Team ID _____
Page Score _____

Total Score _____/50

SOIL PROPERTIES

1) Complete the list of the five soil formation known by their acronym ClORPT. *(2 points)*

Climate
Organisms
Relief
Parent material
Time

2) Which soil structure type is most likely to allow water to move down through the soil profile quickly? (*1 point*)
   a) granular
   b) squiggly
   c) massive
   d) platy

3) A wind-transported soil parent material you might find near a volcano is called: (*1 point*)
   a) glacial deposits
   b) ash
   c) organic material
   d) residuum

4) Where can you expect the thinnest topsoil? (*1 point*)
   a) ridgetop
   b) stream terrace
   c) bottom of a hill
   d) no-till field

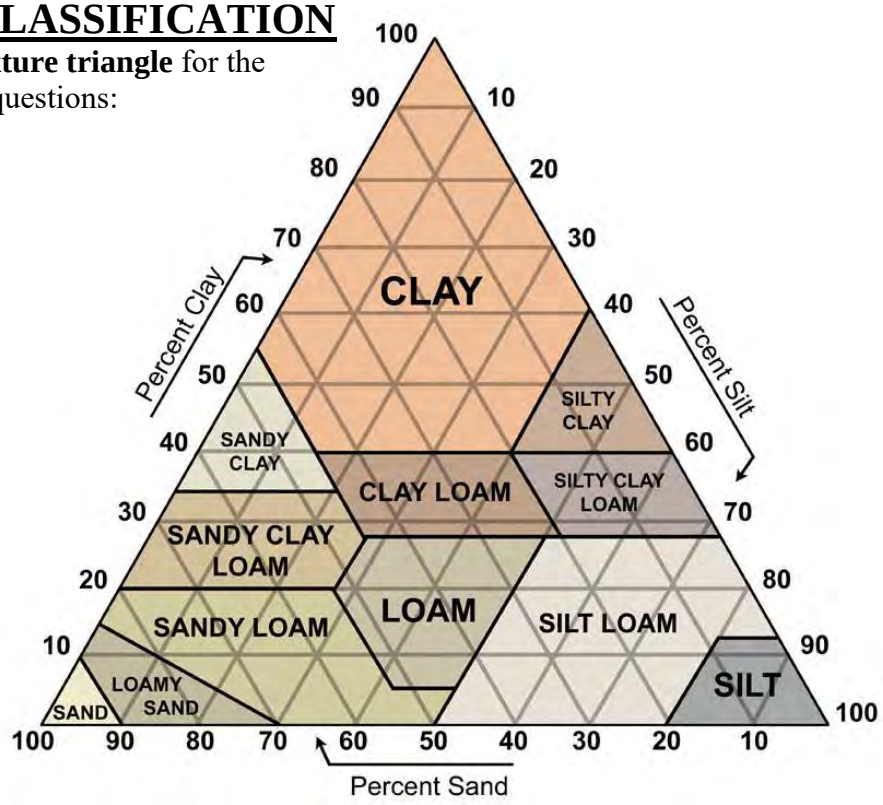
5) In soil formation, leaching of nutrients out of the soil profile by rainfall or irrigation is considered a/an: (*1 point*)
   a) addition
   b) loss
   c) translocation
   d) transformation

6) When a clay particle breaks down into a different mineral it is considered a/an…? (*1 point*)
   a) addition
   b) loss
   c) translocation
   d) transformation

7) Which of the following affect soil pH Circle all that apply (*2 points*)
   a) blocky structure
   b) adding fertilizer or lime
   c) bright soil matrix colors
   d) excessive or limited rainfall

SOIL CLASSIFICATION

Use the **texture triangle** for the following questions:



8) What is the minimum percentage of clay that can be found in clay? (*2 points*)
   40%

9) What texture describes a soil that has 40% sand and 30% silt? (*2 points*)
   clay loam

10) Determine the texture and color of Soil Samples A and B. Use **Soil Texture By Feel Flow Chart** and **Munsell Color Book** provided**.** (*6 points*)

Texture	Munsell Color Notation (moist)
3 pts: loam 1 pt: silty clay loam, clay loam, or silt loam	3 points: 10YR 2/1 (black) or 10YR 3/2 (very dark gray) 0.5 points: 7.5YR hue; 4 value; 3 chroma

