

Accessing and Using Forest Inventory and Analysis (FIA) Data in FVS

John D. Shaw^{1,*}

¹USDA Forest Service, Rocky Mountain Research Station, *john.d.shaw@usda.gov

Overview:

- The USDA Forest Service, Forest Inventory and Analysis (FIA) program maintains a network of more than 135,000 forested permanent sample plots that are measured on a rotating basis at 5- to 10-year intervals on all ownerships across the U.S.
- As the FIA dataset has grown, so too has the interest and demand for FIA data to be made available in “FVS-ready” format. Beginning in 2019, the FIA program released data for all 1.6 million plot visits recorded in the FIA database (FIADB) in FVS-ready format, distributed with other FIADB tables in SQLite databases through the FIA Datamart (<https://research.fs.usda.gov/products/dataandtools/tools/fia-datamart>).
- Since the initial release, several minor updates have been applied to the data formatting program, which is known as FIA2FVS. These updates will be applied in a completely refreshed set of tables in the spring of 2024.

Summary:

Although there has been some level of demand for FIA data in a format usable in FVS for at least two decades, it has accelerated in recent years due to the need for data collected consistently over large geographic areas. These applications are most commonly in support of carbon- and fire-related analyses, but at scales such as individual national forests or potential woodsheds the focus is commonly on timber yield analyses. In the past, a prerequisite to any large-scale analysis was reformatting of FIA or other datasets into an FVS-compatible format.

Several concurrent developments have led to the abundance FVS analyses using FIA data: (1) compared to 20 years ago, FIA data are much more abundant and consistently collected across the U.S.; (2) FIA has been on an annualized inventory cycle, with new data collected in every state every year; (3) FVS implemented a database extension, which replaced the earlier text file format; (4), the FIA and FVS programs, in some coordination, adopted SQLite as a common database format for data distribution and FVS function; and (5) FVS was released as a new, browser-based interface, replacing the Suppose interface. Advances in computing power also led to the feasibility of doing simulations involving thousands of stands, since the core modules of FVS remained computationally efficient and therefore did not offset increasing CPU speeds.

The development of FIA2FVS and storage of pre-translated (FVS-ready) data in the FIA Datamart eliminated a major burden from users wanting to run FIA plot data through FVS. The data are now “plug-and-play”—i.e., users need only download the desired FIA SQLite database(s) and import the FVS-tables through the FVS interface. In addition, FVS-ready FIA data can be run in three different modes: FIA condition (stand), the whole FIA plot, usually

comprising 4 subplots, and individual FIA subplots, in contrast to the traditional stand and plot formats previously possible in FVS (figs. 1, 2; Shaw and Gagnon 2020).

Key Concepts for FVS Users:

- User demand and innovative use of FIA data in FVS has been important to the recognition and support of continued maintenance of FVS-ready FIA data in the FIA Datamart.
- Due to the large amount of data, varied history of FIA plot design, presence of undocumented variations in data content and formatting in FIADB, and other factors, user feedback is essential to improving and maintaining data quality. Users who discover or suspect that problems running FIA data in FVS might be data-related should contact the author (john.d.shaw@usda.gov).
- As with any downloadable dataset, users should make note of the download date(s) for the database(s) they are using. Each State is updated separately as new plot data are loaded to FIADB. In addition, State-level updates generally cover only the most recent 5 years. The planned comprehensive database refresh will synchronize State-to-State versioning more closely.

Management Applications/Future Directions:

- With easy access to FVS-ready data, the number and variety of applications continues to grow. The linkage of TreeMap (Riley et al. 2022) to FVS-ready FIA data now allows users to “grow pixels” in FVS simulations, allowing for analyses that were not previously possible.
- Following the implementation of the most recent changes to FIA2FVS and the upcoming database refresh, an updated user guide will be released. This will cover advanced topics, such as connecting FVS tables to the core FIA tables for different purposes.

