

# NASP Quick Start Training Guide

## 2026

**Forest Vegetation Simulator**

**U.S. FOREST SERVICE**  
Caring for the land and serving people

Project title: **NASP Training**  
Last accessed: **Thu Oct 20 12:39:33 2022**  
Run contents: 4 stand(s), 6 group(s)

Release date: 20220930  
Local configuration

[Simulate](#) [View Outputs](#) [Visualize](#) [View On Maps](#) [Manage Projects](#) [Help](#)

**Selected run**  
Complex 1  
[New](#) [Reload](#) [Save](#) [Duplicate](#) [Delete](#)

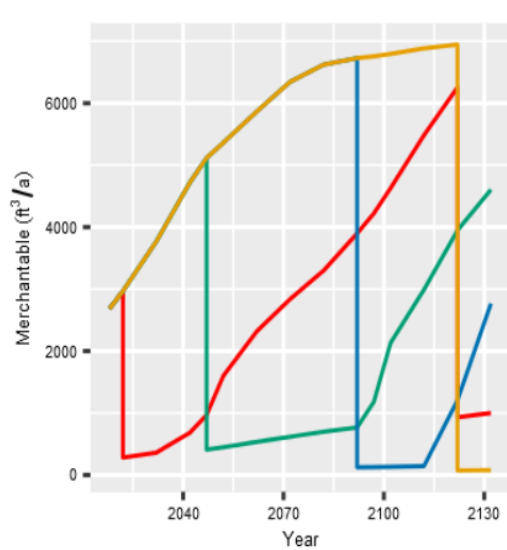
**Run title**  
Complex 1

**Run Contents** ☒ Full run ☐ Just groups  
090603020480017 r001 25  
> Grp: All Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKey  
-> Kwd: Exclude YB from Harvest  
-> Cnd: After significant harvesting/thinning  
-> Kwd: Plant/Natural with Partial Estab Mo  
-> Cnd: After significant harvesting/thinning  
-> Kwd: Plant/Natural with Partial Estab Mo  
> Grp: Forest\_Type=801  
> Grp: AutoRep=1  
> Kwd: Entry1: Group Opening 2022  
> Kwd: Entry5: Group Opening 2122  
090603020480017 r002 25  
> Grp: All Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKey  
-> Kwd: Exclude YB from Harvest  
-> Cnd: After significant harvesting/thinning  
-> Kwd: Plant/Natural with Partial Estab Mo  
-> Cnd: After significant harvesting/thinning  
-> Kwd: Plant/Natural with Partial Estab Mo  
> Grp: Forest\_Type=801  
> Grp: AutoRep=2  
> Kwd: Entry2: Group Opening 2047  
090603020480017 r003 25  
[Edit](#) [Change to freeform](#) [Cut/Delete](#) [Copy](#)  
[Paste item selected below](#)  
**Components available to paste**  
  
**Find stand:**

**Stands** **Time** **Components** **Select Outputs** **Run**

**MgmtID (4 chars)**  
GS  
☒ Wait for run  
☐ Run in background  
[Save and Run](#)  
[FVS Main Output File](#)

**Select run script (normally, use the default)**  
Default useful for all FVS variants



| Year | Stand 090603020480017 r001 | Stand 090603020480017 r002 | Stand 090603020480017 r003 | Stand 090603020480017 r004 |
|------|----------------------------|----------------------------|----------------------------|----------------------------|
| 2040 | 2500                       | 500                        | 500                        | 2500                       |
| 2070 | 1000                       | 1000                       | 1000                       | 5500                       |
| 2100 | 1000                       | 2000                       | 1000                       | 6000                       |
| 2130 | 1000                       | 4500                       | 2500                       | 0                          |

Run made with: FVSI v:20220930

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## Installing FVS

The Forest Vegetation Simulator (FVS) is a browser-based forest modeling system utilizing the Shiny web application framework to interact with FVS geographic growth and yield models.

The installation package for FVS may be found in the download section on the FVS Software Complete Package webpage (<https://www.fs.usda.gov/fvs/software/complete.php>).

The installation package is a single executable that will install the standard suite of programs included with FVS. Installing all the components will require more than 250 MB of hard drive space and take about 10-15 minutes to install. Any program files from previous installations of the FVS Complete Package will be overwritten. All other project folders in the destination specified will not be overwritten. Depending on your security settings, you may need administrative privileges to install/uninstall FVS.

To install the current FVS Software Complete Package, perform the following steps.

1. Click the link for the FVS Software Complete Package installation file to begin downloading it.
2. When prompted, Save the file to a location on your local computer (remember where you save it).
3. When the executable has finished downloading, choose to open the installation executable by clicking the **Open** button. If you do not have this option, navigate to the directory where you specified the file be saved and double-click on the executable.
4. Following the FVS splash screen, select a location to save your projects or accept the default location and click the **Install** button.
5. When the installation is finished, click the **Finish** button.



The installation package will install an FVS Icon on your desktop that is linked to the FVS program located in your selected folder. Within the folder, you will find the default project folder named, *Project\_1*. When FVS is started, *Project\_1* will be the active project.

6. Double click the **FVS** icon on your desktop. FVS will open in your default browser.

## Understanding the interface

At the top of the interface, you will see a title bar with information regarding the active project, the date and time you last accessed FVS, the release date, and the interface configuration.

Below the title bar you will see the main menu tab panel, consisting of six tabs: **Simulate**, **View Outputs**, **Visualize**, **View on Maps**, **Manage Projects**, and **Help**.

These tabs open pages that contain command items (buttons, selection and text boxes, and check boxes) as well as secondary menu tab panels that contain groups of command items.

The screenshot shows the Forest Vegetation Simulator (FVS) web interface. At the top is a title bar (1) containing project information: Project title: National Training, Last accessed: Fri Dec 09 08:39:15 2022, Run contents: 0 stand(s), 0 group(s), and Release date: 20230106. Below the title bar is a main menu tab panel (2) with tabs: Simulate, View Outputs, Visualize, View on Maps, Manage Projects, and Help. The 'Simulate' tab is active, showing a secondary tab panel (3) with sub-tabs: Stands, Time, Components, Select Outputs, and 'Run'. The 'Run' sub-tab is selected. On the left, the 'Selected run' section (4) includes a dropdown for 'Run 1', buttons for 'New', 'Reload', 'Save', 'Duplicate', and 'Delete', a text box for 'Run title' (containing 'Run 1'), and radio buttons for 'Run Contents' (Full run selected, Just groups). Below this is a large text area for 'Run Contents' and buttons for 'Edit', 'Change to freeform', 'Cut/Delete', and 'Copy'. A 'Find stand:' section with a text box and 'Find' button is at the bottom left. On the right, the 'Training data installed' section includes a 'Quick link to: Upload inventory database' button. Below this is the 'Inventory Data Tables' section with a dropdown for 'Stands (FVS\_StandInit)'. The 'Variants' section (5) has a dropdown for 'ak: Alaska'. The 'Groups' section shows a list of stands: All\_Stands, Forest\_Type=122, Forest\_Type=125, Forest\_Type=301, Forest\_Type=305, and Forest\_Type=902. Below this is a section for 'Stands must be in any or all selected groups' with radio buttons for 'Any' (selected) and 'All'. Further down are input fields for 'Number of replicates of each added stand' (1) and 'Relative weights of each replicate' (1), with buttons for 'Add selected stands' and 'Add stands in selected groups'. At the bottom right, the 'Find stand(s):' section (6) has a text box and a 'Find' button.

- 1. Title Bar
- 2. Main Menu Tab Panel
- 3. Secondary Tab Panel
- 4. Command Button
- 5. Selection Box
- 6. Text Box

Below is a brief description of each menu item.

### Simulate

The **Simulate** tab is divided into two regions where on the left you have options to select or create runs and view/modify their contents. On the right, you have a secondary tab panel designed to help you parameterize runs. This tab panel is used to add stands to a run (**Stands**), set the time frame (**Time**), add instructions (**Components**), select output tables (**Select Outputs**), and run the simulation (**Run**).

## View Outputs

The **View Outputs** tab contains a secondary menu tab panel on the left which allows you to load and explore FVS outputs (**Load** and **Explore**) that were selected on the **Simulate > Select Outputs** tab or create user-defined outputs using custom queries (**Custom Query**) of available output tables. A **Describe tables** selection box is found on the right which provides descriptions of all variables contained in any FVS output table.

## Visualize

The **Visualize** tab contains check boxes and selection boxes that allow you to display two sets of images of stands in any FVS run, if the **SVS** check box was selected in the **Simulate > Select Outputs** menu prior to running the simulation. Each image set will contain three static images (perspective, profile, and overhead views) and one dynamic image (user may adjust view).

## View on Maps

The **View on Maps** tab contains selection boxes that allow you to display FVS outputs from a selected run for stand polygons or points overlain on one of four Google base maps. The output may be viewed in tabular or graphical form by selecting the appropriate **Display** radio button.

## Manage Projects

The **Manage Projects** tab contains a secondary menu tab panel which allows you to select, create and backup projects (**Manage Project**); import forest inventory input data and maps (**Import input data**); import runs, custom component files, graph settings, and queries from another project (**Import runs and other items**); and, download input/output databases and run components (**Downloads**).

## Help

The **Help** tab explains each of the aforementioned menu items in enough detail to guide you through making runs with FVS.

## Creating an FVS project

FVS is installed with a default project, named *Project\_1*, which contains a training dataset composed of inventory and map data from across the country. The modules associated with this training guide use this project for all exercises. If you wish to create a new project for your data, follow the steps below.

When it is time to run your data through FVS, we recommend creating a new FVS project using the **Manage Projects > Manage Project** tab. Once created, the new project will contain a copy of the training dataset mentioned above. You will be able to replace the training dataset with your own FVS-ready data using the **Manage Projects > Import input data > Upload inventory database** options. The following steps describe how to create a new project and replace the existing training dataset with your own dataset. Once your new project is created, you can toggle back and forth between projects using the **Select project** selection window on the **Manage Projects > Manage project** tab. When you open a selected project, you will be sent to the **Simulate** tab for that project.

1. Select the **Manage Projects > Manage project** tab.
2. In the **Create a new project** title text box, type in a name for your project such as, “NASP Training.”
3. Click the **Make new project** button.
4. Once the project is created, use the **Select project** selection window to select *NASP Training* project and click the **Open selected project** button.

FVS will restart with the **Simulate** tab activated for your project. At the top of the page, you’ll see the project title has been set to the name you entered.

|                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  Forest Vegetation Simulator<br>  U.S. FOREST SERVICE<br>Caring for the land and serving people | Project title: <b>NASP Training 2026</b><br>Current Location: <b>C:/FVS/NASP Training 2026</b><br>Last accessed: <b>Fri Jul 31 11:12:21 2026</b><br>Run contents: 0 stand(s), 0 group(s) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Replacing the training database

There are two ways to navigate to the **Upload inventory database** tab: (1) you can click the **Upload inventory database** button on the quick link of the **Simulate > Stands** tab or you can navigate to the upload tab by clicking **Manage Projects > Import input data > Upload inventory database** tab. The **Upload inventory database** tab gives you the option to replace or add to the existing database with an FVS-ready database utilizing the FVS input database structure, as described in the [User’s Guide to the Database Extension](#). Acceptable database formats include SQLite databases (.db or .sqlite), Microsoft Access databases (.mdb or .accdB), or Microsoft Excel spreadsheets (.xlsx) where the table/sheet names are the same as the target table names. Variable names need to match FVS input database structure. Replacing the existing database is a two-step process where you first upload an FVS-ready database, then you install the uploaded database. The steps to do so are clearly spelled out in FVS.

5. Select the **Upload inventory database** tab.
6. Follow the directions in **Step 1** to upload your FVS-ready database.
7. Follow the directions in **Step 2** to install the uploaded database.

Once your database is installed, you may upload your map data using the **Upload map data** tab. Many map file formats are supported, refer to this [list](#) for a list of file formats. To upload a map, first

create a .zip file that contains a single directory (folder) where the coverages are stored. Then upload the .zip file and let FVS try to load the appropriate files. If the .zip file contains more than one layer, you can select the layer that contains stand polygons (the system will attempt to make a valid selection). Note that the polygons must be identifiable by StandID but frequently the coverage data contains this information under a different variable name. FVS attempts to discover the correct variable to match to StandID. You can set the variable here if necessary.

If the geographic projection of your data is not stored with the data (usually it is part of the coverage data), then you can set the projection using the provided tools. You can select a projection from the list button or just type in the proj4 string into the text box. Note the projection is set or reset here but the spatial data are not re-projected. Any needed re-projection is done automatically.