Use the provided **soil monolith to answer the following true or false questions**. (*1 point each*)

11) The bottom of the A horizon is at 45 centimeters.
   a) true
   b) false

12) There is no bedrock present within the soil profile.
   a) true
   b) false

13) This soil is well drained because it does not contain redoximorphic features.
   a) true
   b) false

14) This soil would drain quickly due to sandy textures and many rock fragments.
   a) true
   b) false

SOILS & LAND USE MANAGEMENT

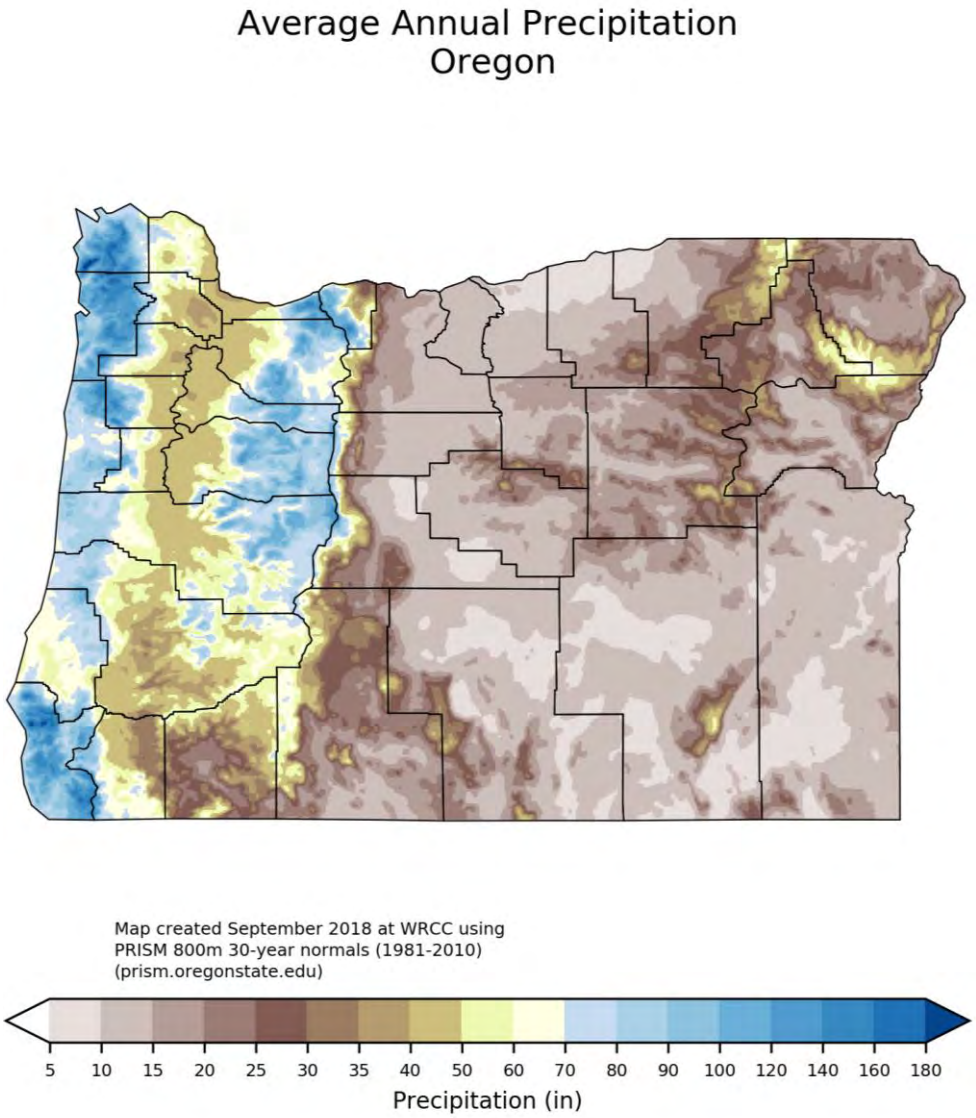
15) Which drainage class of soils would make the best iris farm? (*1 point)*
   a) Excessively drained
   b) Moderately well drained
   c) Not so goodly drained
   d) Very poorly drained

