Forest Soil Data for Your Forest Stewardship Plan

WASHINGTON STATE UNIVERSITY EXTENSION • EM064

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Introduction

The soil is one of the most important resources in your forest, and a key factor in forest productivity. It is the site of critical ecological processes such as decomposition, nutrient recycling and uptake, carbon storage, connections between plants and mycorrhizal fungi, and microbial activity. The depth and characteristics of the soil influence tree rooting patterns and stability. Soil is a key part of the water cycle, with the physical soil structure influencing water availability to plants and the rates and patterns of water drainage. Soil chemistry determines nutrient availability and contaminant filtration capacity.

Understanding the soil types and characteristics in your forest is critical for management planning. The timing of canopy closure, thinning needs, and maturity for final harvest will depend largely on soil productivity. What species are appropriate for a given site depends largely on soil drainage. The suitability for road construction, timber harvesting, different types of equipment, and even foot paths, depends on soil characteristics. Soil information will also help identify erosion and compaction hazards.

This manual provides you with a step-by-step guide through the process of getting soil information for your property from the USDA Natural Resource Conservation Service's (NRCS) Web Soil Survey (WSS). This is a free website that serves as a nationwide clearinghouse of soil information. This information was previously published by NRCS (formerly known as the Soil Conservation Service) in soil survey books (usually by county); however, the books are no longer published.

This manual will also suggest specific soil information that you should include in a forest stewardship plan, and provides examples of what the information means for the management of your forest. For more information on the role of soil in forest ecology, please refer to WSU Extension Bulletin EB1943, *Forest Ecology in Washington*. For management guidelines on how to care for and protect your forest soils, please refer to WSU Extension Bulletin EB2019, *Keeping Your Forest Soils Healthy and Productive*. These publications are available to download for free from WSU Extension Publications at http://pubs.wsu.edu/. Hard copies may also be ordered for a nominal fee online, or by calling 1-800-723-1763.

This manual only covers the most basic functions and features of the WSS as they relate to a forest stewardship plan. There are a wide array of additional tools, data, and features that are worth exploring on your own.

Limitations of Soil Data

Before starting the WSS, it is important to understand its limitations. Soil survey coverage is generally very good for Washington. However, not every location has the same level of detail available, so some of the information described in this manual may not be available for (or applicable to) your property.

Soil survey maps are not exact, but rather are generalizations with a high degree of inaccuracy and uncertainty. This is especially true when zooming in to a small area such as an individual property, as the survey maps are not intended for that fine of a resolution. Looking at changes in topography and vegetation on an aerial photo or on the ground, coupled with your own experience on the land, may help you better estimate where soil type boundaries fall on your property.

It is also important to note that even with a correctly identified and located soil type, there is small-scale variability in soil properties. In other words, the soil properties at one point may be a little different than another point a few meters away, even though they are close together and part of the same soil type. These microsite nuances may need to be considered when making management decisions.

The WSS is tremendously useful for getting general approximations of the locations, descriptions, and properties of the soils on and around your land. Ultimately, soil survey maps are no substitute for on-the-ground investigation. Your own experience and observation of the surrounding landscape factors like erosion, compaction, water movement, soil saturation, etc., will help you to interpret and apply

Technical Difficulties?

If you experience technical difficulties or receive an error message when accessing the WSS, there are several steps you can take to troubleshoot the problem. A common cause of error messages is due to site maintenance of the WSS. Unfortunately, there is no notice stating that the system is down for maintenance. Rather, you will see a cryptic error message like the one in Figure 1. As of this writing, the WSS goes down for scheduled maintenance nightly from 10 p.m. to 2 a.m., and Tuesdays and Thursdays between 5 p.m. and 7:30 p.m. (Pacific time); plus the third weekend of each month; and the second Sunday of each month. For the most up-to-date maintenance schedule, visit http://websoilsurvey.nrcs.usda.gov/app/Help/MaintenanceSchedule.htm. There are also periods of unscheduled maintenance that can occur at any time. If you experience unexplained errors when initiating the WSS, try returning at a different day and/or time.

Another item to check is compatibility with your computer's operating system, web browser, and settings. The WSS is compatible with most systems. JavaScript and session cookies must be enabled, though, and popup blocking should be disabled for the WSS. For a complete description of system requirements, visit http://websoilsurvey.nrcs.usda.gov/app/Help/Requirements.htm.

If you still have difficulty, the WSS team provides excellent support and can be reached by sending an email to soilshotline@lin.usda.gov.