Adding the map coverage is also a two-step process.

8. Select the **Manage Projects > Import input data > Upload map data** tab.
9. In Step 1, click the **Browse** button and select the zip file containing your spatial dataset. As the data is uploaded, FVS will attempt to attach your spatial data to the tabular data loaded in the previous steps. If successful, FVS will display the joining variable along with the percent match.
10. Click the **Install imported spatial data** button to finish installing your map data.

If you do not have map data for your project, you can still view FVS outputs on a map if you enter latitude and longitude in your input stand data (FVS\_StandInit table). When viewing FVS outputs on maps using this method, the stands will appear as points on your map. The training data for Alaska only contains latitude/longitude point data while the rest of the training dataset contains polygon map data.

You are now ready to simulate forest development within your project.

## Base 1: Single stand run

In this exercise, you will use FVS to describe stand development for the next thirty years using the **View Outputs**, **Visualize**, and **View On Maps** menu options.

### Starting a new run

Starting an FVS run begins with naming and saving your run. Upon startup, FVS reads the inventory data and activates the **Simulate** menu. The default run title is set to *Run 1*. A new run can be initiated by clicking the **New** button and typing in a new title in the **Run Title** text box. The **Save** button saves the run.

1. Within the **Simulate** menu, begin a new simulation by clicking the **New** button.
2. Change the **Run title** to *Base 1*.
3. Click the **Save** button.

### Adding a stand into a run

Specific stands may be added to the run by using the selection tools in the **Stands** menu. Your selection choices impact options in a top-down manner where your choice of **Inventory Data Tables** will dictate which **Variants** are available and subsequently which **Groups** are available. Selecting a grouping code will display stands that meet all the above criteria specified. If multiple group codes are selected, the default is to display any stands that have at least one of the grouping codes. This may be changed to display only those stands that meet all the grouping codes selected by changing the option associated with the **Stands must be in any or all selected groups** radio buttons to *All* from *Any*.

You can add a single stand by highlighting the stand and clicking the **Add selected stands** button. Once added to a run, the stand will be added to the **Contents** window.

Perform the following steps to add a stand into the run.

4. In the **Variants** selection box, select *wc : West Cascades*
5. In the **Groups** selection box, select *Forest\_Type=201*.
6. In the **Stands** selection box, select stand *06180195670002086*.
7. Click the **Add selected stands** button.

Simulate

View Outputs

Visualize

View On Maps

Manage Projects

Help

Selected run

Base 1

New

Reload

Save

Duplicate

Delete

Run title

Base 1

Content View

☒ Full run
☐ Just groups

Simulation Contents

06180195670002086  
> Grp: All\_Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKey  
> Grp: Forest\_Type=201

Edit

Change to freeform

Cut/Delete

Copy

Paste item selected below

Components available to paste

Find stand:

Find in Simulation Contents

Stands

Time

Components

Select Outputs

\*Run\*

Inventory Data Tables

FVS\_StandInit

Variants

wc: West Cascades

Groups

Forest\_Type=270  
Forest\_Type=301  
Forest\_Type=999  
Location\_Code=618  
Project=Inventory  
Variant=wc

Stands must be in any or all selected groups

☒ Any
☐ All

Available Stands

06180195670001579  
06180195670001614  
06180195670001619  
06180195670001683  
06180195670001691  
06180195670001735  
06180195670001794  
06180195670001835  
06180195670001844  
06180195670001883  
06180195670001891  
06180195670001899  
06180195670001905  
06180195670002040  
06180195670002086  
06180195670002114  
06180195670002146  
06180195670002166

105 Stand(s) in 1 Group(s)

Number of replicates of each added stand

1

Relative weights of each replicate

1

Add selected stands

Add stands in selected groups

Find stand(s):

Find in Available Stands

FVS keywords assigned to stands or grouping codes will be added into the simulation. In this dataset, keywords linking the FVS variant to the stand and tree data will be added from the *FVS\_GroupAddfilesAndKeywords* table using the *All\_Stands* grouping code. This can be seen in the **Contents** window with the indented line starting with *->Kwd:*.

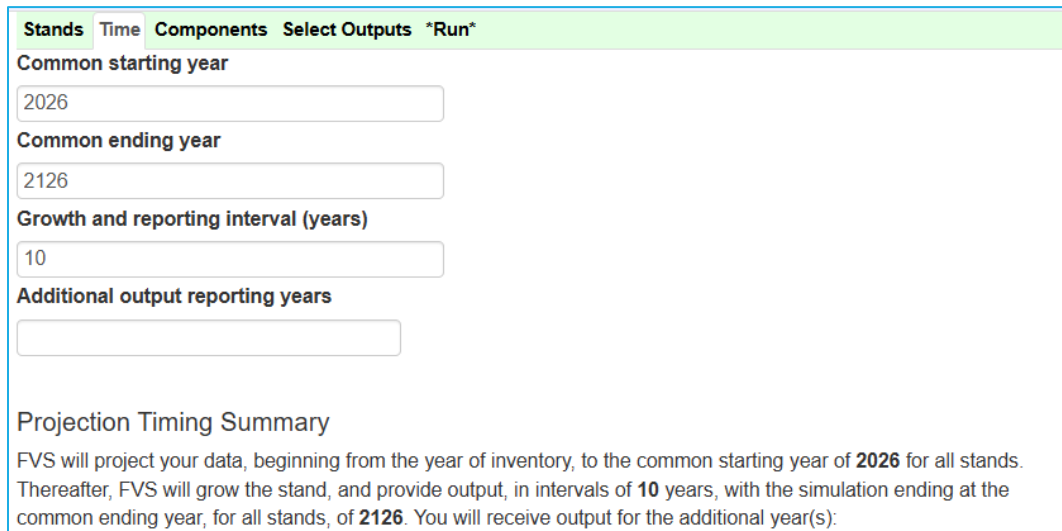
## Setting the time frame

8. Select the **Time** menu.

Setting the time frame of the run is done using the **Time** menu. By default, the common starting year is set to the current year and the common ending year is set to ten growth cycles in the future. For most variants, the default growth interval is ten years which results in a default simulation length of 100 years. The growth and reporting interval may be changed, and additional reporting years may be specified; however, care is needed as FVS can only simulate up to 40 total growth intervals.

Perform the following steps to set up a thirty-year simulation starting in 2026.

9. Change the **Common starting year** and **Common ending year** to 2026 and 2056, respectively.
10. Read the **Projection Timing Summary** for a description of how your timing choices will affect the run.



The screenshot shows the 'Time' tab in the FVS software interface. It contains several input fields for simulation parameters. Below these fields is a 'Projection Timing Summary' section that provides a textual overview of the simulation setup based on the entered values.

| Stands                                                                                                                                                                                                                                                                                                                                                            | Time | Components | Select Outputs | *Run* |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------|----------------|-------|
| <b>Common starting year</b>                                                                                                                                                                                                                                                                                                                                       |      |            |                |       |
| <input type="text" value="2026"/>                                                                                                                                                                                                                                                                                                                                 |      |            |                |       |
| <b>Common ending year</b>                                                                                                                                                                                                                                                                                                                                         |      |            |                |       |
| <input type="text" value="2126"/>                                                                                                                                                                                                                                                                                                                                 |      |            |                |       |
| <b>Growth and reporting interval (years)</b>                                                                                                                                                                                                                                                                                                                      |      |            |                |       |
| <input type="text" value="10"/>                                                                                                                                                                                                                                                                                                                                   |      |            |                |       |
| <b>Additional output reporting years</b>                                                                                                                                                                                                                                                                                                                          |      |            |                |       |
| <input type="text"/>                                                                                                                                                                                                                                                                                                                                              |      |            |                |       |
| <b>Projection Timing Summary</b>                                                                                                                                                                                                                                                                                                                                  |      |            |                |       |
| FVS will project your data, beginning from the year of inventory, to the common starting year of <b>2026</b> for all stands. Thereafter, FVS will grow the stand, and provide output, in intervals of <b>10</b> years, with the simulation ending at the common ending year, for all stands, of <b>2126</b> . You will receive output for the additional year(s): |      |            |                |       |

## Selecting Outputs

11. Select the **Select Outputs** menu.

The **Select Outputs** menu allows you to request output tables for various output categories. Some tables are automatically produced, such as the *FVS\_Summary* table which includes common stand level summary statistics describing stand density, size and volume. Other tables need to be selected using the check boxes provided.

In this exercise, you will select outputs that will describe stand composition, surface material, and snags.

12. Check the **Stand Visualization** box to request image files
13. Check the **Tree lists** box to request output needed to create a stand and stock table.
14. Check the **Carbon and fuels** and **Snags and down wood** boxes to request output describing biomass in other stand components.

**Stands Time Components Select Outputs \*Run\***

Select outputs

Note that all outputs are put in output database except for the Stand visualization data.  
FVS\_Cases, FVS\_Summary, FVS\_Compute, FVS\_Error and mistletoe (FVS\_DM\_Stnd\_Sum, FVS\_DM\_Spp\_Sum) are always produced.

---

**Stand Visualization Options**

☒ Stand visualization: Plot shape ☒ Round ☐ Square Images per fire:

---

**Database and Text Output Options**

☒ Tree lists (FVS\_Treelist, FVS\_CutList, FVS\_ATRTList, (StdStk-stand and stock))

☒ Carbon and fuels (FVS\_Carbon, FVS\_Consumption, FVS\_Hrv\_Carbon, FVS\_Fuels)

☐ Fire and mortality (FVS\_Potfire, FVS\_BurnReport, FVS\_Mortality)

☒ Snags and down wood (FVS\_SnagSum, FVS\_Down\_Wood\_Cov, FVS\_Down\_Wood\_Vol)

The **Describe tables** selection box at the bottom of the **Select Outputs** menu allows you to review table variables and their definitions. These definitions will provide most of the information you need to select the appropriate variables to describe your stand. Further information describing the variable calculation methods may be found in Essential FVS: A User's Guide to the Forest Vegetation Simulator (Dixon 2002), The Fire and Fuels Extension to the Forest Vegetation Simulator: Updated Model Documentation (Rebain 2010), and other FVS documents found on the [FVS documents](#) webpage. The **Describe tables** selection box also appears in the **View Outputs- Load** menu.

15. Use the **Describe tables** selection box to familiarize yourself with the outputs associated with the tables selected above.

**Describe tables**

FVS\_Fuels

FVS\_Fuels is generated by the Fire and Fuels Extension. The table contains fuel loads of standing trees by size classes and dead versus live, and surface fuels by fuel class (litter, duff, and down wood size classes). There is one row for each stand and cycle year. NOTE: this table corresponds to the All Fuels Report described in Section 2.4.10 of the Fire and Fuels Extension Guide. FVS\_Fuels

| Variable       | Description                                                        |
|----------------|--------------------------------------------------------------------|
| CaseID         | Unique FVS case identifier that corresponds to the FVS_Cases table |
| StandID        | Stand identification                                               |
| Year           | The simulation year of the report                                  |
| Surface_Litter | Ground litter                                                      |
| Surface_Duff   | Surface duff                                                       |
| Surface_lt3    | Dead fuel less than 3 inches                                       |
| Surface_ge3    | Dead fuel greater than or equal to 3 inches                        |
| Surface_3to6   | Dead fuel between 3 and 6 inches                                   |
| Surface_6to12  | Dead fuel between 6 and 12 inches                                  |

## Running the simulation

16. Select the **\*Run\*** menu.

The final step of performing an FVS run is to save and run your simulation. This is accomplished through the **Run** menu. The **Run** menu title includes asterisks (**\*Run\***) when there is a change from a previously saved version. Before clicking the **Save and Run** button on the **Run** menu, you can specify a specific management identification code for the run. This allows you to display outputs from