16) In which slope class might you find a low-lying wetland? (*1 point*)
   A- ≤ 3% slope
   B- 4 to 8% slope
   C- 9 to 15% slope
   D- 16 to 35% slope
   E- 36 to 60% slope
   F- 61 to 80% slope

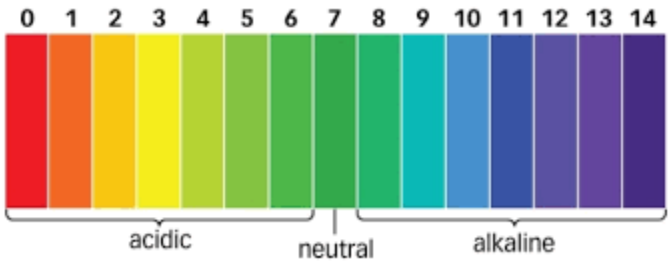
17) Which of the following is considered a root limiting layer? Select all that qualify. (*2 points*)
   a) Granular soil structure
   b) Dense hardpan from years of plowing
   c) Silt loam
   d) Seasonal high water table

18) Which earth cycles are soils involved in? *(1 point)*
   a) Hydrologic cycle
   b) Carbon cycle
   c) Nitrogen cycle
   d) All of the above

19) What is the name of the soil tool provided? (*1 point*)
   a) densiometer
   b) buchner funnel
   c) soil sieve
   d) bulk density tester



20) Based on the rainfall map above, where would you expect the most mineral leaching out of the soil profile occur? (*1 point*)
   a) western Oregon
   b) eastern Oregon



21) Based on the rainfall map above, which landscape would you expect to have the highest (most alkaline/basic) pH? (*1 point*)
   a) western Oregon
   b) eastern Oregon

22) Why did you select your answer for questions 20 and 21? (*1 point*)
Answer should include annual rainfall, may also include mineral leaching (considered a "loss" in soil forming processes), evaporation, cations, base saturation, dissolving/dissolution, acidification, etc.

23) Which pH range do most agricultural plants tolerate best? (*1 point*)
   a) Strongly acid (5.1-5.5)
   b) Neutral (6.6-7.3)
   c) Moderately alkaline (7.9-8.4)

24) Discuss at least one way in which soils can be used to reduce or reuse waste. Explain how it works. (*3 points*)
Answer can include any of the following: filtering wastewater including via septic systems, cycling nutrients (organic matter, nitrogen, carbon, etc.), soil microbes breaking down dead material like leaves, composting, applying agricultural waste like manure or urine as a soil amendment, leaving or tilling in unharvested portions of plants to add organic matter to agricultural fields, mulching with waste products like forestry slash, leaves, or rice hulls

SOIL SURVEY

Use the **Soil Map for** a portion of **Opal Creek Wilderness Area** to answers the following questions:

25) At what scale was this soil survey **mapped**? (*1 point*)
1:24,000

26) What is the **scale of the printed map**? (*1 point*)
1:20,200

27) What is the Map Unit Name of map symbol **8305**? (*1 point*)
Zygore very gravelly medial loam 40-85 percent slopes, south facing
(okay if slope and cardinal direction omitted)

28) What is the available water capacity in centimeters per centimeter for map unit symbol **8101**? *(1 point)*
0.27

29) You are hired as a soil scientist for the United States Forest Service, the federal agency that manages Opal Creek Wilderness Area, an area that was burned during the tragic 2020 Beachie Creek Fire. Based on the **potential damage from fire rating**, name the three soil map units that have the highest risk of fire damage? (*3 points one point each*)
7107/ Cascadia-Aschoff-Rock outcrop complex, 40 to 85 percent slopes, south-facing
8101/ Browder gravelly medial loam, 15 to 50 percent slopes, south-facing
9301/ Battleax very gravelly medial loam, 25 to 70 percent slopes, south-facing

(okay if slope and cardinal direction omitted)