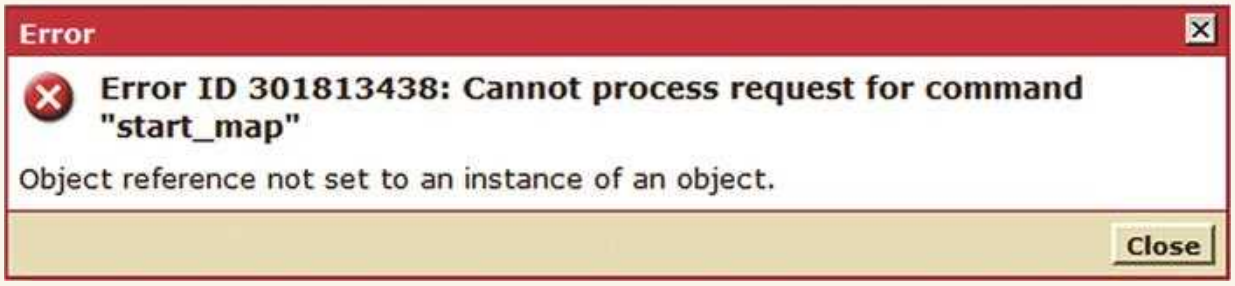

Figure 1. Example error message when the WSS is down for maintenance.

soil survey data for you land. You may also wish to consult a soil scientist for further assistance with interpretation and application of soil survey data.

Contact information for NRCS soil scientists in Washington: http://www.wa.nrcs.usda.gov/technical/soils/technical_ss_assistance.html.

Directory of local USDA—NRCS Service Centers in Washington: http://offices.sc.egov.usda.gov/locator/app?state=WA.

Step 1: Search for your location in the USDA NRCS Web Soil Survey

To access the WSS, go to http://websoilsurvey.nrcs.usda.gov/ and click on the green button to get started (Figure 2). Once the WSS is loaded, you can search for your property location. Under the Area of Interest (AOI) tab on the far left, you will have the option to search several ways, including by address, or by section, township, and range. Enter your search criteria and then click **View**. The interactive map on the right should then zoom in to your search area (Figure 3).

Step 2: Create a soil map for your area of interest

Next you will need to define your specific area of interest; in this case, your property. Above the map is a series of small icon buttons. Click on the button that has a red rectangle and the letters **AOI** (Figure 4). Alternatively, you can use the next button to the right (also with the letters AOI), which allows you to select an irregular polygon instead of a rectangle. Using your computer mouse, click and drag to draw a rectangle on the map over your property. You should now see a blue hatched rectangular area over your property (Figure 5). If you made a mistake in defining your area of interest, you can click the **Clear AOI** button on the far left to go back and try again.

Figure 2. WSS start page.

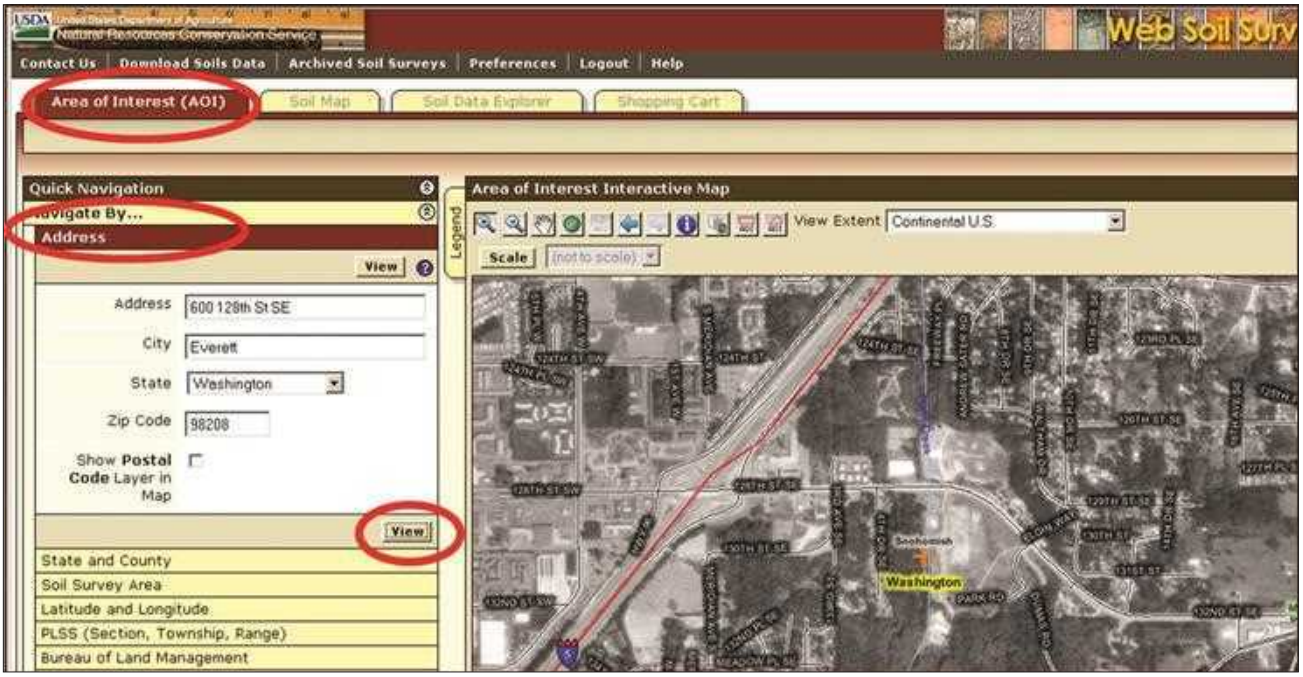

*Figure 3. The **Area of Interest (AOI)** tab, with search fields and the **View** button.*