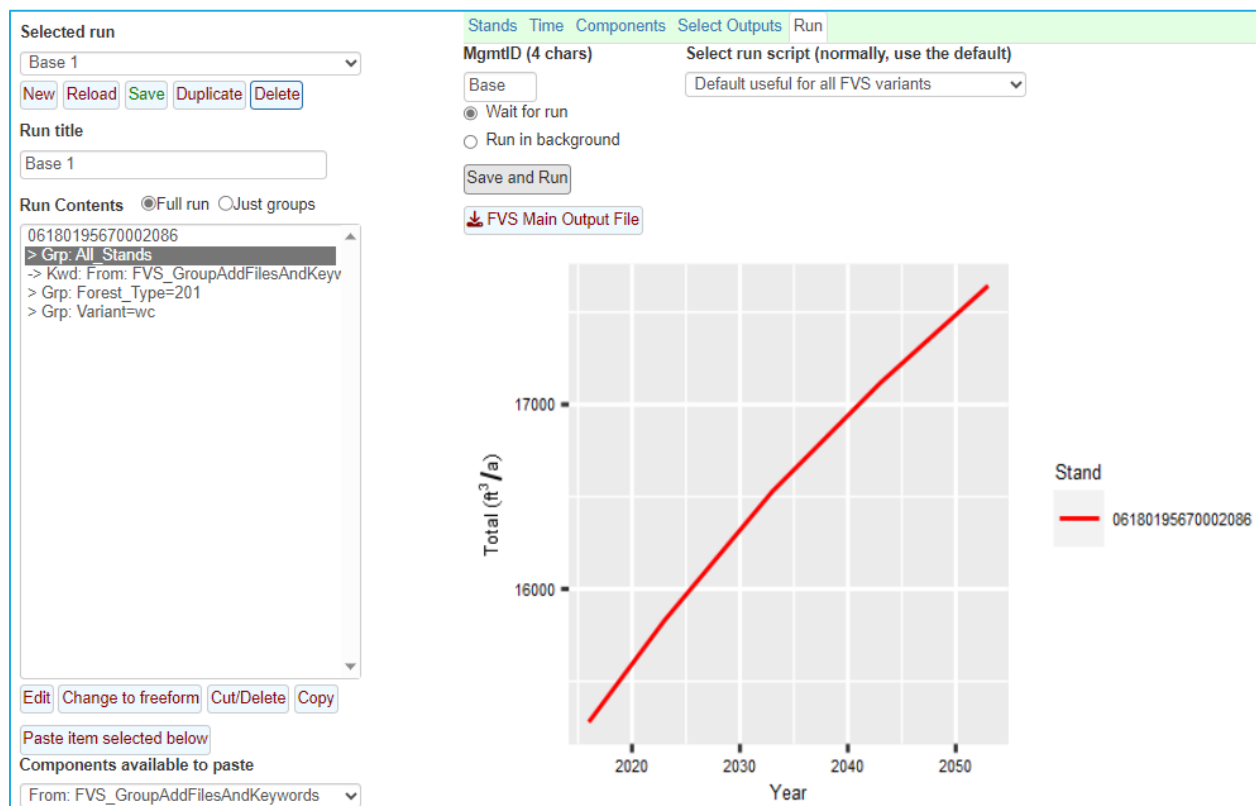
various runs based on unique management identifications. Management identifications are also used to create subsets of averages across stands when creating/viewing average composite tables.

17. Change the management identification code (**MgmtID**) to *Base*.
18. Click the **Save and Run** button.

FVS will save the run as *Base 1* with a management identification code of *Base*.

(If you get a Windows Defender Firewall message regarding the R for Windows front-end, X out of the message and continue. If FVS closes, reopen the FVS program, all your work will be saved and re-do step 19 and the message should not appear again.)

If the run is successful, you will see a figure reporting the volume per acre in the stand for the run time frame. Any warnings or errors in the run will be reported below the figure.



## Describing stand development using Maps

19. Select the **View on Maps** menu.

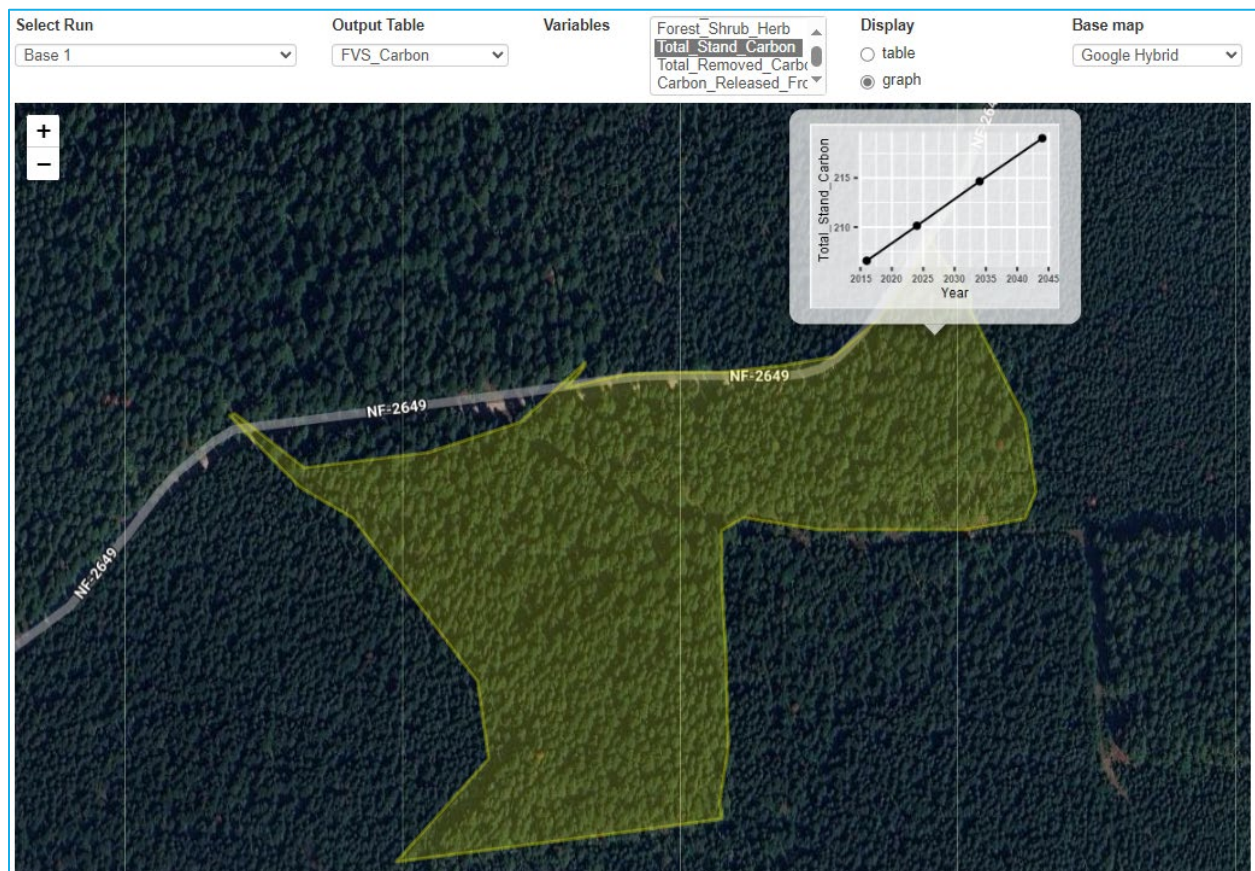
One of the easiest ways to explore stand development is to view your output using the **View on Maps** menu. **View on Maps** will display FVS outputs for your stand polygon projected on a base map.

20. Use the **Select Run** selection box to select *Base 1*.
21. Use the **Output Table** selection box to select *FVS\_Summary2* table.
22. Use the **Variable** selection box to select *Tpa*.

Once trees per acre is selected, an image of your stand (yellow boundary) will display over a base map. You have four base map options in the **Base Map** selection box, with the default being *Google Hybrid* map. If you move your cursor over the image, FVS will display the trees per acre in the stand in

a table over the projection period. By clicking the **graph** radio button in the **Display** area, you will see a figure of trees per acre over the projection period. You can make a table/graph stick to the map by simply clicking anywhere over the stand polygon. The table/graph will stick where you click and may be closed by clicking the X in the upper right corner of the table/figure.

Cycling through a few stand variables allows you to view how the stand is developing over the simulation time frame. Viewing trees per acre (*Tpa*) and basal area (*BA*) show you how density changes, while viewing the quadratic mean diameter (*QMD*) and top height (*TopHt*) show you how tree size changes. Similarly, you can get estimates of merchantable cubic foot volume (*MCuFt*) in the stand or by switching tables to view total stand biomass (*FVS\_Fuels - Total\_Biomass*) or total stand carbon (*FVS\_Carbon - Total\_Stand\_Carbon*).



## Describing stand development using Visualize

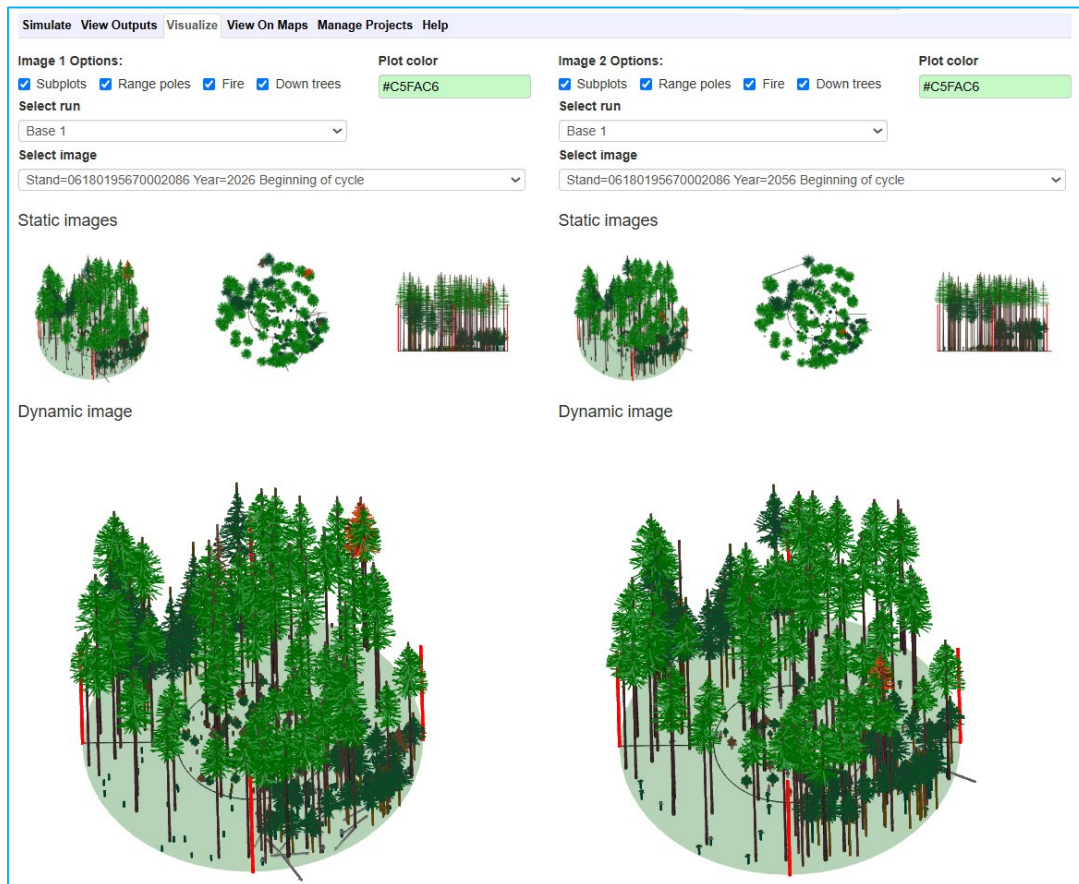
23. Select the **Visualize** menu.

The **Visualize** menu allows you to view and compare images of any stand in your run during your projection time frame. You may select up to two images at a time. Each selection pane allows you to select a run and an SVS image (case), as well as specify whether subplot boundaries, range poles, fire, and down trees will be included in the images. You also can specify the ground color. Once a run and image are selected, rendering of the image takes place. The speed of this process depends on the underlying SVS treelist and may take some time for large lists. It is important to wait patiently while the image is rendered before moving on to selecting a second image.

24. In the left **Select Run** selection box, select *Base 1*.

25. In the left **Select image** selection box, select year 2026.
26. Wait for image to be drawn.
27. In the right **Select Run** selection box, select *Base 1*.
28. In the right **Select SVS image** selection box, select year 2056.

Using your mouse, you can click on the Dynamic image and zoom in and out, and flip or rotate the images. Once you have an image set, you may be able to copy/paste or save each image by doing a right click over the image. If your browser does not give you these options, you can use a snipping tool or other screen capture programs to copy/paste or save your images.



## Describing stand development using View Outputs

29. Select the **View Outputs** menu.

The **View Outputs** menu allows you to explore FVS output data through a two-step process using the **Load** and **Explore** menus or through custom SQL queries using the **Custom Query** menu. For most users, exploring data using the two-step **Load/Explore** process will accomplish most needs and is the focus of this training.

