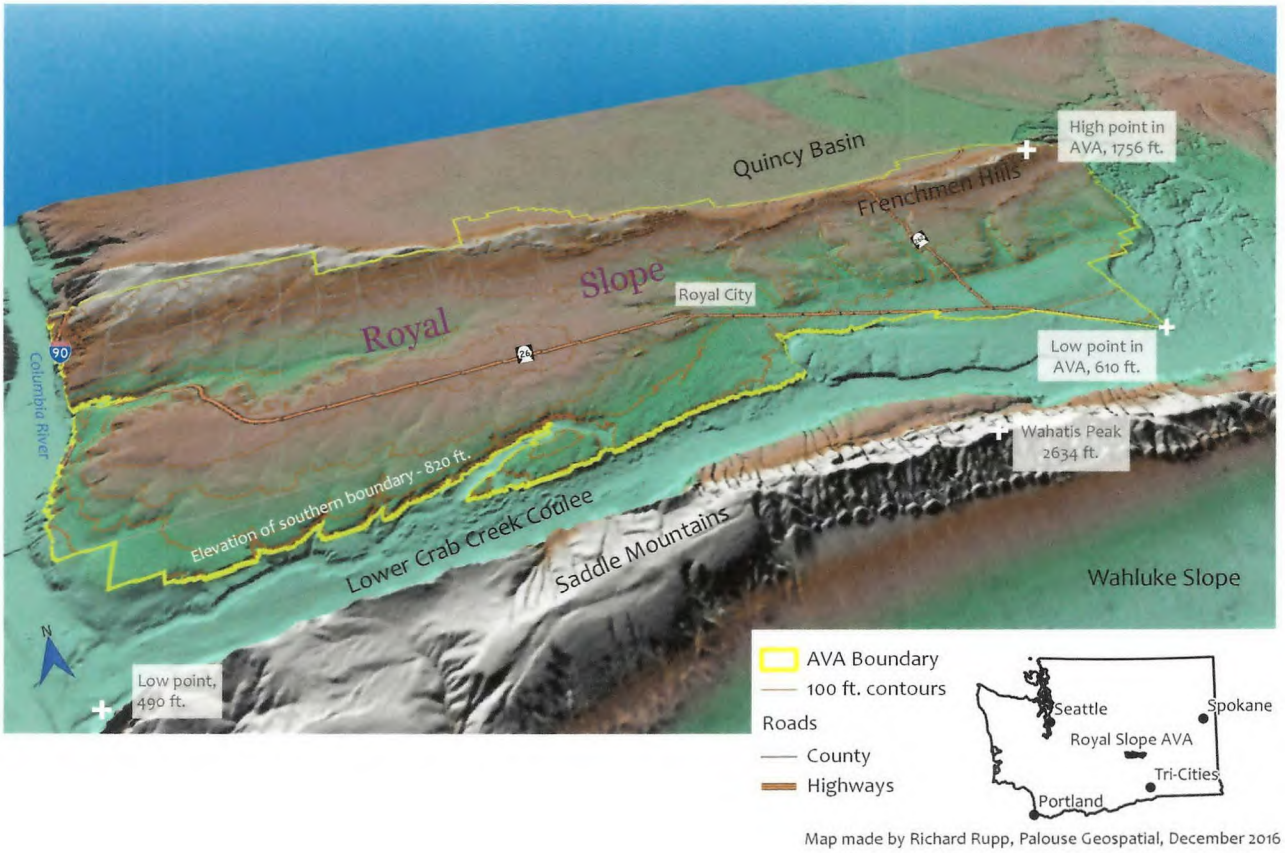

Map made by Richard Rupp, Palouse Geospatial, December 2016

OVERVIEW

This petition has been prepared in support of a new AVA to be designated in Washington State. The proposed name is **Royal Slope American Viticultural Area** or **Royal Slope AVA**. The proposed AVA is contained entirely within the original Columbia Valley AVA in east-central Washington State (Figure 1).

It is comprised primarily of the gentle south-facing slopes of an east-west trending range of hills called the Frenchman Hills. To the north lie lower and very flat lands of the Quincy Basin (Figures 2, 3); to the east and south the area is bounded by the valley of Lower Crab Creek Coulee and further south the Saddle Mountains; and to the west it is bounded by the Columbia River (Figure 2).

The name **'Royal Slope'** has been printed on USGS topographic maps of various scales since at least 1950s to indicate the general area of the proposed AVA and has been in common usage for more than 50 years to describe this rich agricultural district of tree fruit orchards, row and field crops, and, increasingly since the 1980s, *wine grapes*.

The elevation of the proposed AVA ranges from a low of 610 feet in the southeast corner to a high of 1756 feet on the eastern part of the backbone ridge (Figures 2, 3). The total acreage of the proposed AVA is 156,389 acres (244.4 sq. mi.).

More than 1400 acres of wine grapes were in production as of the end of 2016 (Table 1) producing a harvest of nearly 11,000,000 pounds of wine grapes. Approximately 100 additional acres of wine grapes were planted in 2016 and winegrowers report that they plan to plant about 200 additional acres of wine grapes in 2017 (Table 1). At present there is one bonded winery within the proposed AVA area. The thirteen commercial vineyards are very evenly dispersed within the proposed AVA area (Figure 4).

In addition to the Letter of Introduction above and this Overview, the petition to create the **Royal Slope AVA (RSAVA)** consists of 4 formal sections followed by a set of exhibits plus a single Bureau of Land Management (BLM) 1:100,00-scale metric topographic map of the Priest Rapids area, Washington on which is marked the entire boundary of the proposed AVA. ***Please note:*** The BLM edition of the Priest Rapids 1:100,000-scale map that we used to mark the boundary is *exactly* the same map as the USGS edition with one additional feature that makes it better than the USGS map for purposes of this petition: it additionally shows land ownership/management status in transparent color overlays and we use ownership boundaries as part of the proposed AVA boundary.

1. **Name evidence:** We provide evidence that the name identified for the proposed RSAVA is currently and directly associated with the area in which viticulture exists AND that

the area is nationally and locally known by the name Royal Slope.

2. **Boundary Evidence:** We provide evidence that supports setting the boundary of the proposed RSAVA in its proposed location, specifically the commonalities or similarities of features and characteristics of lands within the boundary and how those features and characteristics are different in adjacent lands outside that boundary.

3. **Distinguishing Features:** First we use measurement data and observational data on viticulture, climate, soils, and geology and physical features and other attributes to demonstrate that the proposed RSAVA is similar in broad outline to the Columbia Valley AVA within which it nests and therefore is deserving to remain a part of that larger AVA.

   We then document the commonalities among features *within* the proposed RSAVA, including climate, soils, geology, landform, elevation, etc. that affect viticulture and that make the area distinctive and worthy of AVA status. Next we use measurement data and observational data on climate, soils, geology, etc. to demonstrate how the proposed AVA area is different than adjacent areas immediately outside the proposed AVA boundary.

   Finally we show that the proposed AVA is clearly different and differentiable from other AVAs near it that are also in the Columbia Valley AVA, namely the Ancient Lakes of the Columbia Valley and Wahluke Slope AVAs, as well as slightly more distant AVAs in the Columbia Valley, namely the Red Mountain and Horse Heaven Hills AVAs.

4. **Written Boundary Description and Marked Map:** Our petition includes a detailed written description of the boundary of the proposed RSAVA that is keyed to easily discernible markings and reference points on the BLM Priest Rapids 1:100,000-scale metric topographic map. The exact boundary line is prominently and clearly drawn on the BLM Priest Rapids 1:100,000-scale metric topographic map without obscuring the underlying features.

Please note that the **Figures and Tables** for this petition are grouped *following the narrative section.*

Exhibits: Included as part of this petition are exhibits that support the four sections of the petition, that is, hard copies of name, scientific, and other evidence and documentation of the petition. Exhibits are cross-referenced in the appropriate narrative sections. We have marked the exhibits for Section 1, for example 'Exhibit 1.1', 'Exhibit 1.2', etc., those for Section 2 as 'Exhibit 2.1, 'Exhibit 2.2', and so on.