Because the maps are not exact, a relevant soil type may appear outside of your property on the map. It is important, especially with a small property, to include the surrounding area when generating a soil survey map. Furthermore, some features of the WSS may not work if the selected area of interest is too small.

Once you have defined your area of interest, you can click **Link** in the top navigation bar to generate a customized link that will allow you to return to your area of interest in the future without having to redefine it (Figure 6). To save the link, right-click with your mouse and select the option to save it as a bookmark or favorite in your web browser.

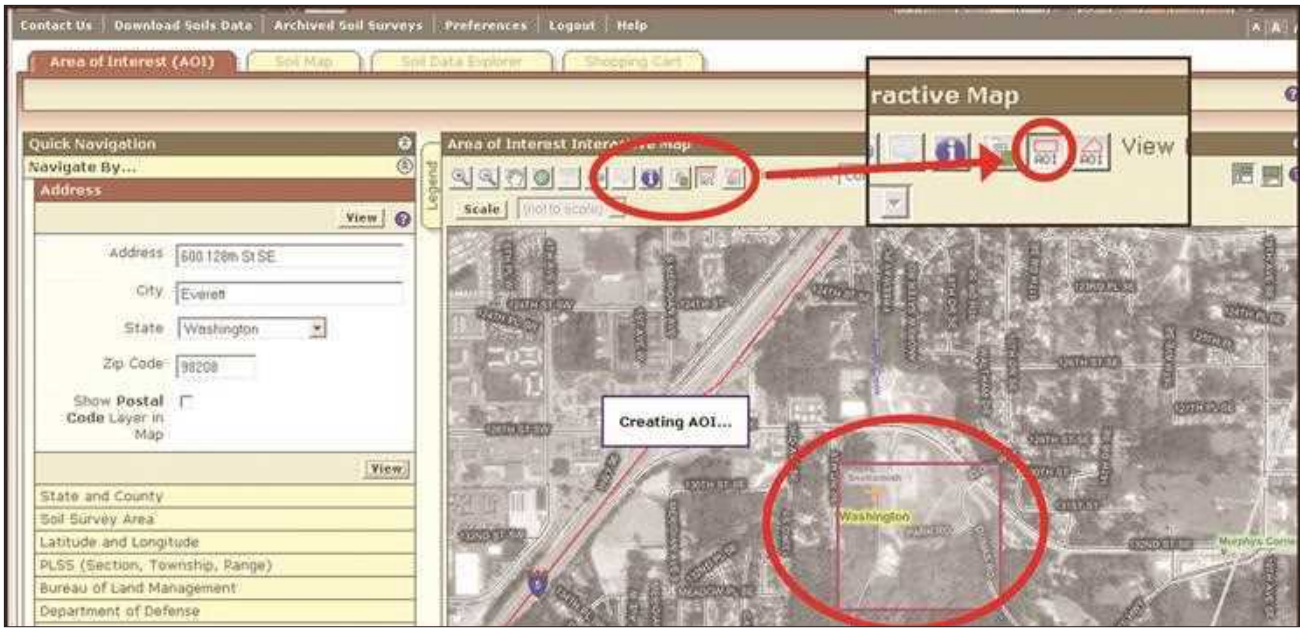

*Figure 4. Using the **AOI** rectangle tool to draw a rectangle on the map.*

