



Northern California Forest Yield Cooperative
Department of Forestry and Resource Management
University of California, Berkeley, Ca. 94720

Research Note No. 18

February 13, 1987

YDAVG User's Guide:

The CACTOS Yield File Averager

Version 2.0

by

P. J. Daugherty, Lee C. Wensel, and W. J. Meerschaert

Abstract

The computer program YDAVG is designed to serve as a postprocessor of CACTOS yield summary files. The program can be used to produce average yields or a summary of the average current stocking condition and variation for strata or management units, when used in conjunction with the California Conifer Timber Output Simulator, CACTOS. YDAVG will produce the average and standard deviation of yields for up to 150 plots (i.e. stand descriptions) and up to 40 simulation periods. This program is written in standard FORTRAN 77 code. The current version is running on the University's Vax 11/780 computer system, IBM PC-compatible, and Apple Macintosh personal computers.

Table of Contents

Abstract	cover
I. Introduction	1
II. How to use the yield averager	1
A. Input file specifications	2
1) The filenames input file	2
2) Yield summary compatibility specifications	3
B. Output file specifications	4
C. Use of YDAVG	5
III. Example uses of YDAVG	5
IV. Literature cited	6

INTRODUCTION

YDAVG is designed to serve as a postprocessor of CACTOS yield summary files. CACTOS, the California Conifer Timber Output Simulator (Wensel, Daugherty, and Meerschaert 1986), is designed to model changes in young-growth conifer stands, based on stand descriptions developed from plot data. YDAVG processes the yield summary files produced by CACTOS to compute the average and standard deviations of the predicted yields for a stratum or management unit as a whole. YDAVG can produce an "averaged yield file" for a stratum or management unit based on up to one hundred and fifty plots for up to forty simulation periods. However, a lengthy growth projection is not recommended since the growth models in CACTOS were not developed for this purpose. The provision in YDAVG for forty simulation periods is intended to allow for prescriptions that include multiple harvest and ingrowth simulations (e.g. a fifty year projection with a ten year cutting cycle and ingrowth added after each harvest would have 31 simulation entries in the yield file).

YDAVG is intended to be used in conjunction with the batch mode of CACTOS, where a series of plots (i.e. stand descriptions) are simulated under the same set of commands. However, nothing in the program prohibits the use of YDAVG with files produced in the interactive mode of CACTOS, but care should be taken to insure that yield files used are compatible for averaging (see "compatibility specifications").

The yield averager program can also be used to quickly and easily produce a summary of the average current stocking condition of a stratum or management unit along with a measure of the existing variation when used in conjunction with CACTOS batch mode. This use of YDAVG will be discussed in more detail in the examples below.

HOW TO USE THE YIELD AVERAGER

YDAVG is a minimally interactive program that requires only three keyboard entries from the user: 1) the name of the input file containing input file names (may be the same filenames file used in CACTOS batch mode), 2) a 5 character prescription code (optional), and 3) a file name for the output file (i.e. the averaged yield file).

A. Input File Specifications

Details of the input file specifications include 1) a description of the filenames input file, 2) the yield file compatibility specifications, and 3) the restrictions on yield summary file makeup.

1) The filenames input file:

YDAVG requires a file that contains the the names of the yield summary files to be included in the calculation of the averaged yield file. The program expects that the file has one yield summary file name on each line with the file name starting in column 1, (FORTRAN format a32). These specifications allow YDAVG to use the same file that was used as the filenames file in CACTOS batch mode. In batch mode the yield summary output file name is automatically created by CACTOS. This yield summary may be a single stand description or a concatenation of several different stand descriptions run through the same prescription. The concatenated yield files produced by CACTOS batch mode have the yield streams for each stand description separated by an asterisk which is sensed by YDAVG. The user should be aware that all yield summaries contained in a concatenated yield file are automatically included in the averaged yield file and there is no way to specify otherwise.

While YDAVG can utilize the input/output filenames file used in batch mode, any file with the yield summary file names in the format described above (i.e. format a32) can be used as the filenames input file. An example of a CACTOS filenames input file is shown below:

```
columns: 123...
          \cactos\comp3\stand1.sd
          \cactos\comp3\stand2.sd
          \cactos\comp3\stand3.sd
          \cactos\comp3\stand4.sd
          \cactos\comp3\stand5.sd
          \cactos\comp3\stand6.sd
```

Note: this example is the same as a CACTOS batch mode filenames file. YDAVG appends the file name with the optional prescription code and substitutes the ending '.yd' for any ending on the filename given above.

2) Yield summary compatibility specifications:

For efficiency reasons YDAVG reads the yield file labels from the first yield file listed in the the filenames input file and assumes that the pattern of all subsequent yield summaries are identical with the first yield file. No checks are made or warnings given in terms of compatibility. If the yield summaries are not compatible, YDAVG will produce erroneous results.