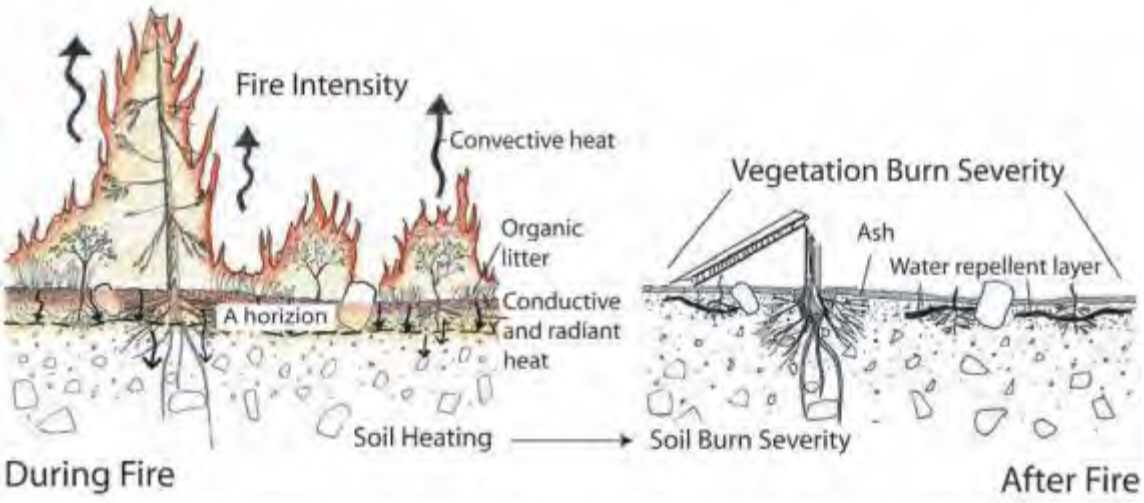


Figure 1. Illustrates the effect of fire intensity on above-ground vegetation and below-ground soil properties. Graphic modified by Mike Hankinson, National Park Service.

30) Luckily, because the Beachie Creek fire was pushed by winds so quickly across the landscape, most of the area did not stay hot long enough to burn deep into the soil profile. While the organic layer was burned off, the underlying mineral soils were only affected in the top centimeter or so. After the fire was out, much of the area was covered in needles from branches that remained in the trees, replenishing the organic layer and acting as a mulch against fall rains.
Based on your answer to question 29, which soil properties (name at least two) would you expect to have the <u>least</u> fire impacts to the soil? (*3 points, hint: look at the rating reasons for Potential for Damage by Fire*)

Soils on north facing slopes would have the least fire impacts because they are deeper, contain fewer rock fragments, have finer textures, are less eroded, and are less steep than their southern-facing counterparts. Answer must list at least two soil properties.

31) What practices would you recommend the USFS utilize to reduce erosion in the burned area? (*1 point*)