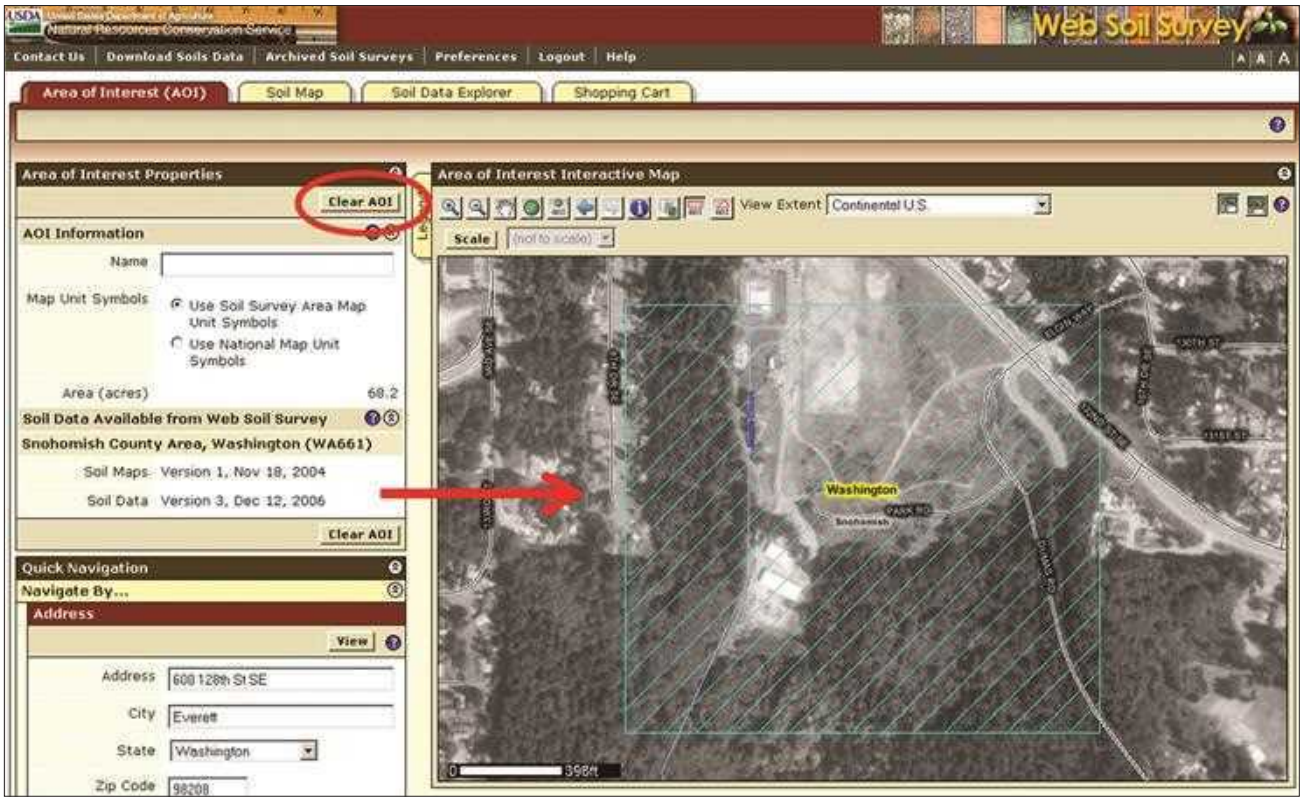

Figure 5. A blue hatched rectangle shows the defined area of interest.

With your area of interest defined, click on **Soil Map**, the second large tab from the left (Figure 7). You should now see a series of shapes drawn with thin orange lines on the interactive map. This is the soil map of your property, with each shape representing a different soil type and labeled with a number (noted with small red circles in Figure 7). These numbers correspond to the list of soil names in the legend on the left hand side.

You should save this map for inclusion in your custom soil report. To save information from the WSS,

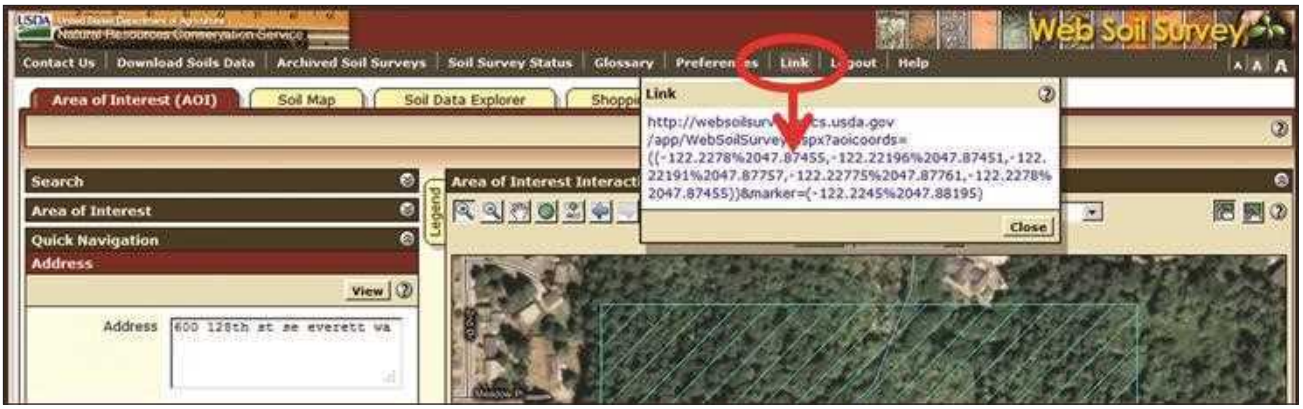

Figure 6. The area of interest link option.