PETITION

As permitted in the Federal American Viticultural Areas regulations, 27 CFR, Part 9, as amended in the Federal Register, Vol. 76, No. 13, Thursday, January 20, 2011, pp. 3500-3502, the members of the Royal Slope Wine Grower's Association (RSWGA) offer the following as evidence that a new American Viticultural Area named **Royal Slope** should be established in the state of Washington:

SECTION 1. Name Evidence

First in this section, we explain the name usage, that is, the manner in which the name is used for the area covered by the proposed AVA and will provide evidence that the name Royal Slope is currently and directly associated with viticulture.. Second in this section we provide evidence that the area within the proposed AVA is nationally or locally known by the name Royal Slope.

(i) The Manner in Which the Name is Used for the Area Covered by the Proposed AVA and Proof That the Name is Associated With Viticulture

The intention of the grape growers and vintners in proposing the name 'Royal Slope AVA' has been to build their AVA identity upon the existing 'brand' of the name Royal Slope, which is equated with high-quality Washington State tree fruit such as apples (Exhibits 1.1, 1.2, 1.3).

Development of irrigated agriculture in the Royal Slope area, which receives only about 6-8 inches of precipitation annually (Figure 5) wasn't possible until 1958 when the system of reservoirs, canals, and tunnels of the U.S. Bureau of Reclamation's *Columbia Basin Project* began delivering irrigation water from the Columbia River. The Columbia Basin Project is the largest water reclamation project in the United States, supplying irrigation water today to over 670,000 acres in eastern Washington (Exhibit 1.30). The project effectively started in 1933 with the construction of Grand Coulee Dam on the Columbia River, which was completed in 1942. Construction of the irrigation system's reservoirs, canals and tunnels began after Congress passed the Columbia Basin Project Act in 1943 and the most distant areas of the project were receiving water by the 1980s.

Within a few short years, however, tens of thousands of acres of orchards, row crops and field crops were being grown on the Royal Slope! And even though the first wine grapes weren't planted on the slope until 1983, today this proposed AVA area contains more than 1,500 acres of wine-grape vineyards (Table 1).

Figure 4 is a satellite image from 2015. It provides excellent visual support for the nearly complete agricultural development of the Royal Slope in less than 60 years, especially considering that up until 1958 the entire area of the proposed AVA was a sagebrush semi-desert with *no paved roads and no towns or permanent settlements* (see Exhibits 1.10, 1.11. 1.12, which are photocopies of topo maps from the early to mid 1950s).

The following four paragraphs serve both in this Section 1: Name Evidence and again in the first part of Section 2: Boundary Evidence (modified slightly there) to document that the proposed AVA is currently and directly associated with an area in which viticulture exists.

As stated above, the first wine grapes were planted on the Royal Slope in 1983 (Table 1, U245 Vineyard). Now, in just about 35 years, the proposed AVA area is home to more than 1,500 acres of vineyards (Table 1). The websites of individual vineyards proudly name the Royal Slope as the location of their farms (for example Lawrence Vineyards; Exhibit 1.4).

The Washington Wine Commission has a map search tool on its website to help wine consumers identify different wine-growing regions of the state and to find vineyards and wineries to visit. Exhibits 1.5 and 1.6 are screen grabs from the WWC website showing pop up or call-out buttons of two of the proposed AVA area vineyards, Lawrence and Stillwater Creek, that each highlight their Royal Slope provenance to wine consumers.

And even with the hyper-fast growth of vineyard acreage from about 40 acres in 1998 to 1500 acres today almost twenty years later, the Royal Slope area is not growing anonymous grapes for bulk wines. In fact the opposite is true: references to wines from *Royal Slope grapes* are commonly associated with scores as high as 100 points for Syrah and other wine varieties made from proposed AVA vineyard fruit, scores that have been awarded by national and international wine publications such as *Wine Enthusiast* and *Wine Advocate* (*e.g.* Stoneridge Vineyard, Exhibits 1.6.1, 1.6.2).

The quality of wine grapes is so exceptional in the area of the proposed Royal Slope AVA that as far back as 2013, *Great Northwest Wine*, the most respected and read online wine magazine for the Pacific Northwest, singled out the Stillwater Creek Vineyard for the exceptional wines made from its fruit and even extolled the special climatic and geologic character of its vineyard sites in comparison to the nearby Wahluke Slope AVA (Busacca, 2004) in touting the area as worthy of AVA status (Exhibits 1.6.3 a-c).

In Exhibits 1.4 through 1.6.3c referenced above, the name *Royal Slope* appears clearly in vineyard and winery websites, the state wine commission website, the website of the most widely read online wine magazine, and more not shown as the place of origin of fine wine grapes.

As good fortune would have it when proposing the name for a new AVA, the place name 'Royal Slope' and its variants is in use *no where else in the United States,* as attested to in the U.S. Board on Geographic Names 'Geographic Names Information System' (Exhibits 1.7.1, 1.7.2).

The area enclosed by the boundary line of the proposed RSAVA is made up of land that is about 90% gently to somewhat steeply south facing (Figures 2, 3), which is the best aspect for wine grapes in the Pacific Northwest and for any agriculture generally because of the northerly latitude. The gentle south aspect accords with the story of the origin of the name: 'One story is about a pair of Scotsmen, who climbed the Saddle Mountains and drank in the view of the south-canted topography - perfect for farming - and remarked "Now that's a Royal Slope!" '(Exhibits 1.8, 1.9).

(ii) Name Evidence That the Area Specified in This Petition is Locally and Nationally Known as the Royal Slope

Documented next are numerous regional and national sources of information that refer to the Royal Slope as a recognized geographic area in the location of the proposed AVA and as a source of business and other names.

The oldest known USGS topographic maps that show the entirety of the proposed RSAVA area are 15-minute series maps (1:62,500 scale) of the Beverly, Red Rock (now Smyrna), and the Corfu quadrangles, dated 1912, 1911, and 1923, respectively, from west to east across the area. These early 20th-Century maps show almost nothing but wagon roads and rural schools and the name Royal Slope does not appear on these maps (copies of these maps are not included in the Exhibits).

The name Royal Slope *does appear* prominently first in the area of the proposed AVA on revised editions of these same three quadrangles published in 1954, 1951, and 1951, respectively (Exhibits 1.10, 1.11, and 1.12). In addition, the 1958 edition of the Walla Walla 2-degree sheet (1:250,000 scale) also shows the Royal Slope on the map (Exhibit 1.13).

The Sixth Edition, Second Printing of the Washington Atlas and Gazetteer (2002) by DeLorme (www.DeLorme.com) shows the entire area of the proposed RSAVA area at the top of pages 52 and 53 and the name Royal Slope is printed on the map in that area (Exhibit 1.14).

The Wikipedia entry for Royal City, Washington acknowledges that the source of the town name comes from the surrounding *Royal Slope area* (Exhibit 1.15). Further demonstrating that the area specified in the petition is known by the name *Royal Slope,* the port district that

encompasses the area is named 'The Port of Royal Slope' (Exhibit 1.16, 1.18, 1.19). Local roads use *Royal Slope* in their names (Exhibit 1.17).

Local businesses also use the *Royal Slope* name, such as the "Sunny Royal Slope Dairy" as captured on their Facebook page (Exhibit 1.27) and articles on local farming activities in the area in Capital Press, the West's major agricultural weekly newspaper and now website (www.capitalpress.com) sport titles such as 'Triticale harvest under way on Royal Slope' to tens of thousands of readers across the west (Exhibit 1.28).

As discussed above, the place name 'Royal Slope' is in use *no where else in the United States,* as attested to in the U.S. Board on Geographic Names 'Geographic Names Information System' (Exhibits 1.7.1, 1.7.2).

In fact, a page printed from the Geographic Names Information System (Exhibit 1.20) associates the name Royal Slope in all of the U.S. *only* with five USGS 7.5-minute quadrangles (1:24,000 scale) that are dated 1986: Beverly NE, Royal City, Frenchman Hills Lake, Royal Camp, and O'Sullivan Dam. These five quadrangles together cover all of the proposed AVA area and the name Royal Slope is displayed prominently on the generally south-facing slopes and benches across each of the five maps (Exhibits 1.21-1.25), proving that all of the area within the proposed AVA is locally and nationally known by the proposed name.