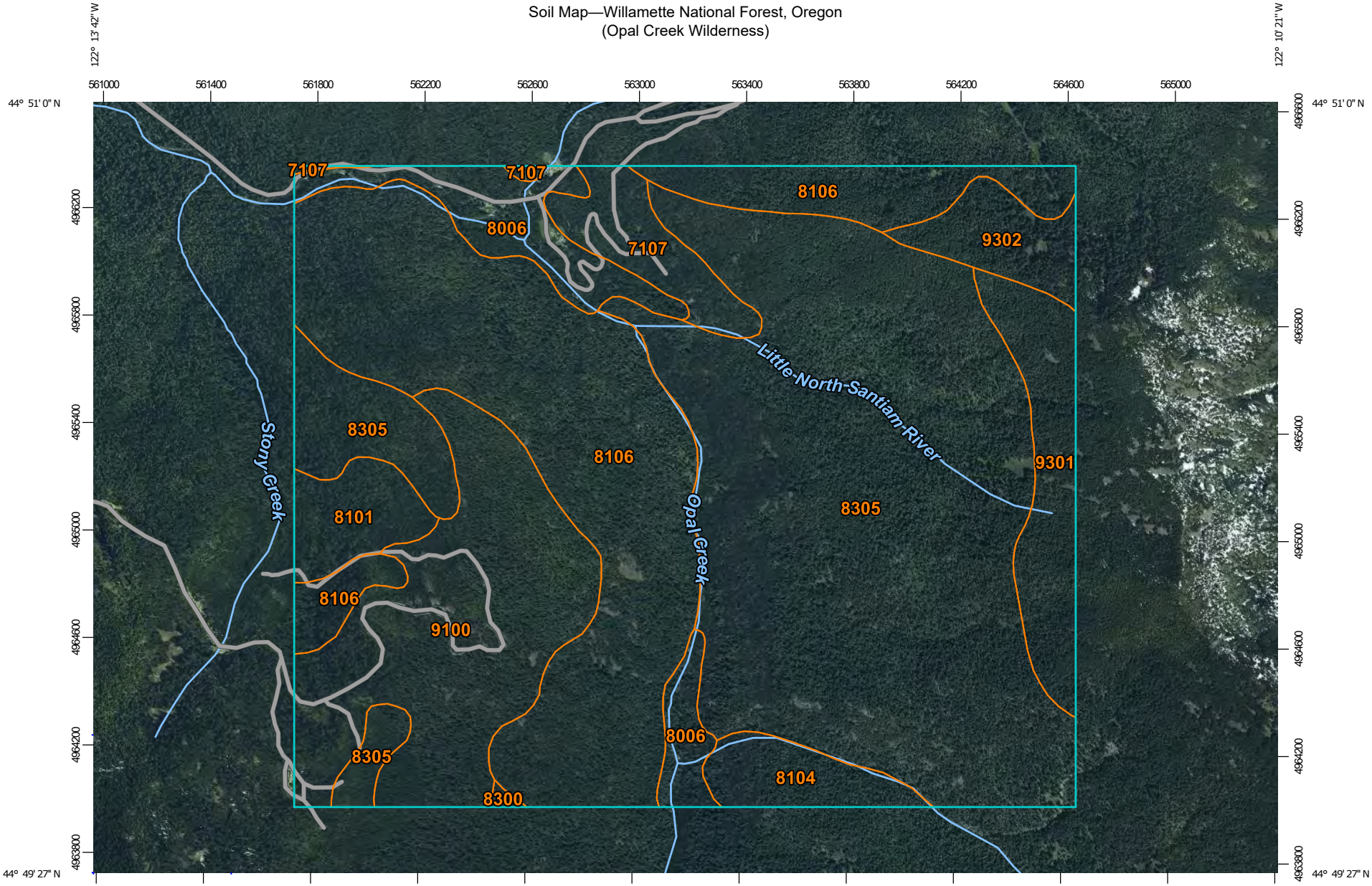
Answer must include mulching, seeding, or another form of protection from rain and wind erosion soon after the fire.

32) What is the difference between soil and dirt? (*3 points*)

From the Oregon Envirothon soil manual: "Soil is the *living* part of the environment which transforms decomposing matter back to lifeforms. Soils are made of solids, liquids, and gases and are home to everything from the tiniest bacteria to the largest living organisms (fungus). Oregon loves and depends on soils so much, we have an official state soil called Jory. By contrast, dirt is soil that has been moved from where it was formed to elsewhere, for example under your fingernails, or tracked into a building. Transported dirt can convert back to soil if it is undisturbed long enough to support plant life and begin to undergo soil-forming processes, as in filled urban areas."

- Two points for identifying that **soil** is living and/or undergoing processes
- One point for identifying that **dirt** is not living/changing **or** displaced from where it formed.

Soil Map—Willamette National Forest, Oregon
(Opal Creek Wilderness)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 0.13

> 0.13 and <= 0.19

> 0.19 and <= 0.21

> 0.21 and <= 0.22

> 0.22 and <= 0.27

Not rated or not available

Soil Rating Lines

<= 0.13

> 0.13 and <= 0.19

> 0.19 and <= 0.21

> 0.21 and <= 0.22

> 0.22 and <= 0.27

Not rated or not available

Soil Rating Points

<= 0.13

> 0.13 and <= 0.19

> 0.19 and <= 0.21

> 0.21 and <= 0.22

> 0.22 and <= 0.27

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Willamette National Forest, Oregon
Survey Area Data: Version 9, Oct 27, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 28, 2020—May 29, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Description

Available water capacity (AWC) refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in centimeters of water per centimeter of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure, with corrections for salinity and rock fragments. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. It is not an estimate of the quantity of water actually available to plants at any given time.

Available water supply (AWS) is computed as AWC times the thickness of the soil. For example, if AWC is 0.15 cm/cm, the available water supply for 25 centimeters of soil would be 0.15 x 25, or 3.75 centimeters of water.