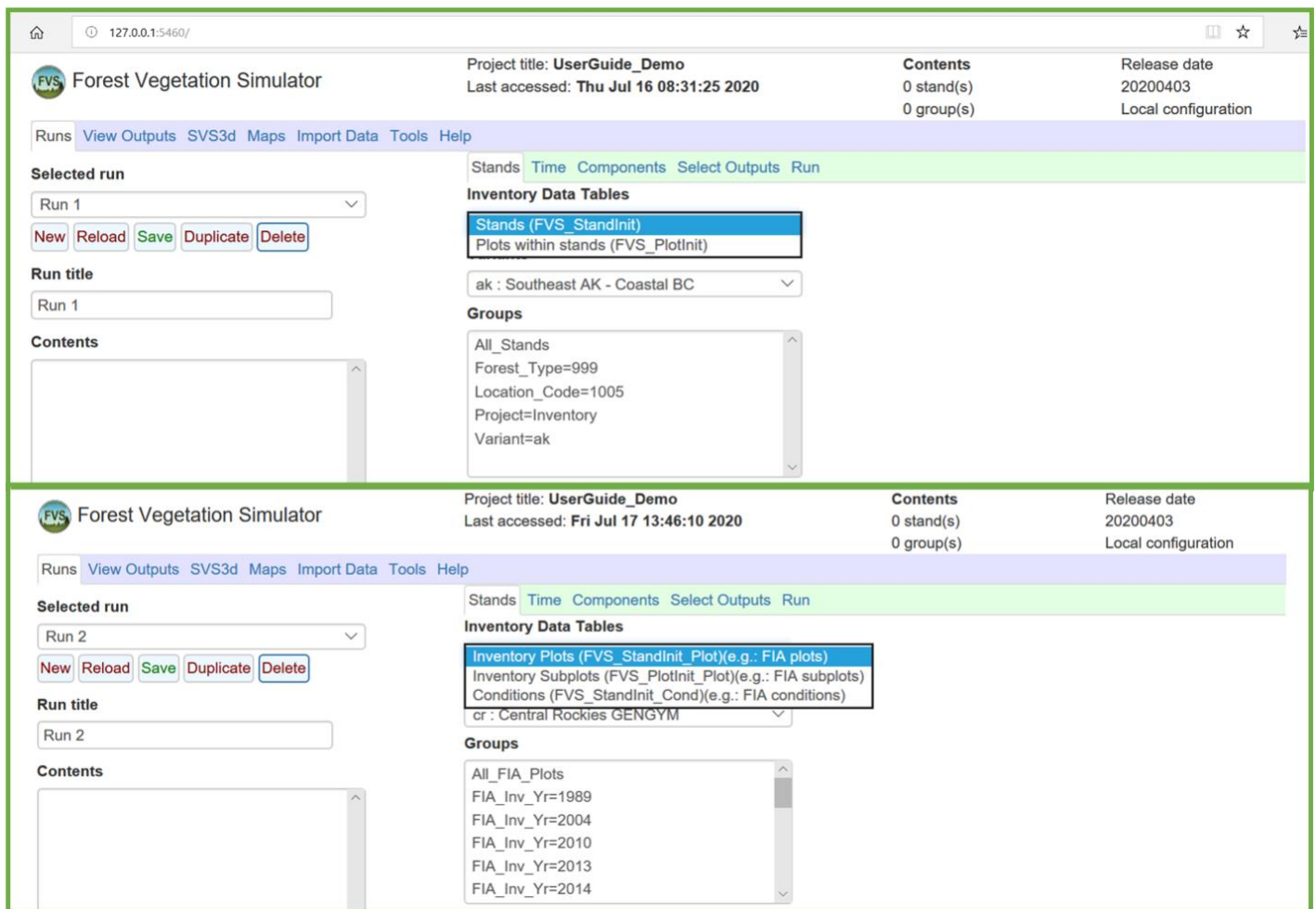


Figure 1—Comparison of stand selection options when using conventional data in FVS (top) and FVS-ready FIA data (bottom). Because FIA2FVS produces standardized output, FVS recognizes the format on the input step and automatically provides the option of projecting FIA conditions, whole plots, or subplots.

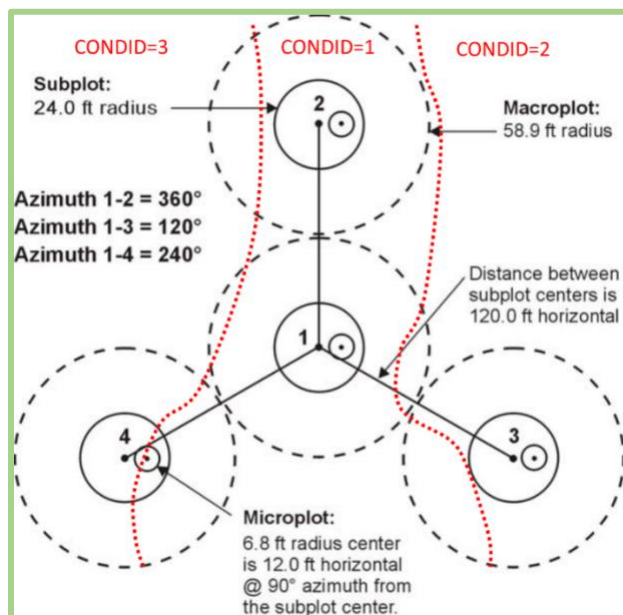


Figure 2—Diagram of the current FIA plot design, showing the mapping of conditions (CONDIDs). Conditions in FIA data are equivalent to “stands” as they might be mapped in preparation for a conventional inventory for the purpose of stratification and plot layout. In the methodology used since about 2000, FIA does not rearrange subplots to accommodate natural stand boundaries; the plot is located at the theoretical position, and any existing boundaries, which may exist between different forest types or forest and nonforest, are mapped in the dataset. Condition-level data, in FVS_StandInit_Cond, are most true to traditional stand delineation and the FIA data structure. Plot-level data (FVS_StandInit_Plot) ignore condition boundaries and therefore certain compromises in the data structure. For example, assuming that condition #1 is forested, the variables populated in FVS_StandInit_Plot (e.g., site index or PV_Code) will be those that are recorded for condition #1 because it occupies the majority of the plot footprint. Attributes for conditions #2 and #3 are ignored.

References:

Riley, K.L.; Grenfell, I.C.; Shaw, J.D.; [et al.]. 2022. TreeMap 2016 dataset generates CONUS-wide maps of forest characteristics including live basal area, aboveground carbon, and number of trees per acre. Journal of Forestry. 2022: 607-632. <https://research.fs.usda.gov/treesearch/65597>

Shaw, J.D.; Gagnon, A. 2020. Field Note: A new conversion of forest inventory and analysis data for use in the forest vegetation simulator. Journal of Forestry 118(3): 307-312. <https://research.fs.usda.gov/treesearch/59245>