There is even a Master of Arts thesis dated 1996 from Central Washington University by Ellis Wayne Allred titled "Mid-Twentieth Century Pioneering of the Royal Slope, Central Washington" (Exhibit 1.26).

Finally, to demonstrate that the area specified in this petition is locally and nationally known as Royal Slope, we performed a Google search on the words 'royal slope' with no other delimiters and the search of course returned thousands of hits. The important things is that *the first 55 hits* and more in an unbroken sequence **all** refer to the geographic area specified in the petition, businesses within the area specified, etc. (Exhibit 1.29a-b shows the first 20 hits).

SECTION 2. Boundary Evidence

In a first subsection of this *Section 2*, we explain in detail the name evidence for defining the boundary of the proposed Royal Slope AVA as it is described in *Section 4* of this petition.

(i) Name Evidence as One Basis for Defining the Boundary of the Proposed AVA as Set Forth in Section 4

The most direct way to demonstrate that the proposed boundary is in the best and correct location from a naming standpoint is to re-state that the GNIS (Exhibit 1.20) associates the name Royal Slope in all of the U.S. with only five 1:24,000-scale USGS topographic quadrangles and that these five maps together cover *all of the proposed AVA area.* The name Royal Slope is displayed prominently across each of the five maps on the generally south-facing slopes and benches that make up the area where viticulture takes place (Exhibits 1.21-1.25).

The following four paragraphs served in Section 1: Name Evidence and do so again in this subsection of Section 2, slightly edited and highlighted in green, to document that the proposed AVA boundary is in the correct location because the area within it is currently and directly an area in which viticulture exists:

The first wine grapes were planted on the Royal Slope in 1983 (Table 1, U245 Vineyard). Now, in just about 35 years, the proposed AVA area is home to more than 1,500 acres of vineyards (Table 1). The websites of individual vineyards proudly name the Royal Slope as the location of their farms (for example Lawrence Vineyards; Exhibit 1.4).

The Washington Wine Commission has a map search tool on its website to help wine consumers identify different wine-growing regions of the state and to find vineyards and wineries to visit. Exhibits 1.5 and 1.6 are screen grabs from the WWC website showing pop up or call-out buttons of two of the proposed AVA area vineyards, Lawrence and Stillwater Creek, that each highlight their Royal Slope provenance to wine consumers.

And even with the hyper-fast growth of vineyard acreage from about 40 acres in 1998 to 1500 acres today almost twenty years later, the Royal Slope area is not growing anonymous grapes for bulk wines. In fact the opposite is true: references to wines from *Royal Slope grapes* are commonly associated with scores as high as 100 points for Syrah and other wine varieties made from proposed AVA vineyard fruit, scores that have been awarded by national and international wine publications such as *Wine Enthusiast* and *Wine Advocate* (e.g. Stoneridge Vineyard, Exhibits 1.6.1, 1.6.2).

The quality of wine grapes is so exceptional in the area of the proposed Royal Slope AVA that as far back as 2013, *Great Northwest Wine*, the most respected and read online wine magazine for the Pacific Northwest, singled out the Stillwater Creek Vineyard, prominent among the vineyards within the proposed AVA area, for the exceptional wines made from its fruit. The authors of the article even extolled the special climatic and geologic character of the area's vineyard sites in comparison to the nearby Wahluke Slope AVA (Busacca, 2004). In fact, in that article in *Great Northwest Wine*, the authors in 2013 touted the area as worthy of AVA status (Exhibits 1.6.3 a-c).

Figures 2 and 4 provide an excellent starting point visually to support a brief explanation of why and how the boundary was set on the south, west, east and north sides of the proposed AVA. A simple glance at Figure 4, which uses a satellite image as its base map, shows that areas within the proposed AVA area are about 90 percent developed to irrigated orchards, vineyards and field and row crops, whereas areas outside of the boundary are nearly devoid of agricultural development (except for some areas to the north that will be explained shortly).

Explaining this pattern of intensive development inside the proposed boundary and essentially no agriculture outside of it except poor-quality livestock grazing requires that we recount a bit of the geology and geography of eastern Washington.

(ii) Brief Background of the Geography and Geology of Eastern Washington's Winegrowing Areas, Including the Area of the Proposed AVA

About 96 percent of the vineyards in Washington State are situated on the Columbia Plateau in eastern Washington, the area of relatively low relief that is bordered on the north and east by the Rocky Mountains and on the west by the Cascade Mountains (Figure 1). The Cascade Range runs north to south through the state and forms the boundary between western and eastern Washington. Since the predominant source of rainfall is cyclonic storms formed over the Pacific Ocean off of the Washington coast that are carried eastward across the state by mid-latitude westerly winds, the Cascade Range also creates the a rain shadow on the Columbia Plateau, reducing annual rainfall there to less than about 20 inches annually.

The Columbia Plateau is an area partially coincident with but much larger than the Columbia Valley AVA shown on Figure 1. The plateau is underlain by hard black basaltic lava bedrock that was erupted mostly between 17 and 15 million years ago. The basalts are thousands of feet thick over this vast area. Subsequent to their eruption they were folded about 5 to 2 million years ago by tectonics forces into a series of approximately east-west trending ridges or mountains (*anticlines* in geologic parlance) that are separated from one another by valleys. For example, The Saddle Mountains and the Frenchman Hills are two of

the east-west trending ridges and the Lower Crab Creek Coulee is the valley between them (Figure 2).

The Columbia River for millions of years has maintained its course flowing from north to south here cutting a water gap through both ridges as they were thrust upward. Thus it forms a classic *antecedent stream* that truncates the west end of both ranges (Figure 2). Lower Crab Creek Coulee (Figure 2) is the intervening *syncline* (down-folded valley floor) between the two.

The entire system of folds is called the 'Yakima Fold Belt' by geologists and extends from the Horse Heaven Hills on the south to just north of the area of the Ancient Lakes AVA on the North (Figure 1). The different areas of wine production in eastern Washington and thus most of its AVAs are created by the different and unique locations of each within the east-west trending valley-and-ridge systems. That's because the different locations lead to differences in dominant elevation, slope, and aspect, etc. of the different AVAs and in turn differences in heat accumulation, winds, air flow and more.

In the immediate area of the proposed AVA (see Figure 2), the Saddle Mountain is a larger and taller east-west anticline ridge (highest point 2634 feet). The Wahluke Slope AVA (Busacca, 2004) lies at the foot of its south face, whereas the Frenchman Hills is a smaller and lower east-west ridge (highest point 1756 feet) that has the proposed Royal Slope AVA area located mainly on the south face of it.

Ice-age mega floods have been hugely important in the history of the Columbia Plateau. They both eroded the Columbia River Basalts into unique landforms in eastern Washington and they deposited millions of tons of exotic gravel, sand, and silt on the plateau and these sediments form the dominant parent materials of the soils of Washington's vineyards. For reference, different parts of the geologic system on the Columbia Plateau during the Ice Ages (Pleistocene Epoch) are described in varying detail in Meinert and Busacca (2000, 2002), Busacca (1989, 1991), McDonald and Busacca (1988), Sweeney, Busacca, and Gaylord (2005), and Busacca and McDonald (1994).

To summarize here in a brief sketch: A lobe of the western Canadian ice sheet moving southward in its valley blocked a major side drainage, the Clark Fork River, in northern Idaho (Figure 1) during the height of the last Ice Age about 18,000 years ago. This damming created a huge temporary lake in western Montana dubbed by geologists "glacial Lake Missoula". This lake at its largest size held about 500 mi^3 of water (an amount that is about 100 mi^3 greater than that of Lake Ontario) behind an ice dam almost 2,000 feet high! The lake behind the dam of glacial ice filled up and the dam failed repeatedly about every 50 to 200 years over about a 5,000-year period. The continued southward movement of the glacier re-formed the ice dam after each flood until the end of the ice ages. The largest of

the more than 100 floods during this time were truly cataclysmic, creating among the larger floods of water ever documented in earth history.