For each soil layer, AWC is recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters per centimeter

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

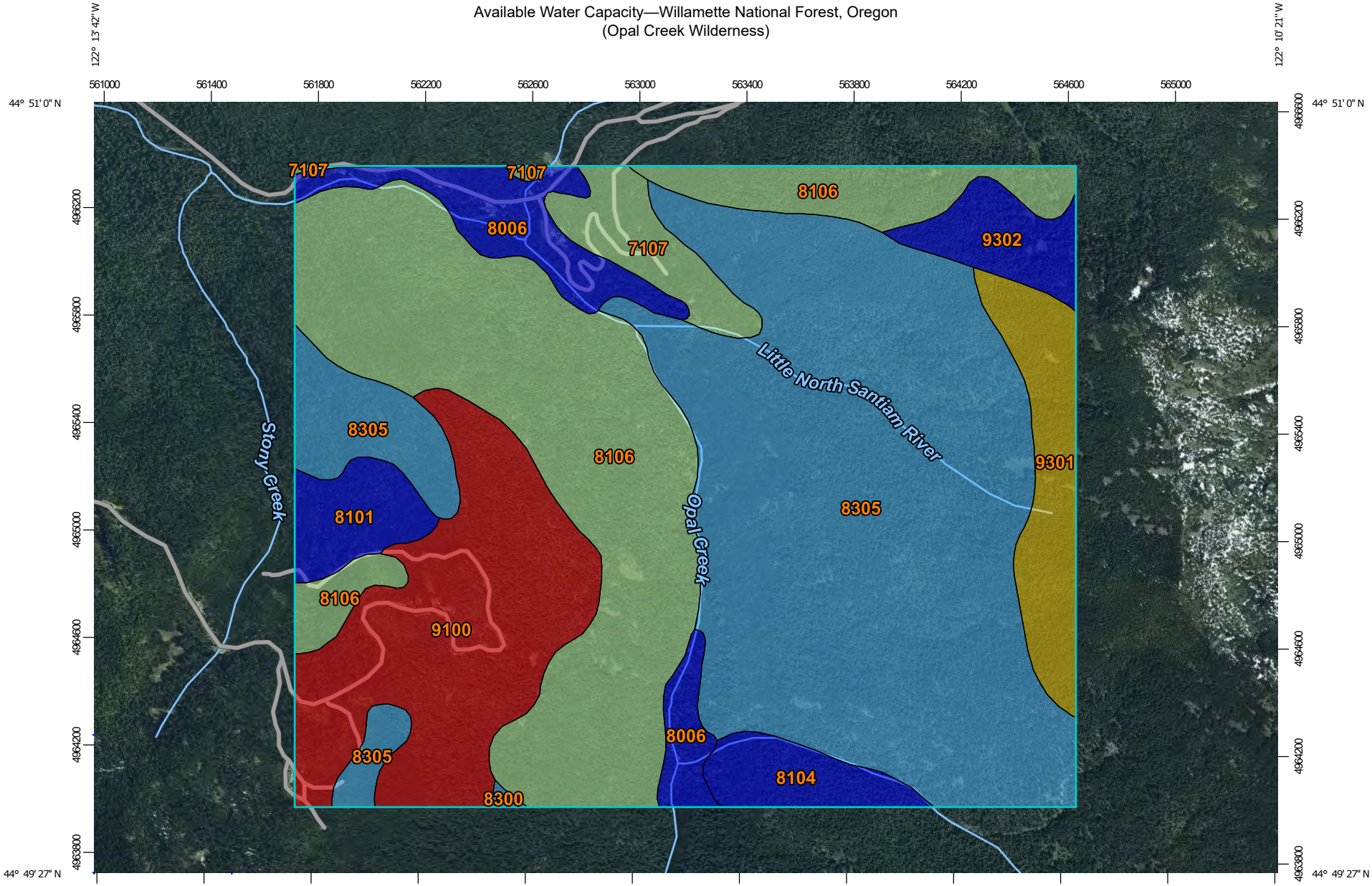
Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 25

Units of Measure: Centimeters

Available Water Capacity—Willamette National Forest, Oregon
(Opal Creek Wilderness)



Map Scale: 1:20,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 250 500 1000 1500

Feet
0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Available Water Capacity