CACTOS yield files contain combinations of the five types of simulation entries listed below:

- 1) an entry after every growth cycle
- 2) an entry for each harvest simulation
- 3) an entry for each ingrowth simulation
- 4) an entry for the stand after each harvest or ingrowth simulation
- 5) an entry for the total harvest during a simulation

YDAVG reads the yield labels from the first yield file and stores the pattern of simulation in memory (e.g. the first yield summary indicates a pattern of 5 growth cycle entries, a harvest entry, a stand after harvests entry, 5 more growth cycle entries, and an entry for total harvest during simulation). The program then reads the remaining yield files, storing the entries in the pattern found in the first yield file. If any of the yield summaries do not follow this pattern the resulting averaged yield file will be incorrect. This type of error will show up as an inconsistency in the averaged yield file. However as the number of plots included in the averaged yield file increases the magnitude of the discrepancies will decrease. Whenever an averaged yield file shows a discrepancy the user should check for incompatibility in the yield files used as input.

The compatibility of yield files concerns only the pattern of yield entries as opposed to the values of a given entry. The pattern of yield entries must be identical for all yield files, but their content may vary between yield files. For example the number of species as well as the species composition may vary between yield files.

When YDAVG is used in conjunction with a single batch run of CACTOS the compatibility of yield files is insured because each file was produced by the same set of simulation commands and a harvest entry is included in the yield file whenever a harvest is attempted even if a particular stand description had too little volume to be harvested. The harvest entry in this case would contain one line of zeros, and this line will maintain compatibility.

The cases where YDAVG is used to average yield files produced by the interactive mode of CACTOS or by two or more separate batch runs present the greatest risk of incompatibility. In these cases the user must take care to insure compatibility between yield files. While the lack of internal checking for incompatibility places more responsibility on the user, it also keeps the program smaller and faster in operation.

In addition, YDAVG assumes the same merchantability standards are used for all yield summaries (i.e. the same min. DBH and merch top).

B. Output File Specifications

The yield averager produces one output file which is similar in format to the CACTOS yield summary file. The file has a heading of "AVERAGED YIELD FILE". The names of any files that could not be included in the averaged yield due to input/output (I/O) errors will be listed at the top of the file. If all files requested in the filenames file were successfully included in the average no I/O error messages will be written to the output file. The stand identifier labels of all yield files included in the calculations are printed next followed by the merchantability limits used. The next section lists the averaged site index and age, along with their standard deviations by species. In the case of site index and age, the values calculated include only those entries listed in the yield files. For example, if out of ten yield files averaged only two contained site indices and ages for white fir, the average site index and age for white fir would be based on two plots. The number of plots each average site index is based on is listed on the same line under the column heading "n".

The rest of the averaged yield file contains the average yields by species with the standard deviations listed directly below the average values. The values listed as elapsed time "et" are not averages. The values listed under "dbar" are averages, but they are calculated using the average basal area and the average trees per acre and thus do not have an entries for standard deviation. An example of a YDAVG output file is included at the end of this manual. Note: the elapsed time (et) printed in the averaged yield file comes from the last yield file included in the calculations. While elapsed time may seem to provide a simple check for incompatibility of yield files, this use of elapsed time would prohibit the use of YDAVG with yield files that were produced from stand descriptions that had a growth period adjustment value included to align the yield steams of plots measured at different times.

C. Use of YDAVG

To use YDAVG, the user would enter the command "yavg". The program will welcome the user to the program and request that the user enter <return> to continue. The program will then ask the user to enter the name of the filenames file. After this file is successfully opened the program will request a name for the averaged yield file. The program has file overwriting capabilities. The program then asks for a five-character prescription code for correcting the file names file. Once these user entries are completed the program begins processing the yield files, printing the stand identifier of the file currently being processed to the screen. Once the yield files are read the program calculates averages and standard deviations, and writes the results to the output file.

EXAMPLE USES OF YDAVG

The most common use of YDAVG will be to produce average yield streams for strata or management units based on multiple plots simulations using the same set of simulation commands in CACTOS batch mode. This type of use has been discussed throughout the guide and is the most straightforward use of YDAVG. The stand descriptions for a stratum or management unit would be run through CACTOS batch mode. When the batch run is successfully completed, YDAVG could be executed using the same filenames file as used in the batch run.

A second use for YDAVG is to produce an averaged yield file for summarizing the current average stocking and variation of a stratum or management unit. Here CACTOS is used only to summarize the stand description, and since no growth is projected, this can be done by running all of the plots in a given unit through CACTOS batch mode using the following command file:

<u>command</u>	<u>explanation</u>
rx1	prescription code (must be given to YDAVG interactively)
y	enter initialization routine
iq	set quintupling option
l	inhibit quintupling option
ex	exit initialization routine
ex	end simulation

The yield files produced by this command file would only contain the yield entry for elapsed time of zero (i.e. current condition). The yield files produced could then be run through YDAVG to produce average stocking and variation (i.e. standard deviation) for the unit as a whole. Note: in the above command file record quintupling was inhibited to speed processing time (i.e. avoid pseudo-stochastic calculations) since these calculations do not affect initial condition. A user may also want to set merchantability standards in this type of use.