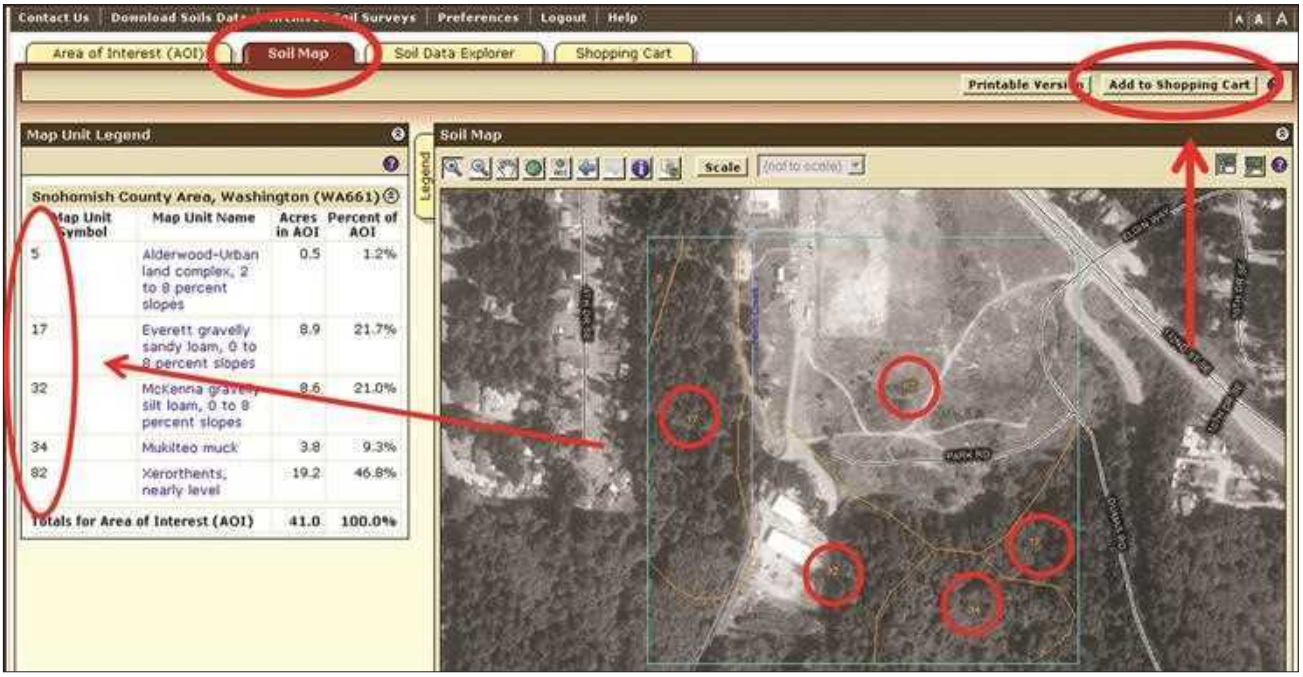

*Figure 7. The **Soil Map** tab, showing the soil types with a legend and the **Add to Shopping Cart** button.*

click the large rectangular button in the upper right marked **Add to Shopping Cart** (Figure 7). There is no charge for any of the information from the WSS, and you will not be asked to purchase anything. The Shopping Cart simply keeps track of the specific information you have selected and puts it together in a custom soil report when you are finished.

Step 3: Generate soil reports

The next step is to go to the **Soil Data Explorer**, which is the third large tab from the left on the top line. Note that after clicking on this tab, a second row of tabs is revealed. Select **Forestland** from the pull-down soil information use menu (Figure 8). Most of the information you need will be under the **Soil Reports** tab, which is on the far right of the lower row of tabs. The menu on the left lists the different topics available; and clicking on a given topic will reveal sub-topics. Select a sub-topic of interest, and then click **View Soil Report** to bring up the information (Figure 9). If you want to save this information in your custom soil report, add it to your shopping cart. Repeat this for other reports of interest. Recommended reports for your forest stewardship plan are listed in the sidebar on the following page.

Step 4: Gather additional information of interest

There are several other sub-tabs (lower row) under **Soil Data Explorer** that may be of interest. The **Suitabilities and Limitations for Use** sub-tab,

Recommended reports for your forest stewardship plan

Here is a list of recommended reports to add to your shopping cart to assist you in developing your forest stewardship plan. Please note that for some properties, not all of the listed topics and sub-topics will be available.