Map unit symbol	Map unit name	Rating (centimeters per centimeter)	Acres in AOI	Percent of AOI
7107	Cascadia-Aschoff-Rock outcrop complex, 40 to 85 percent slopes, south-facing	0.20	50.6	2.9%
8006	Menagerie-Manlywham complex, 0 to 30 percent slopes	0.27	85.1	4.9%
8101	Browder gravelly medial loam, 15 to 50 percent slopes, south-facing	0.27	41.0	2.4%
8104	Browder-Cadenza complex, 25 to 70 percent slopes, north-facing	0.27	38.9	2.3%
8106	Cadenza-Browder complex, 35 to 80 percent slopes, north-facing	0.21	457.5	26.5%
8300	Uppersoda-Fernview complex, 0 to 30 percent slopes	0.22	1.7	0.1%
8305	Zygore very gravelly medial loam, 40 to 85 percent slopes, south-facing	0.22	697.7	40.4%
9100	Holderman-Rockdirt complex, 5 to 40 percent slopes	0.13	234.4	13.6%
9301	Battleax very gravelly medial loam, 25 to 70 percent slopes, south-facing	0.19	78.6	4.6%
9302	Idanha-Hummington complex, 25 to 70 percent slopes, north-facing	0.27	42.2	2.4%
Totals for Area of Interest			**1,727.8**	**100.0%**

Description

The ratings in this interpretation indicate the potential for damage to nutrient, physical, and biotic soil characteristics by fire. The ratings involve an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

The ratings are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope.

The ratings are both verbal and numerical. The soils are described as having a "low," "moderate," or "high" potential for this kind of damage. "Low" indicates that fire damage is unlikely. Good performance can be expected, and little or no maintenance is needed. "Moderate" indicates that fire damage can occur because one or more soil properties are less than desirable. Fair performance can be expected, and some maintenance is needed. "High" indicates that fire damage can occur because of one or more soil properties and that overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration.

Numerical ratings indicate gradations between the point at which the potential for fire damage is highest (1.00) and the point at which the potential is lowest (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

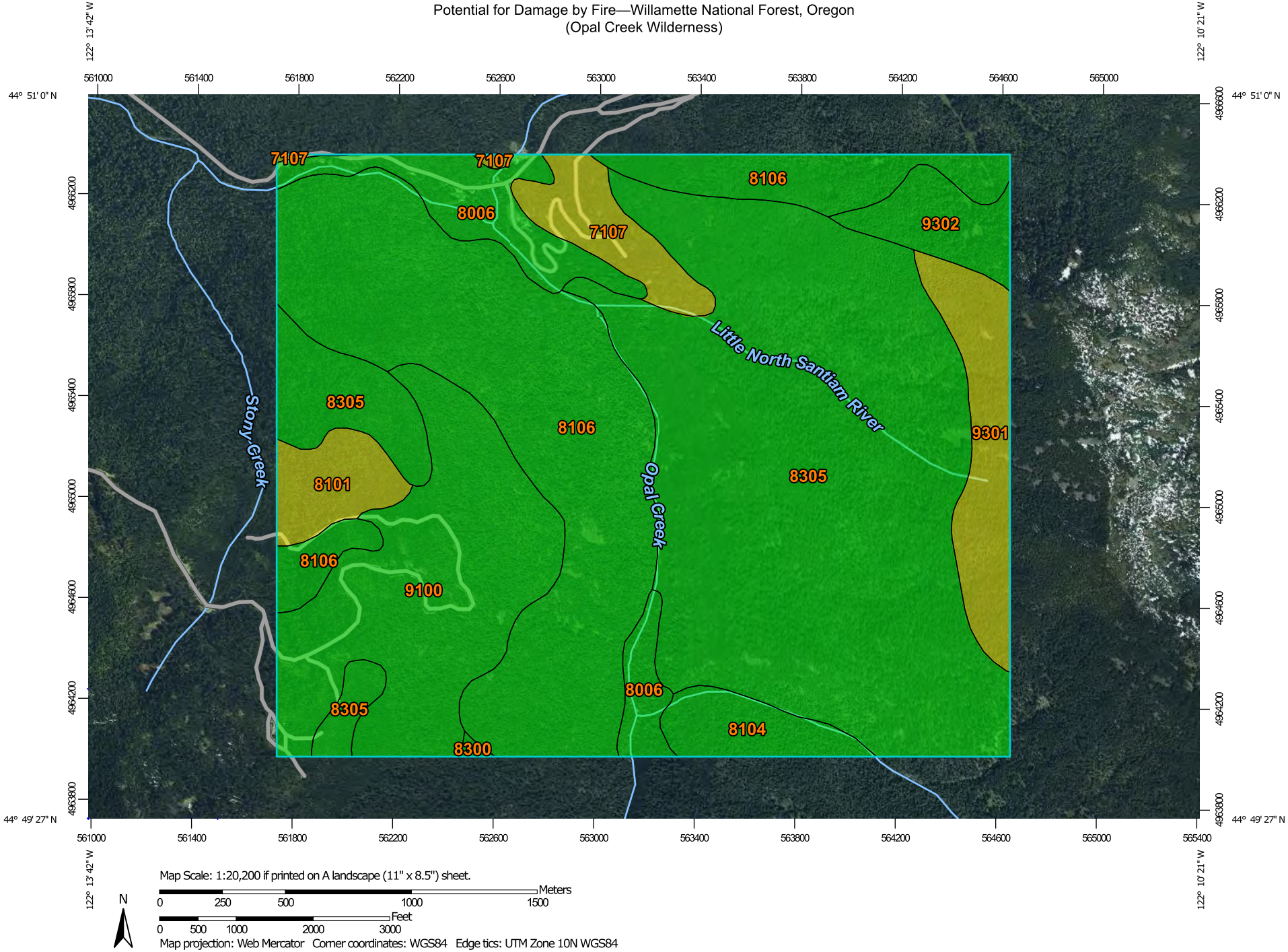
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Potential for Damage by Fire—Willamette National Forest, Oregon
(Opal Creek Wilderness)