These floods overwhelmed the Columbia River drainage system and flowed away from North Idaho through today's Spokane Valley in NE Washington and out across the gently southwest-sloping platform of the basalt. The power of the repeated mega floods was so great that thousands of square miles of land between Spokane and the proposed AVA were stripped nearly bare of any loose rock or soil. The floods also eroded hundreds of huge, winding channels up to hundreds of feet deep into the basalt bedrock that extend for tens of miles across the Columbia Plateau. Today these are rocky, unfarmable dry valleys called 'coulees' (after the French '*couloir*'). This fantasy landscape was named the 'Channeled Scabland' by the geologist J Harlen Bretz, who rocked the profession of geology to its core in the 1920s when he proposed the prophetic and ultimately correct theory that the scablands had been formed by vast floods of water.

The floods deposited immense gravel bars where flow slackened along the path of the floods to the Pacific Ocean (the 20-mi long Wahluke Slope AVA area is one example!) and deposited untold millions of tons of sand in the main valleys and along the course of the Columbia River all the way to the Pacific Ocean. Where the floods forced their way into side valleys like Walla Walla and Yakima that were not in the direct path of the floods, layers of sand and silt up to hundreds of feet deep were deposited. Today these areas of sediment are called 'slackwater' sediments and their landscapes form the heart of the Walla Walla and Yakima Valley AVAs.

Strong prevailing winds reworked the glacial sediments both before and after the last ice age to form sand dune fields just down wind (to the east and northeast) of the main valleys, and the winds also formed deposits of *loess*, which is the silty sediment from dust storms, further down wind. Windblown dunes and loess cover the glacial sediments to depths ranging from tens of inches to tens of feet in many of the areas where grapes are grown in eastern Washington. As a result, soils in which most vineyards are planted in eastern Washington have rooting zones that consist of either 1) deep, uniform windblown sand or silt; 2) windblown sand or silt over glacial sediments that themselves can be silty, sandy, or gravelly; or 3) glacial sediments. Basalt bedrock only rarely occurs within the rooting zone of vineyard soils.

(iii) Boundary Evidence Explaining How and Why the East, South, West, and North Boundaries Were Placed in Their Proposed Locations

The AVA boundary on the east and south: Crab Creek Coulee originates just beyond the northeast corner of the proposed AVA (Figures 2, 3 show it well) at the foot of today's O'Sullivan Dam and Potholes Reservoir (shown on Figures 3, 4). From there it flows to the

south to a point just outside of the southeastern boundary of the proposed AVA. We chose as the eastern boundary of the proposed AVA generally the edge of the steep and rocky slopes that fall away into Crab Creek Coulee (Figure 3a), separating the farmable parts of the Royal Slope area from the slopes of the coulee.

From the southeast corner of the proposed AVA, Crab Creek Coulee then turns and flows to the west, deepening significantly just below and outside of the south rim of the Royal Slope agricultural area and flows into the Columbia River just outside of the southwest boundary of the proposed AVA (Figures 2, 4).

The AVA boundary on the west: The natural western boundary to the proposed AVA occurs at the top of the canyon slope that falls away to the Columbia River (Figures 2, 3). The steep to very steep, rocky, west-facing slopes are not farmable below the boundary's topographic elevation of 250 meters (820 feet). [Note on the satellite images used in Figures 3 and 4 that the Columbia River is more than one mile wide to the west of the Royal Slope because the river is pooled into a huge reservoir behind Wanapum Dam. In pre-dam time, the valley of the Columbia River here was essentially a huge version of a scabland coulee where scoured basalt bedrock dominated.]

The AVA boundary on the north: The Frenchman Hills and Royal Slope fall away on the north to the Quincy Basin (Figures 2, 3), which is a flat floored valley that is about 40 miles from east to west and 20 miles from north to south. During the Missoula floods it filled with well-sorted coarse sand up to tens to hundreds of feet deep. Then during the post-glacial period (that is, during the Holocene Epoch or about the last 12,000 years) the sands were blown into a huge complex of dune fields.

Today, especially around the Potholes Reservoir (visible in the upper right of Figures 3 and 4) there is a high water table and the reservoir is surrounded by hundreds of 'pothole' ponds that formed in the low areas between sand dune crests. So from the perspective of landscapes and soils, the boundary on the north approximates the natural boundary between well drained upland soils that are highly prized for farming and flat, poorly drained sandy soils in wildlife area protection. And further to the north of the area shown in the figures the Quincy Basin is heavily developed for center-pivot field & row crops such as corn, potatoes, mint, and alfalfa. A smaller portion of the proposed AVA boundary on the northwest coincides with the southern boundary of the Ancient Lakes of the Columbia Valley AVA.

On all four sides, then, natural boundaries to the proposed AVA area are a combination of steep, rocky slopes in some parts, non-farmable soils in others, and land ownership and use restrictions in still others.

Next we describe more exactly where we propose that the boundary be established on the four sides of this almost rectangular AVA. To form the boundary on the south and west, we use the 250-meter (820.2 foot) contour line on the Priest Rapids 1:100,00-scale metric topographic map (see the official boundary map, Section 4). We use this contour line because it in general separates areas of raw 'scabland' of exposed basaltic bedrock below this elevation that then fall outside of the proposed AVA from areas above this elevation that are inside the proposed AVA. Areas above this elevation almost everywhere along this boundary have deep soil cover of flood sediments, wind blown sand, and loess and are thus prime farmland. Although some small areas of scabland lie above 820 feet and thus are within the proposed AVA along the middle of the southern boundary (Figure 4), setting the boundary any higher in elevation would result in the exclusion of thousands of acres of existing irrigated Royal Slope farmlands from AVA status.

To form the boundary on the north and east, we use existing legal ownership boundaries that separate private farm land on the Royal Slope that lies within the proposed AVA from State and Federal wildlife refuge lands that would be excluded in any case and unavailable for viticulture. From Figure 4 it can be seen that the boundary on the north and east is made up of section and quarter-section lines in the Public Lands Survey System (P.L.S.S.) that follow the ownership pattern of private versus public lands.

This is one of the benefits of marking the proposed AVA boundary on the BLM 'Surface Management Status' edition of the USGS Priest Rapids 1:100,000-scale metric topographic map. Referring to that map, which we submit with this petition, it can be seen that, for the most part, the northern boundary of the proposed AVA is the boundary between private farm land inside the AVA and the Desert State Wildlife Area outside of it. Similarly, the boundary on the east and southeast sides is the boundary between private farm land inside the AVA and of the combined boundaries of the *'Goose Lakes State Wildlife Area'* and the *'Columbia National Wildlife Refuge'* outside of it..

Fortunately and not coincidentally, the proposed boundary along the north side mimics the natural physiographic boundary between the Royal Slope and the Quincy Basin. In the same way, the proposed boundary on the east and southeast sides match very closely the natural physiographic boundary between the Royal Slope farming area and the scablands of Crab Creek Coulee.

Three smaller segments of the proposed boundary remain to be explained. First, the westernmost one third of the northern boundary coincides with the southern boundary of the Ancient Lakes of the Columbia Valley AVA (see Figure 1). The southern boundary of that AVA was established by TTB in 2012 and we matched up to it with with no overlap or underlap along the common portion of the proposed AVA.

Second, a triangular area in the southeastern corner of the proposed AVA is included within the AVA area because one of the prominent large vineyards on the Royal Slope, Stoneridge Vineyard (Table 1; Figure 4), and the sole winery in the area, Foxy Roxy Wines, both are in this part of the Royal Slope.

Third, at the southwestern corner of the proposed AVA boundary, there is a jog away from the 820-foot topographic contour line and onto section lines for a little more than a mile. We did this so that the Beverly and Merkle Vineyards that are at about 800 feet in elevation would fall outside the proposed AVA, because the Zirkle Fruit Company and Mr. Tom Merkle, who own these two vineyards, respectively, asked *not* to be included in the AVA. Exhibit 2.1 is a copy of the email from Mr. Will Strand, manager of the vineyards in question owned by Zirkle Fruit Company stating their approval of the SW corner of the proposed boundary and a copy of the BLM map that we sent him showing how the boundary would be run between Point 9 and Point 10 to exclude them from the AVA.