Under Land Management:

- Damage by Fire and Seedling Mortality
- Forestland Site Preparation
- Haul Roads, Log Landings, and Soil Rutting on Forestland
- Hazard of Erosion and Suitability for Roads on Forestland

Under Vegetative Productivity:

- Forestland Productivity with Site Index Base

Under Water Features:

- Water Features

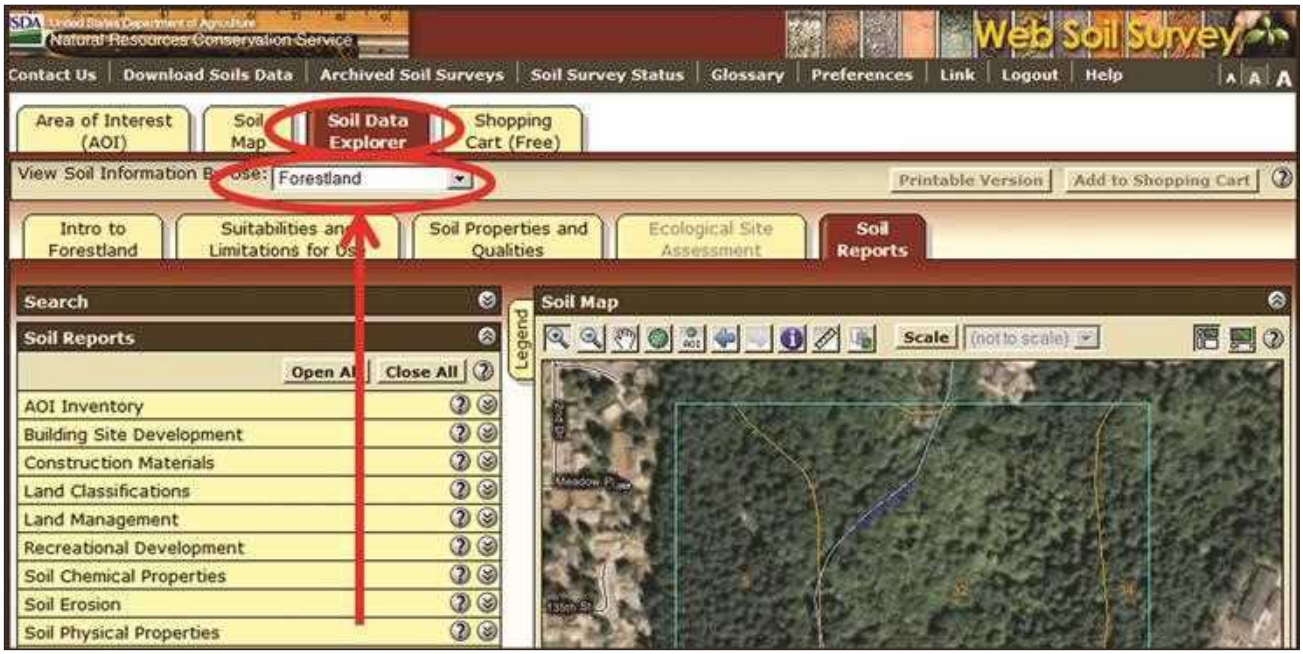

*Figure 8. The **Soil Data Explorer** tab, with sub-tabs and filtered for Forestland use.*

which is second from the left, has information similar to that in the soil reports, but presented as color-coded maps (Figure 10). You may wish to include some of these maps in your overall report. Listed under **Recreational Development** (left menu) are additional topics not found in the soil reports, such as the suitability ratings for **Paths and Trails**. As with the soil reports, not all topics are available for all properties. Select any subtopic of interest and click **View Rating** to display the information. Add any information you wish to your shopping cart.

The **Intro to Forestland** sub-tab (far-left tab under **Soil Data Explorer)** provides a wealth of background information on forest soils. Use the checkboxes on the left side to select topics of interest (Figure 11). Then click **View Selected Topics** to display the information. These can be added to your shopping cart, but use prudence in selecting topics to avoid the custom soil report becoming too large to manage.