Potential for Damage by Fire

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
7107	Cascadia-Aschoff-Rock outcrop complex, 40 to 85 percent slopes, south-facing	Moderate	Cascadia, dry (50%)	Texture/slope/surface depth/rock fragments (0.50)	50.6	2.9%
8006	Menagerie-Manlywham complex, 0 to 30 percent slopes	Low	Menagerie (70%)		85.1	4.9%
			Manlywham (25%)	Texture/surface depth/rock fragments (0.10)		
8101	Browder gravelly medial loam, 15 to 50 percent slopes, south-facing	Moderate	Browder (90%)	Texture/slope/surface depth/rock fragments (0.50)	41.0	2.4%
8104	Browder-Cadenza complex, 25 to 70 percent slopes, north-facing	Low	Cadenza (40%)	Texture/slope/rock fragments (0.10)	38.9	2.3%
			Luckyboy (8%)			
			Cadenza, moist (7%)	Texture/slope/rock fragments (0.10)		
8106	Cadenza-Browder complex, 35 to 80 percent slopes, north-facing	Low	Cadenza (60%)	Texture/slope/rock fragments (0.10)	457.5	26.5%
			Luckyboy (10%)			
			Cadenza, moist (5%)	Texture/slope/rock fragments (0.10)		
8300	Uppersoda-Fernview complex, 0 to 30 percent slopes	Low	Uppersoda (50%)	Texture/surface depth/rock fragments (0.10)	1.7	0.1%
			Fernview (45%)			
			Mariel (3%)			
			Aquandic Cryaquepts (2%)	Texture/rock fragments (0.10)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
8305	Zygore very gravelly medial loam, 40 to 85 percent slopes, south-facing	Low	Zygore (95%)		697.7	40.4%
9100	Holderman-Rockdirt complex, 5 to 40 percent slopes	Low	Holderman (60%)		234.4	13.6%
			Rockdirt (30%)			
9301	Battleax very gravelly medial loam, 25 to 70 percent slopes, south-facing	Moderate	Battleax (90%)	Texture/slope/rock fragments (0.50)	78.6	4.6%
9302	Idanha-Hummington complex, 25 to 70 percent slopes, north-facing	Low	Idanha, moist (50%)	Texture/slope/rock fragments (0.10)	42.2	2.4%
			Tumble (5%)	Texture/rock fragments (0.10)		
Totals for Area of Interest					**1,727.8**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Low	1,557.5	90.1%
Moderate	170.2	9.9%
Totals for Area of Interest	**1,727.8**	**100.0%**