30. If it is not already selected, select the **Load** menu.

To view outputs, you begin by choosing the species codes to use in the tables, followed by loading the runs and FVS-generated output table(s) that interest you. When you select a table, all data

columns are chosen by default; however, you can limit the database columns by selecting specific variables in the **Database variables to consider** selection box.

In addition to the traditional FVS-output tables, FVS generates a stand and stock table (StdStk) which reports trees per acre, basal area, and volumes by species and diameter class. By default, the stand and stock table is built with four-inch diameter classes (midpoint values reported in table); however, you have the ability to reset the diameter class width by changing the value in the **DBH class size** field and clicking the **Rebuild StdStk** button.

When selecting variables, you may review variable output definitions using the **Describe tables** selection box on the right side.

When selecting tables, you should only select tables of the same hierarchy (stand vs. diameter class vs. tree tables); otherwise, some non-sensical data may be provided.

31. In the **Runs to consider** selection box, select *Base 1*.
32. In the **Database tables to consider** selection box, make sure *FVS\_Summary2* is selected.

Step two involves exploring the data you selected by selecting the **Explore** menu.

33. Select the **Explore** menu.

The selection tools on the left side of the **Explore** menu allow you to further refine your results by allowing you to select output for specific runs, stands, management identification codes, years, species, diameter classes, and variables. If some selection criteria are not available, that means the tables you selected do not have that information.

34. Select years 2026 through 2056.
35. Using the check boxes in the lower left, select the following forest type, size class, and stocking class variables to include in the table to the right.
  - a. *StandID*
  - b. *Year*
  - c. *Tpa*
  - d. *BA*
  - e. *ForType*

Output selected will be displayed in the **Table** menu on the right side, which is then downloadable in either MS Excel format (.xlsx) or comma delimited format (.csv) by setting the **File Type** and clicking the **Download table** button. Download the table into an excel file and format the table for sharing with others.

36. Click the **Download table** button.
37. Open the MS Excel file.
38. Change the variable names to be easier to understand.
39. Use the [Essential FVS: A User's Guide to the Forest Vegetation Simulator](#) (Dixon 2002), Appendix B, to translate the values into common terminology.

The resulting table should give viewers enough information so that they do not need to translate any of the output.

The data are also available to view in graphical form.

40. Select all the variables in the check boxes on the lower left side of the **Explore** window.
41. To view the selected outputs in graphical form, select the **Graphs** menu.

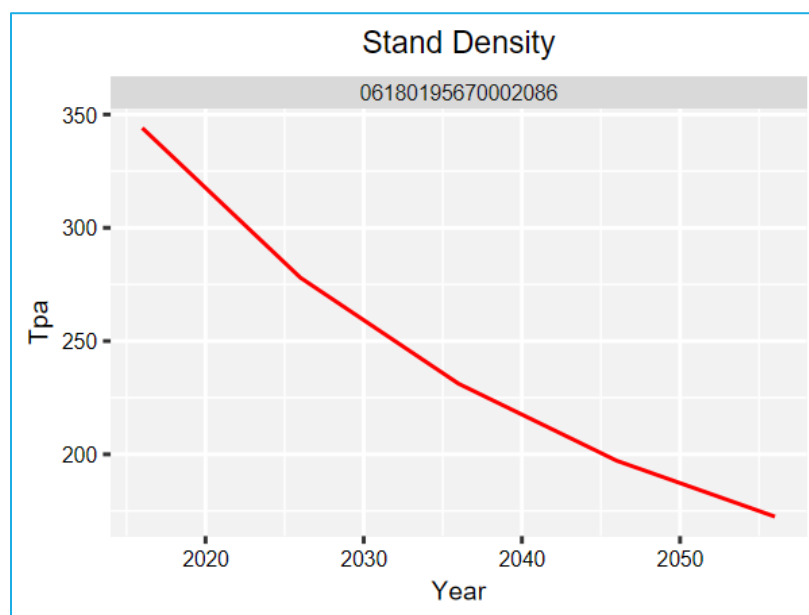
The **Graphs** menu provides access to graphing tools that operate on the data displayed in the table. The graphing options allow you to choose the type of the graph, the x and y axes, and labels. In addition, you have the ability to organize and label the output using horizontal and vertical facets and the plot-by code. While the facets allow you to organize multiple graphs side by side or top-down, the plot-by code allows you to display the outputs on one graph. Additional options are available when you choose to show more controls.

The best way to learn how the graphing tool works is to experiment. First display density over the time projection time frame.

42. Make the following changes to the graphing options:

- a. **Y-axis** ..... *Tpa*
- b. **Vertical facet**.....None
- c. **X-axis** ..... *Year*
- d. **Horizontal facet**.....StandID
- e. **Title**.....Stand Density
- f. **Y-label**..... Trees Per Acre

Once you finish the graph, depending on your browser, you may be able to do a right click and copy/paste or save the image. Another option to copy a graph is to use your operating system's snipping tool.

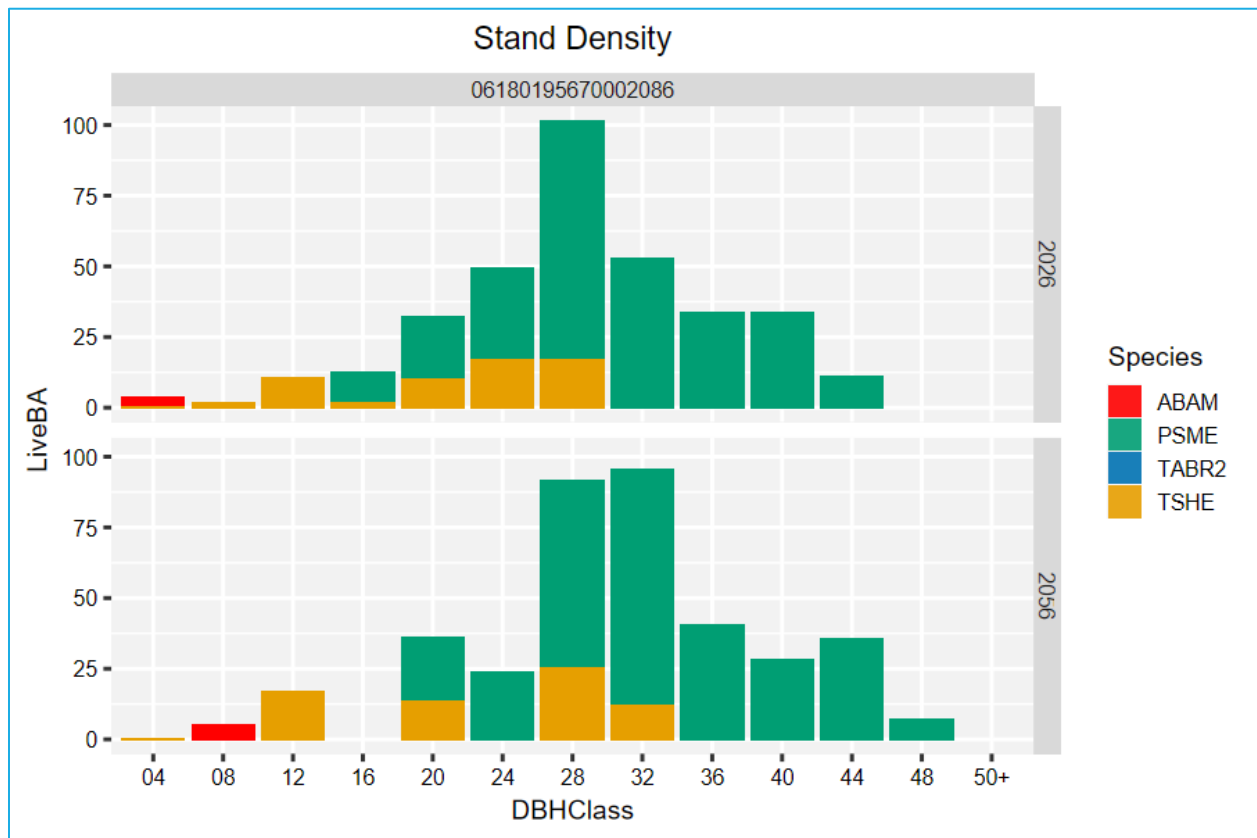


The graphing function is also useful in determining species composition within the stand. You will need to load the stand and stock table to explore species composition.

43. Select the **Load menu**.
44. In the **Runs to consider** selection box, select *Base 1*.
45. In the **Database tables to consider** selection box, select *StdStk*.
46. Select the **Explore menu**.
  - a. **Years**.....2026 and 2056
  - b. **DBHClasses**.....All except the *All* category
47. Make sure the **Graphs** menu is selected.

48. Make the following changes to the graphing options:

- a. **Type**.....Bar
- b. **Y-axis** .....LiveBA
- c. **Vertical facet**.....Year
- d. **Width**.....6
- e. **X-axis** .....DBHClass
- f. **Horizontal facet**.....StandID
- g. **Plot-by code** .....Species
- h. **Height**.....4
- i. **Title**.....Stand Density
- j. **Y-label**..... Basal Area Per Acre



Using the outputs from this run, answer the following questions.

From the snag and fuels data (FVS\_SnagSum, FVS\_Fuels, and FVS\_Carbon), describe snag, coarse woody debris dynamics, and carbon stocks over the time frame.

## Base 2: Multi-stand run

In this exercise, you will use FVS to describe stand development for the next thirty years for groups of stands in the West Cascades.

### Starting a new run

You can start a new simulation by going to the **Simulate** menu and clicking the **New** button.

1. Within the **Simulate** menu, begin a new simulation by clicking the **New** button.
2. Change the **Run title** to *Base 2*.
3. Click the **Save** button.

### Adding stands into a run

Specific stands or groups of stands may be added to the run by using the selection tools on the **Stands** menu. You can add all stands in a grouping code by selecting a grouping code and clicking the **Add stands in the selected groups** button. Once added to a run, the stands will be added to the **Contents** window.

Perform the following steps to add all the Douglas-Fir stands (*Forest\_Type=201*) into the simulation.

4. In the **Variants** selection box of the **Stands** menu, select *wc : West Cascades*.
5. In the **Groups** selection box, select *Forest\_Type=201*.
6. Click the **Add stands in selected groups** button.

### Setting the time frame

7. Select the **Time** menu.

If you want output on a specific year that doesn't land on a cycle boundary, you can add additional reporting years by specifying the years in the **Additional output reporting years** text box.

Perform the following steps to set up a forty-year simulation starting in 2026, while also including an additional reporting year fifteen years into the simulation (2041).

8. Change the **Common starting year** and **Common ending year** to 2026 and 2066, respectively.
9. Add 2040 to the **Additional output reporting years** text box.
10. Read the **Projection Timing Summary** for a description of how your timing choices will affect the run.

### Adding additional user-defined outputs

11. Select the **Components** menu.
12. Select the **Event Monitor** menu.

Most FVS output variables are also available through the calculation of user-defined variables using Event Monitor-Compute options. With the Event Monitor, users may use these variables along with additional FVS functions and operators to create new variables. The compute expressions you create need to conform to Event Monitor coding standards, as described in section 5.5.2 Event Monitor Rules of [Essential FVS: A User's Guide to the Forest Vegetation Simulator](#) (Dixon 2002).

Perform the following steps to compute the canopy cover of trees greater than or equal to four inches DBH.

13. Select *Compute Stand Variables with SpMcDBH Function* from selection box.
14. Change the **Component title** to *Compute PCC GE 4 inches DBH*

15. Enter the following parameters:
  - a. **Year or cycle number:** .0
  - b. **Enter the name** .....PCCge4
  - c. **Attribute**.....Canopy cover percent
  - d. **Lower DBH limit** .....4
  - e. Leave all other parameters set to the default values.

Management Modifiers Event Monitor **Economic** Keywords Addfile

Compute Stand Variables with SpMcDBH F ▾

Component title Compute PCC GE 4 inches DBH

To request for all cycles, enter 0 (zero) in the 'Schedule by Year/Cycle' input box.

☒ Schedule by year ☐ Schedule by condition

Year or cycle number: 0

Enter the name for your user-defined variable (< 8 characters): PCCge4

Attribute to be returned Canopy cover percent ▾

Species covered in the calculations All species ▾

Tree value class covered All tree value classes ▾

Lower DBH limit in the calculations (GE) 4

Upper DBH limit in the calculations (LT) 200

Lower height limit in the calculations (GE) 0

Upper height limit in the calculations (LT) 500

Calculations are for Live trees ▾

Point Number or Group (0 = All Points) 0

Cancel Save in run

16. Click the **Save in Run** button.

## Selecting Outputs

17. Select the **Select Outputs** menu.

In this exercise, you will ultimately be using SVS images and composite tables to describe the group simulation. Check the following boxes.