(iv) Boundary Evidence Outlining the Common Elements Among Areas Within the Proposed Boundary and How Those Elements Are Different in Areas Outside the Boundary

Demonstrate the Correct Boundary Location Through Climatic Data. To demonstrate that the climate is well suited to wine grapes within the proposed AVA, we compiled and averaged weather data for 2009-2016 from ten of the approximately 180 fully instrumented, recording weather stations in the AgWeatherNet (AWN) system of Washington State University (Table 2; http://weather.wsu.edu). In Table 2 we have compiled several measures of climate suitability for grapes for the three AWN stations within the proposed AVA area (blue-shaded rows on Table 2; see station locations on Figure 5) and compiled the same information for the most pertinent AWN stations outside of the area to the north, south, east, and west (yellow rows and yellow-fading-to-green rows on Table 2). Locations of the three stations *within the proposed AVA* are shown on Figure 5. We include more extensive discussion and analysis of these climatic comparisons as well as comparisons of geology, soils, and other geographical features in Section 3: Distinguishing Features.

Two commonly cited measures of suitability for *Vitis vinifera* are growing degree days (GDD) and cool-climate viticulture suitability index (CCVSI). Growing degree days (also called 'heat units') is a measure of average daytime air temperature, summed over the growing season from April 1 to October 31 (*Winkler and others, 1974*). Air temperature during the growing season is the primary driver of the rate of photosynthesis between temperatures of about 50°F and 95°F (*Keller, 2015*). Different varieties of *vinifera* have different optimal climatic planting zones as expressed through averages of GDD for different locations, but as a generalization, even cool-climate *vinifera* varieties such as

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

AVA and Wahluke Slope AVA is elevation: the average elevation of the 3 stations in the RSAVA is 1,333 feet, whereas the station elevation for the AWN station reporting in the Wahluke Slope AVA is 608 feet.

Within the AVA then, there is internal consistency of warm but not excessively hot growing conditions (GDD values are high Winkler Region II or low Winkler Region III) and long growing seasons free of hard freezes. This contrasts strongly with some areas just outside of the proposed AVA, some of which are modestly to damagingly cooler, yet others just outside are markedly hotter. Thus we have a theme of *'modulated excellence'* for growing high-quality wine grapes within the proposed AVA area that we will expand next in Section 3: Distinguishing Features.

Demonstrate the Correct Boundary Location Through Landscape and Geology: The area within the proposed AVA boundary differs in several fundamental ways in landscape, geography, and geology from areas just beyond or outside of it. First, the Royal Slope grape and crop growing region consists of the relatively gently sloping, dominantly south-facing, heavily farmed rolling landscapes that are draped over the Frenchman Hills anticline. The smooth shape of the farmed lands within the proposed AVA have slopes that are overwhelmingly less than 15% but also are almost nowhere less than 3%. On the west, south, and east just outside of the proposed boundary, the smooth and gentle slopes are replaced by large areas of craggy, exposed bedrock or intermittent bedrock with patches of shallow soils and much steeper slopes. Slopes just outside of the west, south, and east boundaries are dominantly greater than 35% (the upper limit for tractor farming) and include extensive areas of cliffs. Some areas just outside of the boundary fall as much as 350' over bedrock cliffs and benches to the floor of Crab Creek Coulee, for example in sections 22 and 15 (T17N, R28E, WBM) on the northeast corner of the AVA (Figure 3a).

The deep cover of sediments and soils from glacial outburst floods and from post-glacial wind-blown sand and silt (sand sheets and loess) exist on the Royal Slope because, unlike the lands and landscapes on all four sides of the proposed AVA, Ice-Age megafloods did not deeply erode the Royal Slope area like they did in downcutting the Crab Creek Coulee and the canyon of the Columbia River. Instead, the floods flowed in a relatively smooth fashion in and around the Frenchman Hills, not eroding the bedrock but instead depositing silts and sands on the gentle slopes we call the Royal Slope today. And these same gentle slopes received additional layers of wind-blown sand and loess in post-glacial times to add depth and diversity to the soils that are farmed today. In contrast, normal erosion processes acting on the steep, exposed bedrock slopes outside of the AVA area in post-glacial times continuously stripped off any loose soil materials, maintaining the 'scabland' character that barely supports light grazing uses.

The recognition that there were deep farmable soils on these gently sloping lands sent farmers rushing to clear the sagebrush and plant farm fields of high-value crops as soon as irrigation water became available. Visual evidence of this contrast in farmability is seen in the green farmed areas within the proposed AVA in Figure 4 versus the brown unfarmed areas just outside of it. The proposed AVA is indeed a "Royal Slope" as the Scotsmen purportedly spoke a century before!

On the east, south, and west just outside the AVA the contrast is stark: the Frenchman Hills are abruptly truncated on the east and south by Crab Creek Coulee and on the west by the Columbia River. The results are such that just outside of the boundary on these three sides the lands consist of virtual moonscapes of bedrock-dominated scabland with no agricultural potential. And on the north just outside the proposed AVA boundary the contrast is different but just as strong where the sloping, mellow farmlands of the Royal Slope are replaced by a freeze-prone flat valley floor covered by a sand sea, part of which has high water tables and much of which has been protected in perpetuity as state and federal wildlife refuges. To the west across the Columbia River, the land rises quickly into the foothills then higher elevations of the Cascade Range and there is basically no part of this area with the climate, slope orientation, or soils suitable for any farming, especially not wine grapes.

Demonstrate the Correct Boundary Location Through Varieties of *Vinifera* Presently Grown Within the Proposed AVA: At least twelve red varieties of *Vitis vinifera* wine grapes totaling about 900 acres and nine white varieties totaling about 550 acres are grown and sold commercially in the vineyards of the proposed AVA (Table 1): The reds are Cabernet Franc, Cabernet Sauvignon, Cinsault, Grenache, Malbec, Merlot, Mourvedre, Petit verdot, Pinot noir, Sangiovese, Tempranillo, and Syrah and the whites are Chardonnay, Chenin blanc, Gewurztraminer, Pinot gris, Riesling, Roussanne, Sauvignon blanc, Semillon, and Viognier. Moreover, there are presently 13 vineyards that together total over 1500 acres of *vinifera* plantings and the vineyards are quite evenly distributed throughout all parts of the proposed AVA area.

The successful cultivation of 20 varieties of the European wine grape *Vitis vinifera* within the proposed AVA boundary since about 1983 supports the conclusion that the boundary is in the correct location when considered in conjunction with the next short section.

Demonstrate the Correct Boundary Location Through Lack of *Vinifera* Vineyards Grown Just Outside the Proposed AVA: We interviewed grape-grower members of the Royal Slope community and made a visual search of Google Earth satellite images to try to find any vineyards within several miles just outside of the proposed boundary (Figure 4) and found none, in further support of the conclusion that the boundary is in the correct location. The only exceptions are the Beverly and Merkle vineyards just outside the

southwest corner of the proposed AVA. These were excluded from the proposed AVA by request of the owners who desire that their vineyards remain solely in the Columbia Valley AVA (Will Strand, Zirkle Fruit Company, written communication, January, 2017).

SECTION 3. Distinguishing Features

In this *Section 3* we offer a two-part discussion because this petition proposes to establish a new AVA entirely within the existing Columbia Valley AVA. In the first part we present information that identifies attributes of the proposed AVA that are consistent with the existing, larger and older Columbia Valley AVA such that grapes grown in the new AVA, if approved, should continue to be entitled to use the Columbia Valley appellation as well as the option to use the new one. Then in the second part we explain how the proposed AVA is yet also sufficiently distinct from the existing AVA that it requires separate recognition as a new AVA.

(i) Attributes of the proposed Royal Slope AVA that are consistent with the existing, larger Columbia Valley AVA

The climate, geology, soils, physical character and elevation range of the proposed Royal Slope AVA are fully consistent with the older and larger AVA, such that the new AVA should remain a part of the existing Columbia Valley.

As described in Section 2 above, the entire Columbia Valley including the proposed Royal Slope AVA lies in the rain shadow of the Cascade Mountains, which strongly limits rain and snow falling across the nearly 11 million acres of the Washington State part of the AVA. The Columbia Valley AVA area, including the proposed AVA, thus has an arid and semi-arid climate with cool to cold, wet winters and warm to hot, dry summers. All parts of the Columbia Valley AVA receive less than about 20 inches of annual precipitation and average about 8 inches. With an average annual precipitation of about 6.5 inches (Table 2), thus the proposed AVA is consistent with the overall average of the enclosing Columbia Valley.