*Figure 9. The **Soil Reports** sub-tab showing available reports.*

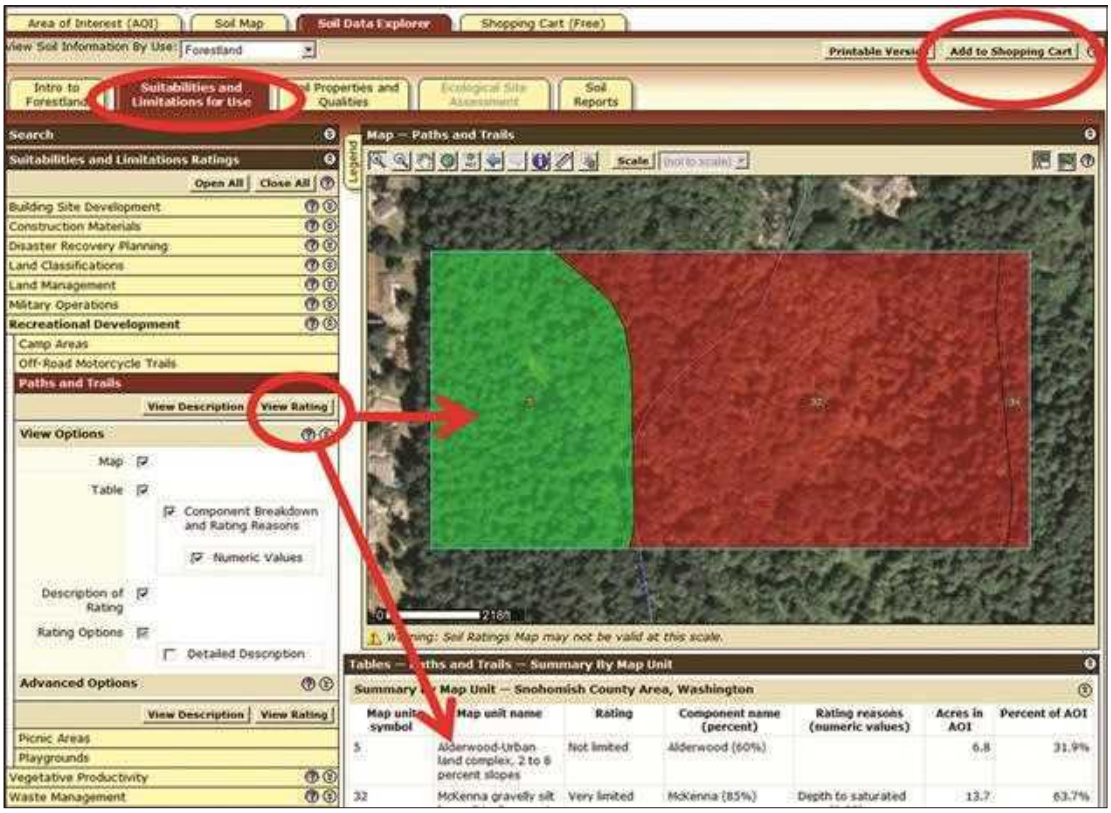

*Figure 10. The **Suitability and Limitations for Use** sub-tab, showing available ratings.*