18. Check the **Stand Visualization, Tree lists, Carbon and fuels, and Snags and down wood** boxes.

## Running the simulation

19. Select the **\*Run\*** menu.

The final step of performing an FVS run is to perform the run.

20. Change the management identification code (**MgmtID**) to PSME.
21. Select Run Type **“Run in background”** radial button
22. Click the **Save and Run** button.

FVS will save the run as Base 2 with a management identification code of PSME. If you selected “Run in background”, the run is complete when the “Background run status” box no longer displays the stand processing.

StandsTimeComponentsSelect OutputsRun

MgmtID (4 chars)

PSME

Select run script (normally, use the default)

Default useful for all FVS variants

Select Run Type

☐ Wait for run
 ☒ Run in background

Background processes

10

A background run is divided into sets of separate processes that are run at once. The max number of processes is limited to 20, the number of CPUs cores in this computer.

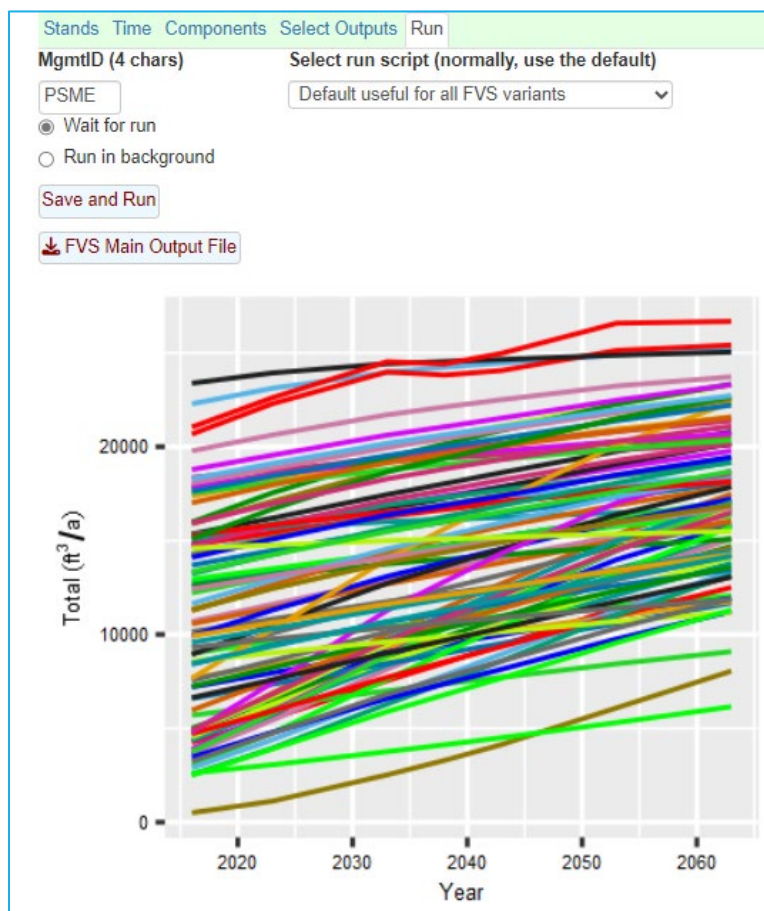
Save and Run

FVS Main Output File

Background run status

Kill selected background run

If you selected “Wait for run” it may take a little longer for processing. If the run is successful, you will see a figure reporting the volume per acre for all stands during the projection time frame.



## Describing stand development using Maps

23. Select the **View on Maps** menu.

**View on Maps** will allow you to display FVS outputs for any of the stands in the run on a map. Hovering over stand polygons will allow you to explore the diversity of values in a specific run.

Check the forest type and canopy cover estimates of some of the stands in the simulation.

24. Use the **Select Run** selection box to select *Base 2*.
25. Use the **Output Table** selection box to select *FVS\_Summary2* table.
26. Use the **Variable** selection box to select *ForTyp*.

Write down the primary forest types for these stands.

27. Use the **Output Table** selection box to select *FVS\_Compute* table.
28. Use the **Variable** selection box to select *PCCGE4*.

Write down the canopy cover range and stand ID for the stand adjacent to Belknap Hot Springs along NF2647 Road.

## Describing stand development using View Outputs

29. Select the **View Outputs** menu.
30. If it is not already selected, Select the **Load** menu.

To view average outputs across a range of stands, you may select any of the runs and composite database tables. Composite tables are created when more than one stand is selected in the **Runs to consider** selection box, either through the selection of a single run with multiple stands or the selection of multiple runs. Composite tables are weighted averages (where values in the *Sam\_Wt* column of the stand table are treated as weights) grouped by the management identification code associated with each stand. The composite tables are created for the summary table, the stand and stock table and the compute table. Composite tables are all prepended letters *Cmp*.

As with the other FVS tables, you should only select tables of the same hierarchy (stand vs. diameter class vs. tree tables); otherwise, some non-sensical data may be provided.

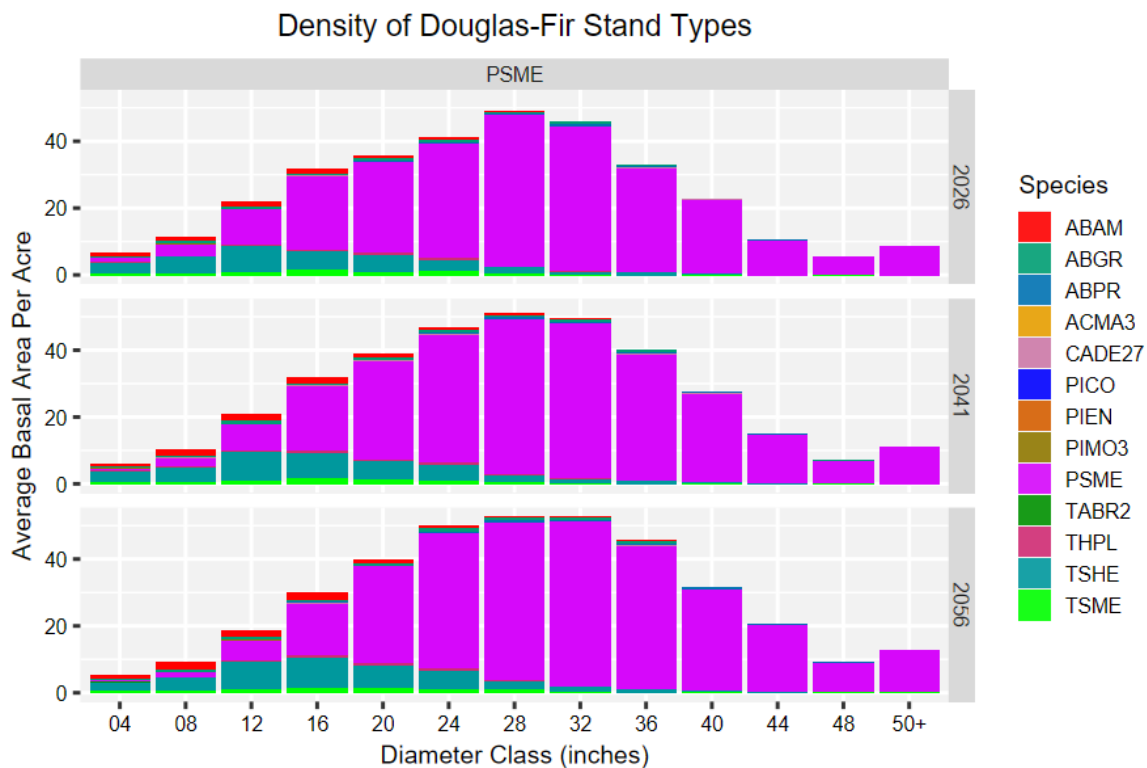
In this run, explore the average compute and summary tables first to describe stand density, size, volumes in 2026, 2041, and 2056.

31. In the **Runs to consider** selection box, select *Base 2*.
32. In the **Database tables to consider** selection box, select the *CmpCompute* and *CmpSummary2* tables.
33. Select the **Explore** menu.
  - a. **Years** ..... 2026, 2041, and 2056.
34. Using the check boxes in the lower left, select *MgmtID*, *Year*, *CmpPCCGE4*, *CmpTPA*, *CmpBA*, *CmpTopHt*, and *CmpQMD*, *CmpTCuft*, *CmpMCuFt*.
35. Select the **Tables** menu.
36. Save this information to a table by clicking the **Download table** button.

Describe the change in density, size, and volume for this group of stands.

Explore the average stand and stock table to describe species composition and size structure in 2025, 2040, and 2055.

37. Select the **Load** menu.
38. In the **Runs to consider** selection box, select *Base 2*.
39. In the **Database tables to consider** selection box, select the *CmpStdStk* table.
40. Select the **Explore** menu.
  - a. **Years** ..... 2026, 2041, and 2056..
41. Select all the **DBHClasses** except the *All* category.
42. To view the selected outputs in graphical form, select the **Graphs** menu.
43. Make the following changes to the graphing options:
  - a. **Type** ..... *Bar*
  - b. **Y-axis** ..... *CmpLiveBA*
  - c. **Vertical facet** ..... *Year*
  - d. **Width** ..... *6*
  - e. **X-axis** ..... *DBHClass*
  - f. **Horizontal facet** ..... *MgmtID*
  - g. **Plot-by code** ..... *Species*
  - h. **Height** ..... *4*
  - i. **Title** ..... *Density of Douglas-Fir Stand Types*
  - j. **X-label** ..... *Diameter Class (inches)*
  - k. **Y-label** ..... *Average Basal Area Per Acre*



## Alt 1: No Action Alternative

At the start of a forest management project, it is important to be able to describe the current stand conditions and describe the treatments goals to get to the desired future condition. In many cases there is a list of stand metrics that are necessary to track so you can compare which management alternatives move you closer to your management objectives. In this exercise you will run a no action alternative and track metrics that the Interdisciplinary Team have listed as important quantify. Those metrics include per acre estimates of canopy cover (3" DBH+), number of large trees (30" DBH +), basal area (3" DBH +), quadratic mean diameter (3" DBH +), Stand Density Index – Zeide (3" DBH +), harvested bdfv volume, and fire risk (potential mortality). Sections 5.5.2.2 – 5.6 of the [Essential FVS Guide](#) covers the Event Monitor variables, functions and creating custom output. Additionally, because the CA Variant of FVS does not automatically establish trees (unless they are sprouting species after a harvest), we will include a regeneration keyword set that will establish seedlings into the stand based on the stand conditions. We suggest you download the [REGIMPUTE.zip](#) and unzip them to C:/FVS/KCPS to help with this exercise.

### Starting the natural growth run

1. Within the **Simulate** menu, begin a new simulation by clicking the **New** button.
2. Change the **Run title** to *Alt 1: No Action*.
3. Click the **Save** button.

### Adding a stand into a run

4. In the **Variants** selection box, select so: *ca : Inland CA, Southern Cascades*.
5. In the **Groups** selection box, select *Forest\_Type=201*.
6. In the **Stands** selection box, select stand *06102460140600262*.
7. Click the **Add selected stands** button.

### Setting the time frame

8. Select the **Time** menu.
9. Set the timeframe for a 50-year projection starting in 2026

### Adding additional user-defined outputs

There are several options for creating user-defined output under the Event Monitor. When you want to create many users defined variables, it is often more efficient to include all your variables in one window with the *Compute Stand Variables in Editor* from the selection box. The following steps will show you how to “program” your own user defined variables in the Event Monitor. Keep in mind each expression starts with a name, followed by an “=” sign, and then a value.

1. Select the **Components – Event Monitor** menu.
1. Select the *Compute Stand Variables in Editor* from the selection box.
2. Change the **Component title** to *Project Stand Variables*
3. Change the **Year or cycle number:** 0 (a zero value will compute the value for every cycle)
4. In the Editor box, on the first line, type the first expression, it will start with the variable name for the canopy cover followed by the equal sign “CC3up =”
5. Define the variable by selecting the **FVS Functions:** *Spmcdbh: Returns the trees, basal area...*
6. Enter the following parameters:
  - a. **Attribute to be returned**..... Canopy cover percent

- b. Lower DBH limit ..... 3
  - c. Leave all other parameters set to the default values.
7. Set your cursor after the “=” sign in the expression

Component title

☒ Schedule by year ☐ Schedule by condition

Year or cycle number:

.....1.....2.....3.....4.....5.....6.....