Because of the warm dry summers and low annual rainfall, virtually all of the vineyards in the Columbia Valley AVA are irrigated as they are also in the proposed AVA. Throughout the Columbia Valley AVA including the area of the proposed AVA dry summers reduce pest pressure and careful drip irrigation gives growers close control of all growth stages of grapevines. The result is that grape and wine quality is very consistent vintage to vintage in the Columbia Valley AVA and that includes in the proposed AVA.

The bedrock underlying the entire Columbia Valley AVA is Miocene-age Columbia River Basalt, including of course the Royal Slope area. Moreover, virtually every part of the Columbia Valley AVA including the Royal Slope area was shaped by Ice-Age megafloods. The effects included massive erosional sculpting of the basaltic bedrock throughout the Columbia Valley into unique 'scabland' landscapes and also the importation of millions and millions of tons of exotic sediment into the Columbia Valley that profoundly changed and improved the soils that grapes are grown in today. Exotic because they are derived

from granitic and metamorphic bedrock terrains of the Rocky Mountains and thus have entirely different mineralogy and character than sediments from the native basalt. It follows then that all of the soils in the Columbia Valley AVA including the Royal Slope area are formed either from gravel or slackwater sediments from the floods or from dune sand or loess created when strong regional winds reworked the flood deposits (Busacca and McDonald, 1994, Boling, Frazier and Busacca, 1998, Busacca and others, 2003). And of course, all of the soils have basalt forming the bedrock at some depth beneath the surface.

Hard winter freezes that can damage buds or even kill the above-ground part of grape vines are the major hazard to grape production in the Columbia Valley including the proposed AVA. In the Columbia Valley and the proposed AVA; however, unlike many other grape-growing areas of the world, most vines are grown on their own roots rather than rootstocks and therefore can be trained back from the ground up in cases of severe damage.

The Columbia Valley AVA ranges in elevation from about 150′ to 2000′ (and a little higher in a few places), whereas the proposed AVA ranges from 610′ to 1756′ (Figure 3), so the elevation range too is consistent with the larger, enclosing AVA.

In all important ways, then, the key attributes of the proposed Royal Slope AVA: physiographic, climatic, geologic, soils, and viticultural practices are entirely consistent with those of the larger, enclosing Columbia Valley, so when the new AVA is approved, grapes grown within it should be entitled to use the existing Columbia Valley appellation as well as the new one.

(ii) Attributes of the proposed Royal Slope AVA that are sufficiently distinct from the existing AVA that it requires recognition as a new AVA

At present, ten AVAs nest within the Columbia Valley (Figure 1). To document the significant and unique characteristics of the proposed AVA, we compare it not to some broad generalizations of the entire Columbia Valley at nearly 11 million acres. Instead, for climate we draw comparisons with the Ancient Lakes of the Columbia Valley and Wahluke Slope AVAs that flank it closely on the north and south, respectively, and also with the Red Mountain and Horse Heaven Hills AVAs that are further to the south (Figure 1). For geology, soils and physical features we draw comparisons to the Ancient Lakes and Wahluke Slope AVAs to the north and south and to areas to the west and east.

Climate as a Distinguishing Feature of the Proposed AVA. Several measures of climate in Table 2 serve to distinguish clearly the proposed Royal Slope AVA from the two neighboring and two more distant AVAs. Mean annual temperature is largely a function of elevation but slope, aspect, trapping or draining of stagnant cold air, and others also play a role. In estimating climate measures for the proposed AVA, we were fortunate to have 3

WSU AgWeatherNet (AWN) stations with records that go back at least to 2009, so we averaged climate data for 2009-2016 for these and the other AWN stations in Table 2 and show their locations on Figure 5.

The 3 AWN stations in the proposed AVA have an average elevation of 1,333' and all have south aspects, whereas the Quincy station representing the Ancient Lakes AVA is at 1,486', is flat, and lies within the very broad, mainly flat Quincy Valley. Consequently, the mean annual air temperature (2009-2016) of 51.8°F is about 1°F warmer than the 50.7°F average at Quincy. This is mirrored in GDD where the average of the 3 AWN stations is about 2900 GDD, or about 100 GDD warmer than the 2807 GDD at the Quincy station in Ancient Lakes AVA.

Awn stations about 25 miles west and 16 miles east of the proposed RSAVA at Broadview and Othello, respectively, are not out of the range of elevation of the AVA (1.492' and 1,180'; however these sites and the areas around them are representative of non-viticultural lands in the case of Broadview with 1,940 GDD and 159

Elevation contrasts are strong between the proposed AVA and the 3 AVAs to the south: 1,333' in the AVA and 608' at Wahluke Slope, 676' at Red Mountain, and 903' at the Horse Heaven Hills AVAs. Being so much lower in elevation, all three have mean annual air temperatures that are 2.2°F to almost 3°F warmer in the proposed AVA (Table 2).

The lower elevations that have correspondingly higher mean annual temperatures lead to substantially higher GDD values for the three AVAs to the south at 3,518, 3,166, and 3,229 GDD, respectively, compared to 2,807 GDD in the proposed AVA. In fact, these values place the proposed RSAVA in the cooler Winkler 'Region II' (2501-3000 GDD) whereas the three AVAs to the south are classified in the warmer Region III (3001-3500 GDD). The fact that the Wahluke Slope AVA is only about 10 miles south of the RSAVA (see Figures 1 and 2) yet they differ by about 700' in elevation and about 600 in GDD is striking.

Averages of mean annual precipitation for 2009 to 2016 do not differ significantly among the different AVAs, ranging only from 7.6" in the Horse Heaven Hills to 5.0" at Red Mountain, with the RSAVA stations averaging 6.2" (Table 2). Very low rainfall is in fact one of the strongest *unifying* characteristics of the broader Columbia Valley as previously discussed. Modeling of mean annual precipitation across the proposed AVA (Figure 5) suggests a range of about 2" from 6.5" to 8.5" annually driven mainly by elevation differences.

Other measures of climate also differentiate the proposed AVA from our set of comparison nested AVAs within the Columbia Valley: The number of days per year on average that exceed 95 degrees (Table 2) shows that the RSAVA area only has about 9 very hot days per

year, whereas the 3 comparison AVAs to the south together average *53* very hot days per year. This has crucial viticultural implications that differentiate the proposed AVA from the comparison group and in fact it favors the proposed AVA. This is because wine grape physiologists long ago found that grapevines shut down photosynthesis at temperatures above about 95°F (Keller, 2015). That is, very hot days in the early to mid growing season can impair leaf expansion and very hot days during veraison (ripening) will slow or stop synthesis of sugars and other ripening factors. This in turn could delay harvest into the start of the rainy season or into a cold snap or even affect sugar or flavor ripeness.

So to re-state this important difference, the small number of very hot days in the proposed AVA allows the grape vines there to actively grow for perhaps as many as *15 days more* in a growing season, that is, almost half a month, than in justly renowned older AVAs such as Red Mountain or Horse Heaven Hills. Indeed, this may well explain why even late-ripening varieties such as Cabernet Sauvignon, Petit verdot and others more typically associated with Winkler Region III grape climates consistently ripen fully and produce medal-winning wines in the Region II Royal Slope AVA.

In fact, it's a strong belief of many great winemakers that the most complexly flavored and nuanced wines for a given grape variety are made from grapes grown in the coolest locations where that grape can reliably but just barely ripen fully. Thus the equable growing conditions characteristic of the AVA, with few days that are too hot nor too cold and a slightly cooler Region II Winkler climate overall than the highly regarded, much hotter, comparison AVAs within the Columbia Valley may well explain scores as high as 100 points awarded by *Wine Advocate* and other publications for wines made from Royal Slope vineyard fruit (see Section 1.(i).).

Geology and Physical Features as Distinguishing Features of the Proposed AVA. Although the entire Columbia Valley AVA is underlain by basaltic bedrock and the entire AVA was profoundly influenced by the Ice Age megafloods from Lake Missoula, each of the existing nested AVAs within it played a different role in the megaflood system and thus have unique sets of characteristic geologic and physical features. So too it is with the proposed AVA.