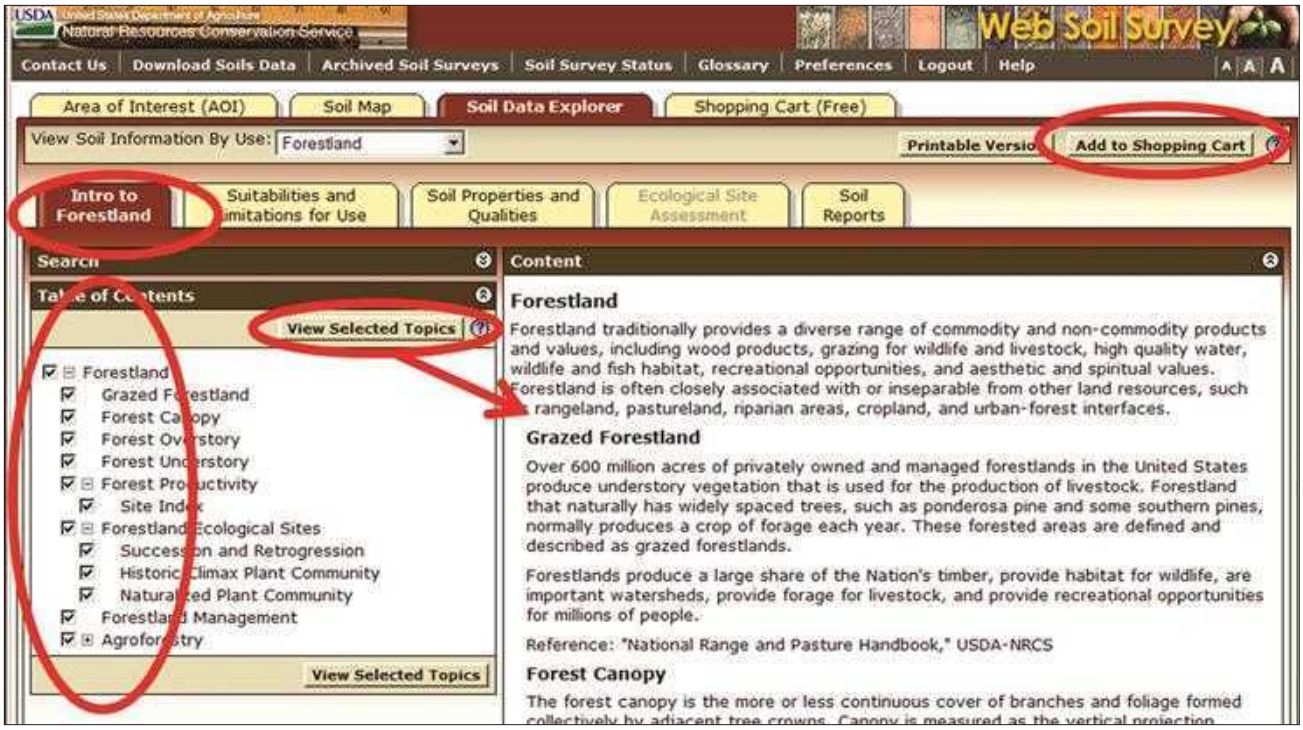

*Figure 11. The **Intro to Forestland** sub-tab under **Soil Data Explorer**.*

Step 5: Generate your customized soil report

Once you have gathered all of the information in your shopping cart, it is time to check out and download your free, customized report. On the top row of tabs, click the **Shopping Cart** tab on the far right and then click **Check Out** (Figure 12). Under delivery options, select **Get Now** and then click **OK** to download your report in PDF format. Depending on what you added to your shopping cart, your report may be quite lengthy. You now have your own detailed soil report that is customized for your property. This report will contain important information that you will want to include in your forest stewardship plan.

Interpreting Your Soil Report

The **Soil Descriptions** section of your report will include basic information about the different soil types on your property including general slope characteristics, soil depth to a restrictive layer like hard pan, information about drainage, and the water table level. This is important information for forest management, as it suggests what types of trees should be planted (e.g. wet- or drought-tolerant), and what limitations there may be for roads, trails, and equipment (e.g. if the water table is high). If the report indicates frequent flooding or ponding, this may indicate a wetland area that could have certain regulatory restrictions.

A particularly important part of your soil report is the **Forestland Productivity with Site Index Base** table. This will list the tree species likely to be found growing on each soil type. For key species, it will list a site index value along with a base age. Site index is a measure of the productivity of the soil for growing a given tree species. It is expressed as the expected height of a dominant tree of that species at a given age, which is the base age listed in the soil report. For example, if your soil type has a Douglas-fir site index of 111 with a base age of 50, you would expect the dominant Douglas-fir trees to be 111 feet tall at age 50.

Higher site index values mean greater soil productivity and faster tree growth. If your soil has a high site index, you may need to thin and perform other management activities sooner than a property with a low site index. Trees will also be ready for harvest at a younger age. Along with the trees, competing brush will also grow faster, so keep this in mind when managing a young stand.

The site index values given in the soil report are broad generalizations and may not be completely accurate for your specific site. You can take measurements of your trees to compute more accurate values for your forest stand(s). For detailed instructions

*Figure 12. The **Shopping Cart** tab with delivery options.*

on how to measure site index in the field, see WSU Extension Publication PNW630, *Basic Forest Inventory Techniques for Family Forest Owners*. This publication is available from WSU Extension Publications for a nominal fee and can be ordered online at http://pubs.wsu.edu/, or by calling 1-800-723-1763.

The **Water Features** section of your report provides more detail about how water will impact your soil throughout the year, including months when you can expect wet soils and ponding. Use this information to help you plan ground-based management activities around times when soils will be dry and less vulnerable to damage. Mention any expected seasonal limitations in your stewardship plan.

The potential for seedling mortality listed in the **Damage by Fire and Seedling Mortality on Forestland** section will help you plan for a reforestation project by providing information on the expected mortality level, and the limiting factors likely to cause seedling mortality, such as not enough available water or extreme wetness. This will further guide you in selecting appropriate species to plant (e.g. wet- or drought-tolerant). Also, if the potential for seedling mortality is high, you may need to plant at a higher density to compensate for expected seedling losses.

The **Hazard of Erosion and Suitability for Roads on Forestland** section will indicate the erosion potential of your soil when building roads and doing other management activities. Erosion hazards are very important to report on in your forest stewardship plan. Soils with high erosion potential will need to be managed very carefully. Timber harvest or road building may not be appropriate in areas with high erosion potential.

The **Haul Roads, Log Landings, and Soil Rutting on Forestland** section will also indicate hazards and potential for damage to your forest soils. Soil rutting hazard is particularly important to include in your forest stewardship plan. Options for ground-based equipment will be more limited on soils with high rutting potential, and seasonal considerations may need to be addressed.

The overall theme of the soils section of your forest stewardship plan should be how you will protect the soils in your forest to avoid erosion, rutting, compaction, and other damage that can cause water pollution and reduce the long-term health and productivity of your forest. WSU Extension Publication EB2019, *Keeping Your Forest Soils Healthy and Productive*, will be an important companion as you prepare this section of your forest stewardship plan. Your local WSU Extension Forester and Washington Department of Natural Resources (DNR) Stewardship Forester are also good resource to help you identify appropriate management recommendations to include in your forest stewardship plan.

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EM064