CC3up=

Math:

Variables:

Species codes:

FVS Functions:

Attribute to be returned

Species covered in the calculations

Tree value class covered

Lower DBH limit in the calculations (GE)

Upper DBH limit in the calculations (LT)

Lower height limit in the calculations (GE)

Upper height limit in the calculations (LT)

Calculations are for LIVE trees

Point Number or Group (0 = All Points)

8. Click the **Insert function** button.

Add the rest of the custom expressions using the pull-down boxes below the editor window. When complete it should look like the Editor window captured below.

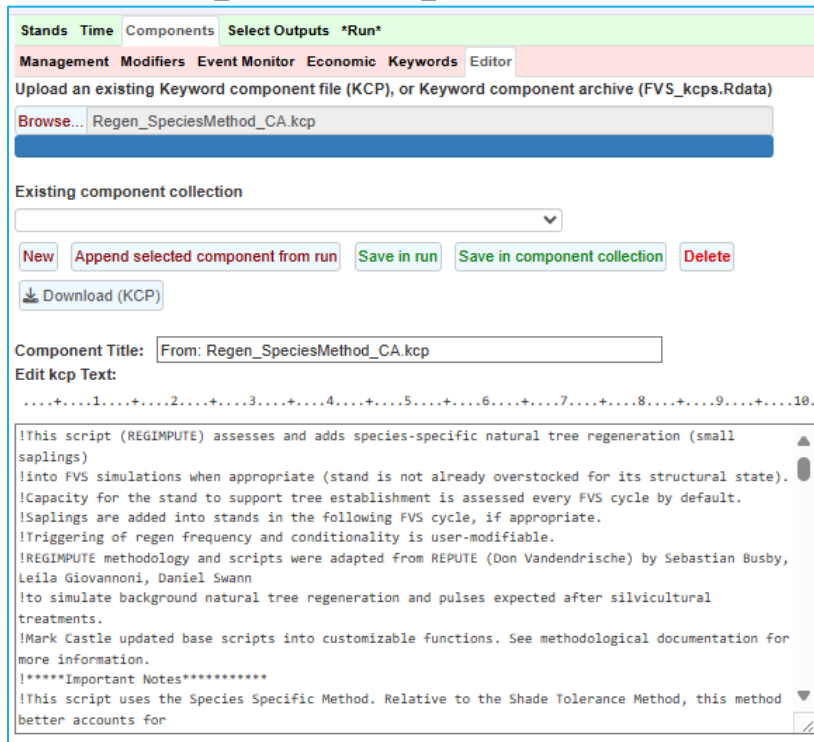
```
CC3up=SpMcDBH(7,All,0,3,200,0,500,0,0)
BigTPA=SpMcDBH(1,All,0,30,200,0,500,0,0)
BA3up=SpMcDBH(2,All,0,3,200,0,500,0,0)
QMD3up=SpMcDBH(5,All,0,3,200,0,500,0,0)
SDIZ3up=SpMcDBH(13,All,0,3,200,0,500,0,0)
HarvBdFT=RBdFt
FireRisk=PotFMort(1)
```

9. Click the **Save in Run** button.

### Add regeneration keyword components

11. Select the **Select the Components – Editor** menu
12. Click the **Browse** button
13. Navigate to the location you downloaded the REGIMPUTE kcps (C:\FVS\KCPS\REGIMPUTE)

14. Select the Regen\_SpeciesMethod\_CA.kcp file and click **Open**



15. Click the **Save in Run** button.

## Selecting Outputs

16. Select the **Select Outputs** menu.

In this exercise, you will want to include SVS images, treelist (to create stock/stand and diameter distribution graphs), and potential fire table to describe the simulation and later be able to compare the no management alternative to your proposed management. Check the following boxes.

17. Check the **Stand Visualization**, **Tree lists**, and **Fire and Mortality** boxes.

## Running the simulation

10. Select the **\*Run\*** menu.
11. Change the management identification code (**MgmtID**) to NA.
12. Click the **Save and Run** button.

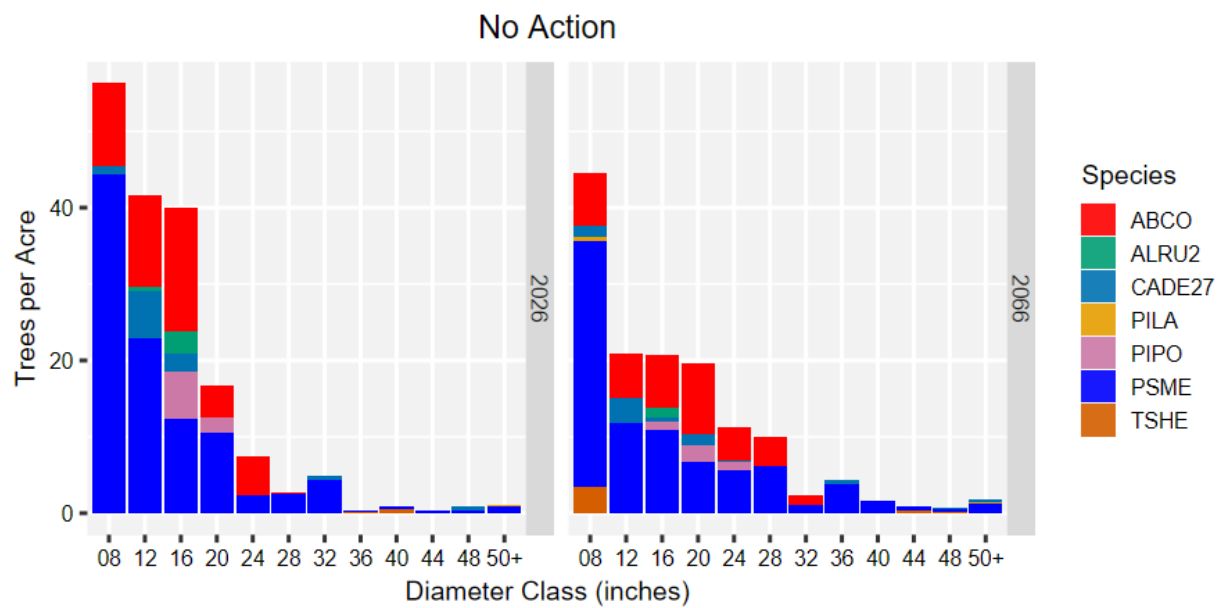
FVS will save the run as *No Action* with a management identification code of NA.

Review the data. How would you describe the current condition and future condition under no management?

Fill in the stand attributes below by reviewing your custom output.

| Year | CC3up | BA3up | QMD3up | SDI3up | BIGTPA | HARVBDFT | FIRERISK |
|------|-------|-------|--------|--------|--------|----------|----------|
| 2026 |       |       |        |        |        |          |          |
| 2046 |       |       |        |        |        |          |          |
| 2066 |       |       |        |        |        |          |          |

Build a diameter distribution graph by species for current and future conditions, similar to the graph below.



## Alt 2: Proposed action with thinning from below and retaining fire tolerant species

Now that we know current conditions and predicted future conditions, we can build the proposed alternative. This project area has a historic fire return interval of 15-20 years. Our desired future condition is to reduce overall basal area to make the stand more resilient to drought, insect and disease issues and reduce the likelihood of a stand replacing fire event. We want to maintain large older trees, particularly in species that are more fire tolerant.

The prescription will include a commercial harvest from below to 120 ft/acre (with whole tree yarding) and fuels reduction work in the non-merchantable size class.

Instead of starting a brand new simulation, we are going to duplicate the No Action Alternative so that we do not have to rebuild all our custom output variables again.

### Starting the first run

1. Within the **Simulate** menu, duplicate run *Alt 1: No Action* by clicking the **Duplicate** button.
2. Change the **Run title** to *Alt 2: Proposed Action*.
3. Click the **Save** button.

### Adding yarding specifications

By default, FVS assume when a harvest occurs, the bole is removed, and branches are left on site. If you want to change this assumption, such as specify whole tree yarding you must specify that in FVS. The yarding option must occur prior to the thinning, so we specify the yarding option, before we add our thinning option.

4. Select the **Components – Management** menu
5. From the **Categories** selection box, select *Biomass Removal and Retention*.
6. From the **Components** selection box, select *Basic: Manage logging slash*.
7. Change the **Component title** to *Whole Tree Yarding*
8. Enter the following parameters:
  - a. **Year or cycle number** .....2026
  - b. **Slash Left**.....No Slash Left
9. Click the **Save in run** button.

### Adding the commercial thinning

The *Thin from below* management action thins the stand from below to a residual trees per acre or basal area per acre density or to a residual percentage of those density statistics. The residual density may be set for a given diameter or height range. The tree record with the smallest diameter within the diameter and height range specified is cut first, then the next smallest tree record is cut and so on until the residual density is met. If the diameter and height ranges are left at the default values (minimum = 0 and maximum = 999) then the residual density is for the entire stand.

Another option in this management action is to reset the cutting efficiency through the **Proportion of trees left** field. This allows some smaller trees to be left in the stand. When FVS attempts to cut a tree record, the proportion of trees specified as left is used to determine how many trees per acre

represented by the tree record are left standing. If left at the default proportion (0.0), FVS cuts all trees represented by the tree record; that is, the cutting efficiency is set to  $1.0 - 0.0 = 1$ .

Set the parameters of the thinning to thin from below to 120 square feet per acre of basal area in 2025 for all trees greater than or equal to 8" DBH.

10. Select the **Components – Management** menu.
11. From the **Categories** selection box, select *Thinning and Pruning Operations*.
12. From the **Components** selection box, select *Thin from below*
13. Change the **Component title** to *Thin from below 8"+ Commercial thin*
14. Enter the following parameters:
  - a. **Year or cycle number** .....2025
  - b. **Specify residual density**..... Basal area per acre
  - c. **Residual Density** ..... 120
  - d. **Proportion of trees left**..... 0
  - e. **Diameter lower limits** ..... 8
  - f. **Diameter upper limits** ..... 999
  - g. Leave all other parameters set to the default values.

Management **Modifiers** Event Monitor Economic Keywords Editor

**Categories**  
Thinning & Pruning Operations

**Components**  
Thin from below

**Component title** Thin from below 8+

☒ Schedule by year ☐ Schedule by condition

**Year or cycle number** 2026

**Specify residual density**

☐ Trees per acre 0

☐ Trees spacing (feet) 0

☒ Basal area per acre 120

☐ Percent of trees per acre at year of thin 0

☐ Percent of basal area at year of thin 0

**Proportion of trees left (spacing adjustment, 1-CutEff)** 0

**Specify tree size limits of thinning**

**Diameter lower limits (inches)** 8

**Diameter upper limits (inches)** 999

**Height lower limits (feet)** 0

**Height upper limits (feet)** 999

Cancel Save in run Change to freeform

h.

Click the **Save in run** button.

## Adding the fuel treatment

Next we will add a biomass removal for all the 0-8" non-merchantable trees. The plan is for this to be removed from the site through a contract or agreement with the local biomass facility.

Set the parameters of the fuels treatment to harvest all of the 0-8" trees with 90% efficiency with the assumption all the harvested non merchantable trees will be removed from the site (no slash left in stand).

1. Select the **Components – Management** menu.
2. From the **Categories** selection box, select *Fuel Treatments*.
3. From the **Components** selection box, select *Thin from below*.
4. Change the **Component title** to *Remove 90% 0-8" Biomass contract*
5. Enter the following parameters:
  - a. **Year or cycle number** ..... 2026
  - b. **Residual Density** ..... 0
  - c. **Specify residual density** ..... Trees per acre
  - d. **Diameter lower limits** ..... 0
  - e. **Diameter upper limits** ..... 8
  - f. **Proportion of trees left**..... .10
  - g. **Slash left**:..... No Slash left

Click the **Save in run** button.

## Running the simulation

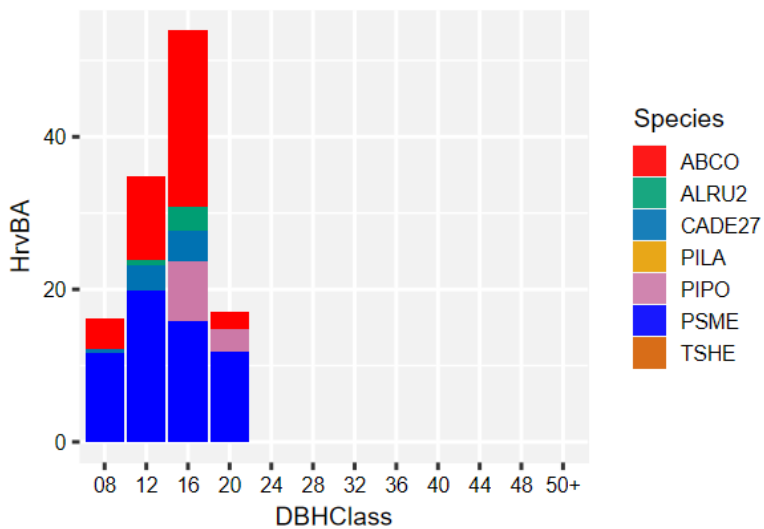
6. Select the **\*Run\*** menu.
7. Change the management identification code (**MgmtID**) to THIN.
8. Click the **Save and Run** button.