Huge volumes of cataclysmic flood waters entered the proximity of the proposed AVA from flood channels to the east and northeast of it. Very fast moving, *turbulent and deep* floodwaters flowed south around the east end of the Royal Slope area and turned west into the valley separating the Frenchman Hills from the Saddle Mountains (Figure 2). The power and turbulence of the floods in this narrow valley cut deeply into the basalt bedrock, deepening the valley and forming the tract of scabland that we call Crab Creek Coulee today and that lies outside of the proposed east and south sides of the boundary because it has no farming value.

Similarly huge volumes of flood waters filled the flat-floored Quincy Valley to the north and northeast of the proposed AVA and flowed west, plunged into the Columbia River and then turned south to follow the Columbia past the west end of the AVA. But the flood waters that flowed west through the Quincy Valley, though deep and voluminous, flowed *smoothly* over the flat floor of that valley (Figure 2), depositing well sorted sand that filled this valley edge to edge and tens to more than a hundred feet deep with this sediment, lapping up against the north side the the proposed AVA as they did. This area forms the majority of the Ancient Lakes AVA area. In fact, in the Notice of Proposed Rulemaking in the Federal Register for the Ancient Lakes of the Columbia Valley AVA (vol. 77, No. 89, Tuesday, May 12, 2012, page 27003) the proposers describe that 'The floor of the basin comprises most of the proposed viticultural area and is much flatter than most of the surrounding region'. [We note for clarity that the Quincy Valley is also referred to very often as the Quincy *basin:* the same physiographic area is indicated by both.]

The other nested AVA nearby, the Wahluke Slope, has its own unique history in the geology of the megaflood system and its own unique physical features. The Wahluke Slope is a nearly 20 mile-long alluvial fan or fan delta (Busacca, 2004). It formed when repeated megafloods flowing in the many floodways and coulees around the Royal Slope combined in today's Columbia River channel and traveled south and burst through the narrow *Sentinel Gap,* the watergap in the Saddle Mountains (Figure 6a). Being only about one mile wide, the watergap constricted the flow of the floods, which backed up to great depth upstream of the gap, jetting through it with great turbulent force and carrying untold amounts of sediment: silt, sand, gravel, cobbles, and boulders even 10 to 15 feet in diameter. Once through the gap, the floodwaters spread out widely into the Pasco Basin, losing depth and sediment-carrying capacity, dumping their load of boulders, gravel and sand in a widening fan-shaped triangle to the southeast (Figure 6a). Since the end of the Ice Age floods the river has cut back down to base level so that today the Wahluke Slope stands 300 feet to 400 feet above the river as a roughly triangular platform of mainly sandy sediment and soils with a gently undulating surface.

In strong contrast to the rugged, flood-cut coulees on three sides of the proposed AVA , the flat valley of the Ancient Lakes area filled with sand on the fourth side of it, or the giant megaflood alluvial fan of the Wahluke Slope, the RSAVA area rode *largely above the Missoula Floods* and thus has an entirely different geology and physical features than these other areas of the Columbia Valley AVA. This can be seen by looking at the hills and slopes of the proposed AVA that preserve the 'normal' dendritic drainage patterns of most upland landscapes and smooth, rounded shapes of topography that was never disfigured by megaflood scabland-type erosion (Figures 2 and 3). This is attested to by the geologic map (Figure 6), which shows that there are large areas of rounded Miocene and Mio-Pliocene

bedrock units (the blue and red Mv and PLMr units on Figure 6) that are only covered by a thin veneer of post-flood loess and eolian sands that make up the surface soils (Figure 7).

Soils as Distinguishing Features of the Proposed AVA. The contrasts in geology and physical features of the proposed AVA just documented above are striking relative to the the flat valley of the Ancient Lakes AVA area, the mega-alluvial fan of the Wahluke Slope AVA, and the scabland coulees that surround the proposed AVA. It follows then that the major soil types and their abundance also stand in clear contrast comparing the proposed AVA to the surrounding areas. In Figure 7 we have simplified the very complex patterns of about 60 soil series that occur in the proposed AVA into 6 general map unit for discussion. In Table 3 we have tabulated the component soil series in each general map unit in Figure 7 by what are called 'soil association units'. The georeferenced vector digital data we used to create Figure 7 and tabular digital data we used to compile Table 3 we obtained from the STATSGO2 Geospatial Data Gateway at: https://catalog.data.gov/dataset/u-s-general-soil-map-statsgo2-for-the-united-states-of-america (accessed on January 20, 2017).

In Table 4 we have compared the percentages of 12 different soils that occur in the proposed AVA, in the adjoining Ancient Lakes AVA, and in the nearby Wahluke Slope AVA. We selected this set of soils to highlight the large differences in abundance of different soil types among the 3 areas. In aggregate the 12 soil series make up between two-thirds and three-quarters of the area of these AVAs. Official soil series descriptions for these soil series are included as Exhibits 3.1 through 3.12, accessed from the USDA-NRCS website (https://soilseries.sc.egov.usda.gov/osdname.aspx accessed on November 4, 2016).

Although there are 6 different general soil map units in the proposed AVA (Figure 7), just two of these, map units 1 and 2, make up nearly 60% of the AVA area (Table 3). What's more, nearly *85 percent of the vineyard acreage in the AVA is on the soils found in these two map units.* That is, only vineyards 6, 8, and 12, which together total about 250 bearing acres, occur in general soil map units 3-6 (Figure 4 and Table 1).

General soil map unit 1 dominates the gentle south-facing parts of the proposed AVA (Figure 7) and constitutes about 44% of the AVA area (Table 3). Almost 95% of the soils in unit 1 are *Warden, Sagemoor, and Kennewick* series soils. These soils are formed in deep wind-blown post-glacial loess over a few feet of layered fine sands and silts from last-glacial megafloods. These were deposited on the AVA slopes when floodwaters that had backed up behind Sentinel Gap briefly formed pools of standing floodwater before they drained away through the gap, hence they are commonly referred to as "slackwater sediments".

General soil map unit 2 occupies the steeper and higher parts of the Frenchman Hills ridge that forms the backbone of the proposed AVA (Figure 7). It constitutes a little more than 16% of the AVA area (Table 3). More than 95% of the soils in unit 2 are *Adkins* series soils

that are formed in deep windblown sediments that are just slightly coarser in texture than the Warden soils (very fine sandy loam versus silt loam; see Exhibit 3.1 versus 3.11).

Three of the four major soils in units 1 and 2 that host about 75% of the vineyard acreage in the AVA: Warden, Sagemoor, and Adkins, are classified as *Aridisols* in the U.S. Soil Taxonomy (Soil Survey Staff, 1999). By definition, Aridisols occur in an *Aridic* soil moisture regime and also have undergone enough weathering and soil formation to have formed subsoil horizons such as cambic, calcic, or duripan horizons (Bw, Bk, and Bkqm, respectively, in the profile descriptions in Exhibit 3). The "*id*" taken from the word "ar*id*" is used as a formative word element in building the somewhat daunting full taxonomic name of an Aridisol such as the Warden series: Xeric Haplocamb*id*s, helping to recognize the soil order in the longer name.

Aridisols are widespread in the Columbia Valley including the Royal Slope (Boling, Frazier, and Busacca, 1998). Aridisols in this area are excellent for viticulture because with their loamy to sandy textures they are always well drained. In addition they have very low amounts of humified organic matter (naturally occurring soil nitrogen) so natural vine vigor is low, which contributes to excellent fruit to leaf area balance for high fruit quality. And finally, with irrigation water provided from Grand Coulee Dam to farms via the Columbia Basin Project, Aridisol soils are excellent for viticulture also because they have low natural soil moisture due to the aridic regime, so winegrape growers can control vine development almost completely via the timing and amounts of drip irrigation applied during the growing season.

In contrast to the dominantly Aridisol soils in the proposed RSAVA, the dominant soil in both the Ancient Lakes and the Wahluke Slope AVAs is an *Entisol*, the Quincy series. Whereas the Quincy soil makes up 18.5% of the Ancient Lakes AVA area and a whopping 32.6% of the Wahluke Slope area (see the soil map unit patterns in Figure 6a), it makes up only *1.8%* of the proposed RSAVA (Table 4). The Quincy soils are formed of nearly pure, well-sorted sands deposited by megafloods right onto the lands that make up those two AVAs today. The large areas of flood sand in both contrasting AVAs were reworked into constantly shifting sand dunes and sand sheets by strong regional winds in post-glacial time.