FVS will save the run as *Alt2: Proposed Alternative* with a management identification code of *THIN*.

## Examining the thinning effects

In this exercise you will be examining the outcomes of the run. Check the Summary2 to confirm the harvest occurred. Did you harvest to 120 ft<sup>2</sup>/acre?

Next review the diameter distribution graphs, pay particular attention to the Harvest Basal Area by diameter class. If our intention was to priority mark for harvest the fir (Douglas-fir and white fir) over the pine (Ponderosa pine and sugar Pine). Did we do that?



A second run will now be performed with the same thin from below but, Douglas-fir and white fir will be preferentially removed during the thinning. You will modify the previous run so that your proposed alternative includes the priority marking for Douglas-fir and white fir.

Thinning with species preferences is an option with all management actions. However, the method used to assign a species preference depends on the management action chosen.

If you choose a management action that contains a targeted species option, the residual densities apply only to the species selected within the DBH or height range specified. In this way, you can remove specific species from diameter and height ranges within a stand. The *Thin throughout a diameter range* action works in this manner.

If you choose a management action that does not contain a targeted species option, such as *Thin from Below* and *Thin from Above*, the residual densities apply to all species within the DBH or height range specified; however, there are a couple of ways to have species influence these removal methods. First, you can allow a species to be excluded or re-included from scheduled harvest activities using the tree removal preference management action: *Exclude or include a species from harvest*. When excluded, FVS does not consider the excluded species density in the residual targets specified in the thinning. Second, for users looking to set a less rigid removal preference, there is the tree removal preference management action: *Removal pref by species*, which assigns a user-specified removal priority to each species. Review section 5.2.4.1 of the Essential FVS Guide for more details on the removal priority algorithm.

Species removal preferences that are positive numbers increase the removal priority, and negative numbers decrease the removal priority. In this manner, you can either increase or decrease a tree record's removal priority by changing the value of the species variable.

### Modifying the Alternative

You will now specify which species you want to preferentially remove in the thin from below that will occur in this simulation. Removal preferences can be specified for individual species or to groups of species. Since you are interested in targeting several species, a group of species will be defined.

## Adding species preferences

9. Select the **Components – Management** menu.
10. From the **Categories** selection box, select *Identify Groups*.
11. From the **Components** selection box, select *General species group*.
12. Change the **Component title** to *Species to target: SPP\_THIN*.
13. Enter the following parameters:
  - a. **Specify a 2-10 character Species Group** ..... SPP\_THIN
  - b. **Species**..... Douglas-fir
  - c. **Species**..... White fir

Management Modifiers Event Monitor Economic Keywords Addfile

**Categories**

Identify Groups ▼

**Components**

General species group ▼

**Component title** Species to target: SPP\_THIN

Identifies a group of species that can be referenced by a single name and included in any species field in management actions, species preferences or user-defined variables.

Warning: This species group identifier needs to come before the management action or output selection utilizing the group name.

Specify an 2-10 character Species Group SPP\_THIN

Species included in the group: Douglas-fir ▼

Species included in the group: White fir ▼

Species included in the group: ▼

Species included in the group: ▼

Within FVS, there is an order preference for the *General species group* and *Removal pref by species* components within the **Contents** window. The *General species group* component must precede any other component which references the species group defined within the *General species group* component. In this case, *General species group* must precede the *Removal pref by species* component. If a *Removal pref by species* component is specified the same year that a thinning action is specified, the *Removal pref by species* component must precede the thinning component. In this case, the *Removal pref by species* component must precede the *Thin from below*. There for you want to insert the *Species to Target* prior to the thinning.

14. In the **Simulation Contents** window highlight “->Kwd:Editor:From Regen\_SpeciesMethod”
15. Click the **Save in run** button.

You will now specify that you want these species to be preferentially removed when a thinning occurs in your simulation. When using the species removal preference option, you must specify when this will take effect in a simulation. This option remains in effect until a second species removal preference option changes the removal priority of the species. In this simulation, you will have the removal preference take effect in 2025.

16. From the **Categories** selection box, select *Tree Removal Preference*.

17. From the **Components** selection box, select *Removal pref by species*.
18. Change the **Component title** to *Removal pref by species: SPP\_THIN*.
19. Enter the following parameters:
  - a. **Year of cycle number** .....2025
  - b. **Species whose removal priority will be changed**..... SpGroup:SPP\_THIN
  - c. **Preference for removal** .....15

20. Click the **Save in run** button.

### Running the simulation

21. Select the **\*Run\*** menu.
22. Click the **Save and Run** button.

### Examining the results

Fill in the stand attributes below by reviewing your custom output. How does this compare to the No Action Alternative (page 25)?

| Year | CC3up | BA3up | QMD3up | SDIZ3up | BIGTPA | HARVBDFT | FIRERISK |
|------|-------|-------|--------|---------|--------|----------|----------|
| 2026 |       |       |        |         |        |          |          |
| 2046 |       |       |        |         |        |          |          |
| 2066 |       |       |        |         |        |          |          |

Rather than filling in the data by hand, is there an easy way to show the custom output table for both the NA and THIN example so they can be easily compared and added to a document?

Build a graph from 2025 to 2065, that shows the Fire Risk for the NA and THIN alternatives. Include both lines on the same graph.

Build a diameter distribution graph (2025) by species for the THIN alternative. Specifically looking at the graph and table of harvested trees, how would you write a simple DxD or DxD marking guide for this stand?

How would I create a side-by-side Stand Visualization of the two alternatives?

## Fire 1: Prescribed burning

In this exercise, you will simulate a prescribed burn.

### Starting a new run

1. Within the **Simulate** menu, begin a new simulation by clicking the **New** button.
2. Change the **Run title** to *Fire 1*.
3. Click the **Save** button.

### Adding a stand into a run

4. In the **Variants** selection box, select *cr : Central Rockies GENGYM*.
5. In the **Groups** selection box, select *Forest\_Type=221*.
6. In the **Stands** selection box, select stand *0302044019000010* and *0302044019000039*.
7. Click the **Add selected stands** button.

### Setting the time frame

8. Select the **Time** menu.
9. Change the Common starting year and Common ending year to 2026 and 2056, respectively.

### Adding the prescribed burn

You will use the *Prescribed burn* management action to simulate the burn. This management action uses the *Simfire* keyword to simulate the burn; however, unlike its use in simulating the wildfire, you set the weather parameters to simulate a prescribed burn.

10. Select the **Components – Management** menu.
11. From the **Categories** selection box, select *Fuel Treatments*.
12. From the **Components** selection box, select *Prescribed burn*.
13. Change the **Component title** to *Prescribed burn in 2026*.
14. Enter the following parameters:
  - a. **Year or cycle number** ..... 2026
  - b. **Wind speed** ..... 8
  - c. **Moisture level** ..... 2 = Dry
  - d. **Temperature** ..... 70
  - e. **Mortality code** ..... 1 = FFE estimates mortality
  - f. **Percentage of stand area burned** ..... 70
  - g. **Season of this fire** ..... 4 = Fall
15. Click the **Save in run** button.

### Selecting Outputs

16. Select the **Select Outputs** menu.
17. Check the **Stand Visualization**, **Carbon and fuels**, **Fire and mortality**, and **Snag and down wood** boxes.

### Running the simulation

18. Select the **\*Run\*** menu.
19. Change the management identification code (**MgmtID**) to *RXBR*.
20. Click the **Save and Run** button.

FVS will save the run as *Fire 1* with a management identification code of *RXBR*.

### **Examining the prescribed burn effects**

Begin exploring the effects of this run by using **Visualize** menu to view pre- and post-burn images. Do the pre- and post-burn images match your expectations. Why or why not?

Use the **View Outputs-Load/Explore** menus to describe the prescribed burn effects.

From the fire-caused mortality output, determine the percentage of fire-caused mortality by species. Did the percentages change by species?

From the snag output, were any large snags created by the prescribed burn? How long did they stay standing?

From the fire consumption output, how much litter, duff, material less than 3", and material greater than 3" were consumed by the prescribed burn?

From the fuels output, describe the surface and standing fuel loads over time.

## Fire 2: Thinning followed by a pile burn

In this exercise, you will simulate a thinning followed by a pile and burn of the slash.

### Starting a new run

1. Within the **Simulate** menu, begin a new simulation by clicking the **New** button.
2. Change the **Run title** to *Fire 2*.
3. Click the **Save** button.

### Adding two stands into a run

4. In the **Variants** selection box, select *cr : Central Rockies GENGYM*.
5. In the **Groups** selection box, select *Forest\_Type=221*.
6. In the **Stands** selection box, select stands *0302044019000010* and *0302044019000039*.
7. Click the **Add selected stands** button.

### Setting the time frame

8. Select the **Time** menu.
9. Change the Common starting year and Common ending year to 2026 and 2056, respectively.
10. Add the year 2028 to the **Additional output reporting years** text box.

### Adding the fuels treatment

The *Thin with fuel piled and burned* management action allows you to thin a stand, manage logging slash and perform a subsequent pile and burn fuel treatment. Input parameters for the thinning include residual stand density (either trees per acre or basal area), diameter class interval, and the proportion of small trees left. Additional features control how much slash is left and how much surface fuel will be piled and burned. The proportion of surface fuel piled and burned applies to both the new activity fuels (slash) and any pre-existing surface fuel. Mortality from the pile burn can also be simulated.

11. Select the **Components – Management** menu.
12. From the **Categories** selection box, select *Fuel Treatments*.
13. From the **Components** selection box, select *Thin with fuel piled and burned*.
14. Enter the following parameters:
  - a. **Year of thinning** ..... 2026
  - b. **Residual density** ..... 200
  - c. **Density in terms of** ..... *Trees per acre*
  - d. **Largest DBH** ..... 11
  - e. **Proportion of small trees left** ..... 0.05
  - f. **Slash left:** ..... *Whole trees left*
  - g. **Year of pile burn** ..... 2027
  - h. **Proportion of surface fuel piled** ..... 0.70
  - i. **Proportion of mortality for small trees** ..... 0.05
  - j. **Largest tree killed (dbh in inches)** ..... 3
  - k. Leave all other parameters set to the default values.

Management **Modifiers** Event Monitor Economic Keywords Editor

**Categories**

Fuel Treatments

**Components**

Thin with fuel piled and burned

**Component title** Thin with fuel piled and burned

**Year of thinning \*Mandatory field\*** 2026

**Residual density (within specified tree size range)** 200

**Density is in terms of:** Trees per acre

**Smallest DBH to be considered for removal (greater than/equal)** 0

**Largest DBH to be considered for removal (less than)** 11

**Proportion of small trees left** 0.05

**Slash left:** Whole trees left

**Year of pile burn \*Mandatory field\*** 2028

**Proportion of surface fuel piled** .70

**Proportion of mortality for small trees during pile burn** .05

**Largest tree killed (dbh in inches)** 3

Cancel Save in run Change to freeform

15. Click the **Save in run** button.

## Selecting Outputs

16. Select the **Select Outputs** menu.
17. Check the **Stand Visualization**, **Carbon and fuels**, **Fire and mortality**, **Snag and down wood**, and **Regeneration** boxes.

## Running the simulation

18. Select the **\*Run\*** menu.
19. Change the management identification code (**MgmtID**) to *TwPB*.
20. Click the **Save and Run** button.

FVS will save the run as *Fire 2* with a management identification code of *TwPB*.

## Examining the effects of the fuels treatment

Begin exploring the effects of this run by using **Visualize** menu to view pre- and post-treatment images for both stands. Adjust the images to determine the general effect on surface fuels and save the comparison. Did the treatment produce similar results? Why or why not?

Use the **View Outputs-Load/Explore** menus to compare the fuels treatment between the two stands. Note: you can use the facets and plot-by options in the **Graphs** menu to compare the two stands.

From the summary output that was created, compare the standing and removed trees per acre from the thinning.

Which stand removed more trees per acre?

Was post-thinning trees per acre greater than 200? Why or Why not?

Make a graph of QMD for the two stands. Explain the shape of the curves for the time frame?

From the down woody volume output, which tree diameter classes had the biggest increase from the thinning and the biggest decrease from the pile burn in the two stands?

From the fuels output, how did surface fuels respond to the treatment?

Overall, what output(s) would you use to quickly describe the treatment effects in these two stands to your management team?

## Complex 1: Regenerating a stand via group selection

In this exercise, you will use FVS to explore regenerating a stand via group selection using the stand replication option. Replication can occur by adding the same stand more than once or by specifying the number of replicates and their relative weights prior to adding the stand to a run. Replicating a stand prior to running the simulation allows you to perform unique management to each stand replicate. The run results in replicate output as well as composite output for the stand as a whole. For instance, if you want to thin 30% of a stand, put openings in another 30% of the stand, and skip or leave the rest of the stand unmanaged (40%), you can add three replicates with relative weights of 30, 30 and 40 so that you can prescribe the unique management in each replicate and obtain outputs describing each of the three areas as well as a properly-weighted stand composite outputs for the run.

You will use the following information to regenerate stand 090603020480017 with group selection using the replication method.

Establish group openings in 25% of the stand every 25 years where you select the size of openings to be conducive to maintaining mid-tolerant species such as basswood, ash, hickory, yellow birch, red oak, and black cherry. Retain all yellow birch in openings while cutting all other species greater than one inch in diameter.

### Starting a new run

1. Within the **Simulate** menu, begin a new simulation by clicking the **New** button.
2. Change the **Run title** to *Complex 1*.
3. Click the **Save** button.

### Adding the stand replicates

4. In the **Variants** selection window of the **Stands** tab, select *Is : Lake States*.
5. In the **Groups** selection window, select *Forest\_Type=801*.
6. In the **Stands** selection window, select stand 090603020480017.
7. In the **Number of replicates of each added stand** text box, enter 4.
8. In the **Relative weights of each replicate** text box, enter 25. This will give each replicate equal weighting of 25% ( $25/(4*25)$ ).
9. Click the **Add selected stands** button.

The weights are used to modify the stand sampling weights specified in the input database. Often these sampling weights are stand sizes or the size of the land area represented by the stand. The set of replicate weights you enter is recycled, if necessary, so that each replicate gets a weight. For example, if you say you want 5 replications of each stand, and you enter 1,2 for the weights, the resulting set will be 1, 2, 1, 2, and 1. The weighting logic includes a normalization step such that each weight is divided by the sum of the weights for the stand, resulting in a proportional adjustment to the replicate sample weights; for example, the resulting normalized weights of the above example would be 0.14, 0.29, 0.14, 0.29, and 0.14. The normalized weights are then multiplied by the stand sampling weight entered in the database and the results are entered into the FVS run so that the sampling weights for each replicate are correctly reported in the FVS output.

**Selected run**  
Complex 2  
New Reload Save Duplicate Delete

**Run title**  
Complex 2

**Contents**  
090603020480017 r001 25  
> Grp: All\_Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKeyv  
> Grp: forest\_type=801  
> Grp: AutoRep=1  
090603020480017 r002 25  
> Grp: All\_Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKeyv  
> Grp: forest\_type=801  
> Grp: AutoRep=2  
090603020480017 r003 25  
> Grp: All\_Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKeyv  
> Grp: forest\_type=801  
> Grp: AutoRep=3  
090603020480017 r004 25  
> Grp: All\_Stands  
-> Kwd: From: FVS\_GroupAddFilesAndKeyv  
> Grp: forest\_type=801  
> Grp: AutoRep=4

Edit Change to freeform Cut/Delete Copy

Paste item selected below

**Components available to paste**  
Find stand: Find

**Stand(s)**  
090603020440015  
090603020440027  
090603020460007  
090603020470008  
090603020480006  
090603020480017  
090603020500006  
090603020500017  
090603020500020  
090603020520006  
090603020550011  
090603020560003  
090603020570015  
090603020780003  
090603020780006  
090603020570041  
090603020570043

38 Stand(s) in 1 Group(s)

**Number of replicates of each added stand** 4

**Relative weights of each replicate** 25

Add selected stands Add stands in selected groups

**Find stand(s):** Find

## Setting the time frame

10. Select the **Time** menu.
11. Change the **Common starting year** and **Common ending year** to 2026 and 2136, respectively.
12. In the **Additional output reporting years** text box, add 2051 and 2101.

## Adding the group cuts

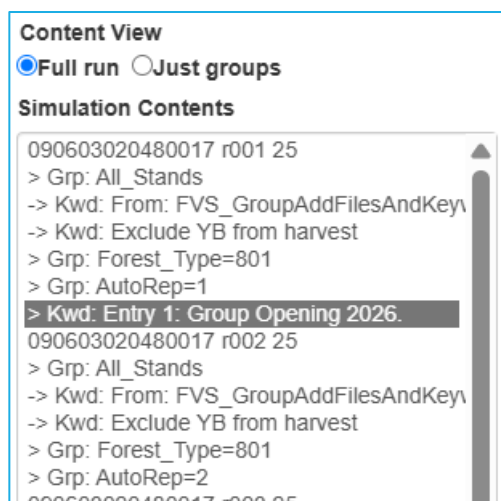
Each replicate will be modeled as separate group opening entries. You will start by omitting all yellow birch from cutting. The cutting steps are to cut all trees greater than 1.0 inch DBH in replicate r001 in 2026 and 2126, replicate r002 in 2051, replicate r003 in 2076, and replicate r004 in 2101.

13. Select the **Components – Management** menu.
14. From the **Categories** selection box, select *Tree Removal Preference*.
15. From the **Components** selection box, select *Exclude or include a species from harvest*.
16. Change the **Component title** to *Exclude YB from harvest*.
17. Enter the following parameters:
  - a. **Year or cycle number** ..... 2026
  - b. **Species**.....yellow birch
  - c. *Exclude the species from harvest*
18. Click the **Save in Run** button.

To apply management to a single replicate, simply click the replicate identification in the **Contents** window, then select the management option.

19. In the **Contents** window, click 090603020480017 r001 25.
20. From the **Categories** selection box, select *Thinning & Pruning Operations*.
21. From the **Components** selection box, select *Thin throughout a diameter range*.
22. Change the **Component title** to *Entry 1: Group Opening 2026*.
23. Enter the following parameters:
  - a. **Year or cycle number** ..... 2026
  - b. **Smallest DBH to be considered** ..... 1
  - c. Leave all other parameters set to the default values.
24. Click the **Save in Run** button.

In the **Contents** window, you will notice that the management action has only been applied to the first replicate.



Use the **Copy/Paste/Edit** buttons below the **Contents** window with this management action to cut this replicate again in 2125.

25. In the contents window, select *kwd: Entry 1: Group Opening 2026*.
26. Click the **Copy** button.
27. Click the **Paste item selected below** button.
28. Select the second *kwd: Entry 1: Group Opening* action and click the **Edit** button.
  - a. **Component title** ..... *Entry 5: Group Opening 2126*
  - b. **Year or cycle number** ..... 2126
  - c. Leave all other parameters set to their values.
29. Click the **Save in Run** button.

Use the **Paste/Edit** buttons below the **Contents** window to add the group cuts to the other replicates.

30. In the **Contents** window, select 090603020480017 r002 25.
31. Click the **Paste item selected below** button.
32. Select the *kwd: Entry 1: Group Opening 2026* action attached to replicate r002 and click the **Edit** button.

- a. **Component title** .....Entry 2: Group Opening 2051
  - b. **Year or cycle number** .....2051
  - c. Leave all other parameters set to their values.
33. Click the **Save in Run** button.
34. In the **Contents** window, select 090603020480017 r003 25.
35. Click the **Paste item selected below** button.
36. Select the *kwd: Entry 1: Group Opening 2026* action attached to replicate r003 and click the **Edit** button.
  - a. **Component title** .....Entry 3: Group Opening 2076
  - b. **Year or cycle number** .....2076
  - c. Leave all other parameters set to their values.
37. Click the **Save in Run** button.
38. In the contents window, select 090603020480017 r004 25.
39. Click the **Paste item selected below** button.
40. Select the *kwd: Entry 1: Group Opening 2026* action attached to replicate r004 and click the **Edit** button.
  - a. **Component title** .....Entry 4: Group Opening 2101
  - b. **Year or cycle number** .....2101
  - c. Leave all other parameters set to their values.
41. Click the **Save in Run** button.

### Adding regeneration

Given the cuts, it is important to augment automatic sprouting following harvests with additional regeneration you expect to regenerate from seed or small seedlings that may not be in your data. To accomplish this, you will conditionally add natural regeneration following the harvest.

42. In the **Contents** window, click *Grp: All\_stands*.
43. Select the **Components – Management** menu.
44. From the **Categories** selection box, select *Planting & Natural Regeneration*.
45. From the **Components** selection box, select *Plant/Natural with Partial Estab Model*.
46. Change the **Component title** to *Natural regeneration following harvests*.
47. Enter the following parameters:
48. Set the **Schedule the date of disturbance** radio button to *Schedule by condition*.
  - a. **Create a condition** .....After “significant” harvesting/thinning
  - b. Leave all other parameters set to the default values.
49. In **Regen 1**), specify the following:
  - a. **Type of regeneration scheduled:** .....Natural
  - b. **Species:**.....red maple
  - c. **Trees/acre:**.....100
50. In **Regen 2**), specify the following:
  - a. **Type of regeneration scheduled:** .....Natural
  - b. **Species:**.....sugar maple
  - c. **Trees/acre:**.....300
51. Leave all other parameters set to their values.
52. Click the **Save in Run** button.

Since the Plant/Natural management action only allows for two species to be added, you'll need to add the other species by attaching additional plant/natural management actions to the condition.

53. From the **Categories** selection box, select *Planting & Natural Regeneration*.
54. From the **Components** selection box, select *Plant/Natural with Partial Estab Model*.
55. Change the **Component title** to *Natural regeneration following harvests*.
56. Set the **Schedule the date of disturbance** radio button to *Attach to existing condition*.
57. Enter the following parameters:
58. In **Regen 1**), specify the following:
  - a. **Type of regeneration scheduled:** ..... *Natural*
  - b. **Species:**..... *black cherry*
  - c. **Trees/acre:**..... *200*
59. In **Regen 2**), specify the following:
  - a. **Type of regeneration scheduled:** ..... *Natural*
  - b. **Species:**..... *yellow birch*
  - c. **Trees/acre:**..... *50*
60. Leave all other parameters set to their values.
61. Click the **Save in Run** button.

Regeneration now includes regeneration from sprouting and seed sources following all group entries. While you will not model it here, to maintain seedlings in the regeneration layer throughout the projection period, you need to consider whether or not to add periodic ingrowth into this run.

### Selecting Outputs

62. Select the **Select Outputs** menu.
63. Check the **Stand Visualization**, **Tree lists**, and **Regeneration** boxes.

### Running the simulation

64. Select the **\*Run\*** menu.
65. Change the management identification code (**MgmtID**) to *GS*.
66. Click the **Save and Run** button.

FVS will save the simulation as *Complex 1* with a management identification code of *GS*.

### Examining the treatment effects

Begin exploring the effects of this run by using **Visualize** menu to view pre- and post-harvest images. The **Visualize** menu allows you to view and compare images of each replicate during the projection time frame; however, you do not get a combined image of all replicates. The naming of each image is also based on the stand as a whole.

In the prescription, only yellow birch should be left in the group openings. Use the images to describe the presence of yellow birch in the openings.

Use the **View Outputs-Load/Explore** menus to further explore the run output.

In this run, you have summary tables, treelist tables, stand and stock tables, and regeneration sprout and tally tables for each stand replicate. You have a composite summary statistics table and a composite stand and stock table averaged across the replicates.

**Load/Explore** the summary output to begin exploring the density in each replicate. Create a table that shows basal area by year (columns) for each replicate.

Scroll through the table and describe the density of each replicate.

**Load/Explore** the stand and stock table output to explore species composition of each replicate over the projection time frame. Create a graph of the live and harvested basal area by species for each replicate during the cutting years. Describe how species composition differs between the replicates.

**Load/Explore** the regeneration output. What is the average size of the sprouts and natural regeneration by replicate?

How did the number of small trees in the stand change following harvests?

**Load/Explore** the composite summary output. Describe volume production in the stand over the projection time frame using the **Graphs** menu. Total production is the standing + harvested volume in the stand. Describe how sawlog production is trending over the projection time frame.

Change the y-axis to total merchantable volumes. Does the trend change?

**Load/Explore** the composite stand and stock table to describe species composition at the start and end of the projection time frame. Describe the change in species composition for the stand.

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