Because of the continuous mixing and movement of the sand in dunes and sand sheets, soil horizons never form and it's the absence of soil horizons that classify soils such as the Quincy series as Entisols (the formative word element for Entisols is *ent* (rec*ent*), as in Xeric Torripsamm*ent*s). Although in the Ancient Lakes and Wahluke Slope areas, Quincy and related Entisol soils have been developed for wine grape vineyards, their extreme droughtiness due to pure sand textures and their extreme wind erosion hazard make them

much more challenging to manage than the loessial silt loam and fine sandy loam soils in the heart of the RSAVA area.

In the case of the Royal Slope AVA area, floodwaters deposited sands in the steep-sided coulees outside of the AVA and in the Columbia Valley on the west but very little on the RSAVA hills themselves, which rode mostly above the floods. Because most of the sands were left by floods in these steep-walled valleys and coulees hundreds of feet below the AVA area, the westerly winds mainly have formed the very shallow, sandy soils on the western end of the proposed AVA in general soil map units 4 and 5 by bringing limited amounts of sand up the canyons from the floodplains (Figure 7). Soils such as the Schawana series consisting of only 10"-20" of sand over basalt dominate unit 4. And soils such as the Koehler and Taunton series consisting of just 20"-40" of sand over a cemented duripan (Bkqm) dominate unit 5. The soils in these two general soil map units make up almost 30% of the proposed AVA area and support about 10% (150 acres) of the vineyard acreage.

The balance of the AVA area is in map unit 3, which consists of very deep soils from flood gravels and sands, and unit 6, which consists of moderately deep soils from mixed sources. One vineyard of about 100 acres lies on the dividing line between these two units.

The information in Table 4 summarizes clearly some major differences in abundance of different soil types of the proposed AVA compared to the Ancient Lakes and Wahluke AVAs. Percentages of soil series that make up more than about 8% of the area of each AVA are bolded and underlined to highlight that very different soils are dominant in the different AVAs.

Five soil series in the proposed RSAVA: Adkins, Kennewick, Sagemoor, Schawana, and Warden are the dominant soils there, together totaling about 65% of the total AVA area.

N*one of the same soils as in the proposed RSAVA are dominant in the Wahluke Slope AVA.* Instead, Burbank (16%), Quincy (32.6%), and Taunton (8.9%) series soils dominate the Wahluke (Table 4).

In the Ancient Lakes AVA, four soils make up more than 8% of the AVA area: Quincy (18.5%), Scoon (8.9%), Taunton (9.9%), and Warden (11.6%). *Only one of these, the Warden series, is an important soil in both the Ancient Lakes and proposed AVAs.* Major differences in landscape setting, geologic history, and dominant geologic processes among the three comparison areas result in major differences in soil types as well.

In summary, a distinctive set of features differentiates the proposed Royal Slope Viticultural Area apart from a comparison group of other AVAs nested in the Columbia Valley AVA,

making it worthy of recognition as a new and separate viticultural area. Climatic factors important to viticulture such as growing degree days, Cool Climate Viticultural Suitability Index, and frequency of very hot summer days set it apart. Important differences also have been documented in landscape shapes, elevation, geologic parent materials, geologic history, and in soils, and these features serve to differentiate the area from surrounding areas in all directions, both other existing AVAs and non-AVA areas.

SECTION 4. Maps and Boundary Description

(i) Maps - The exact boundary of the AVA is prominently and clearly drawn on the map in transparent red so as to not obscure the underlying features that define the boundary. A single map was used that encompasses the entire boundary of the proposed AVA. It is the ***'Washington, Priest Rapids, 2015, BLM, Surface Management Status , 1:100,000-Scale [metric] Topographic Map, 2015, U.S. Department of the Interior Bureau of Land Management'.***

Please note: The BLM edition of the Priest Rapids 1:100,000-scale map that we use to mark the boundary has *all* of the same information in every way and detail as the USGS edition because its printed from exactly the same digital information layers as the USGS map. We use it because it additionally shows land ownership / management status in transparent color overlays, which makes it easier to follow the boundary on the north and east sides of the AVA where it is coincident with various State wildlife areas and Federal wildlife refuges.

(ii) Boundary Description

Note that all legal descriptions of Section, Township, and Range are in reference to the Willamette Base and Meridian (WBM). Note also that the boundary line on the south and west of the proposed AVA is the 250-meter elevation contour (820.2 feet). The contour interval is 50 meters on the map.

a) The boundary description proceeds in a generally clockwise direction. Beginning near the northwest corner of the map, **Point 1** begins where the 250-m contour line meets the northern section line of Section 8, T17N, R23E. From there the boundary of the proposed RSAVA follows the section line eastward to the northeast corner of section 8, T17N, R24E. From there follow the boundary one mile south to the southeast corner of Section 8, then four miles east on the section line to the southeast corner of Section12, T17N, R24E, then north on the section line to **Point 2** where the boundary of the proposed RSAVA meets but does not intrude the boundary of the Desert State Wildlife Area in the NW 1/4 of Section 6, T17N, R25E. Note that the portion of the boundary between Point 1 and Point 2 coincides exactly with a portion of the southern boundary of the Ancient Lakes of the Columbia Valley AVA (ALCV AVA) ensuring that the proposed AVA does not overlap the ALCV AVA.

b) From **Point 2** the boundary follows the boundary of the Desert Unit of the Columbia Basin State Wildlife Area (CBSWA) generally in an easterly direction following section, quarter section, and quarter-quarter section lines to **Point 3** at the northeast corner of

Section 13, T17N, R27E where the wildlife area boundary meets O'Sullivan Dam Road. The boundary of the CBSWA is printed on the Priest Rapids map in the the long dash-dot symbol denoted as ' 'National or State Reservation Boundary' on the map legend.

c) From **Point 3** the boundary follows the centerline of State Highway 262 (O'Sullivan Dam Road) to the east for about 1.5 miles to the center of the intersection of highway 262 and H Road SE, where it turns south following the centerline of H Road SE. The boundary follows the centerline of Road H SE until it intersects the south (E-W) section line of Section 16, T17N, R28E where it follows that section line to the east to **Point 4 at** the southeast corner of Section 16, T17N, R28E. At **Point** 4 the boundary of the proposed RSAVA meets the boundary of the Columbia National Wildlife Refuge (CNWR), which is shown with the long dash-dot symbol printed on the map.

d) From **Point 4** the RSAVA boundary follows the joint boundary of the CNWR and the Goose Lakes Unit of the CBSWA in a generally southerly direction for about 4 miles then continues in a generally southwesterly direction for an additional four miles to **Point 5** where the common boundary of the proposed AVA and the CNWR intersect the eastern (N-S) section line of Section 14, T16N, R27E.

e) From **Point 5** the boundary line turns south, following the N-S section line to **Point 6** where the section line meets the centerline of State Highway 26.

f) From **Point 6** the boundary follows the centerline of state highway 26 in a northwesterly direction to **Point 7** where the centerline of highway 26 intersects the 250-m elevation contour in the SW1/4 of Section 21, T16N, R27E.

g) From **Point 7** the boundary follows the 250-m contour line in a generally westerly direction for about 28 miles to **Point 8** where that contour line intersects the eastern (N-S) boundary line of Section 26, T16N, R23E.

h) From **Point 8** the boundary turns north on that boundary line for approximately 1,100 feet until it meets the northeast corner of that same Section 26. There the boundary line turns west for one mile along the northern (E-W) boundary line of that same Section 26, then it turns north for one mile along the eastern (N-S) boundary line of section 22, T16N, R23E. The boundary then turns west along the northern (E-W) boundary line of that same Section 22 for one mile to the NW corner of that section. The boundary continues west along the same section line for about an additional 170 feet to **Point 9** where it intersect the 250-m elevation contour.

i) From **Point 9** the boundary follows the 250-m elevation contour generally to the north until it meets **Point 1 in** Section 8, T17N, R23E, completing the boundary.

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