LITERATURE CITED

- Wensel, Lee C., Peter J. Daugherty, and Walter J. Meerschaert. 1986.
CACTOS User's Guide: The CALifornia Conifer Timber Output Simulator. Version 3.3
Bull. 1920. Ag. Exp. Sta., Univ. of Ca. Div. of Ag. and Nat. Res.

AVERAGED YIELD FILE

The following 7 stand description yields were used as input:

demo stand #1	demo stand #2	demo stand #3
demo stand #4	demo stand #5	demo stand #6
demo stand #7		

	min. DBH	merch top
cubic ft.	.0	4
board ft.	8.0	6

species	avg site / s.d.	avg age / s.d.	n
Pond. Pine	103.9 16.3	.0 .0	7.
Sugar Pine	91.4 14.5	.0 .0	7.
Cedar misc	70.0 .0	.0 .0	7.
DouglasFir	93.6 15.0	.0 .0	7.
White Fir	86.4 12.1	.0 .0	7.

species	et	dbar	tpa	basar	cvol	bdvol	bagro	cvgro	bdgro
Pond. Pine	.00	19.96	32.1	69.8	2.20	12.00	.0	.00	.00
s.dev.:			35.6	71.8	2.15	11.55	.0	.00	.00
Sugar Pine	.00	20.72	14.3	33.4	1.03	6.08	.0	.00	.00
s.dev.:			31.4	58.2	1.70	9.85	.0	.00	.00
Cedar misc	.00	13.59	46.4	46.8	.99	5.04	.0	.00	.00
s.dev.:			68.7	31.1	.79	4.58	.0	.00	.00
DouglasFir	.00	23.46	17.1	51.5	1.88	11.59	.0	.00	.00
s.dev.:			22.3	71.7	2.72	16.99	.0	.00	.00
White Fir	.00	11.75	15.0	11.3	.31	1.43	.0	.00	.00
s.dev.:			29.3	22.3	.62	2.93	.0	.00	.00
Totals	.00	17.67	125.0	212.8	6.42	36.14	.0	.00	.00
s.dev.:			86.7	48.5	1.81	13.88	.0	.00	.00
Pond. Pine	5.00	20.95	31.6	75.6	2.53	14.27	5.8	.33	2.27
s.dev.:			34.8	77.7	2.48	13.77	5.9	.32	2.23
Sugar Pine	5.00	21.80	14.0	36.3	1.18	7.11	2.8	.14	1.03
s.dev.:			30.7	63.4	1.94	11.50	5.3	.24	1.69
Cedar misc	5.00	14.31	44.1	49.2	1.08	5.57	2.4	.08	.53
s.dev.:			63.4	32.5	.85	4.97	1.7	.06	.43
DouglasFir	5.00	24.44	16.9	55.1	2.11	13.28	3.6	.23	1.69
s.dev.:			22.1	76.4	3.02	19.28	4.8	.30	2.32
White Fir	5.00	12.38	14.4	12.1	.34	1.63	.7	.04	.20
s.dev.:			28.1	23.8	.69	3.30	1.5	.07	.37
Totals	5.00	18.60	121.0	228.2	7.24	41.85	15.4	.81	5.71
s.dev.:			81.2	49.6	1.89	14.77	2.3	.11	1.01

Pond. Pine	10.00	21.95	31.1	81.7	2.88	16.77	6.1	.35	2.51
s.dev.:			34.2	83.8	2.82	16.24	6.1	.35	2.47
Sugar Pine	10.00	22.86	13.7	39.1	1.32	8.20	2.8	.15	1.09
s.dev.:			30.0	68.6	2.19	13.25	5.2	.25	1.79
Cedar misc	10.00	15.01	41.9	51.5	1.16	6.10	2.3	.08	.53
s.dev.:			58.6	33.9	.90	5.37	1.6	.06	.44
DouglasFir	10.00	25.41	16.7	58.8	2.35	15.09	3.7	.24	1.81
s.dev.:			21.8	81.2	3.33	21.70	4.9	.32	2.46
White Fir	10.00	12.95	13.9	12.7	.38	1.84	.7	.03	.21
s.dev.:			27.1	25.1	.75	3.68	1.3	.06	.39
Totals	10.00	19.52	117.3	243.8	8.08	48.00	15.6	.85	6.15
s.dev.:			76.2	50.7	1.95	15.58	2.2	.11	.99

HARVESTS: thin from below growth harvested

Pond. Pine	10.00	15.80	10.0	13.6	.44	2.20	.9	.05	.32
s.dev.:			12.8	14.2	.44	2.23	.9	.05	.32
Sugar Pine	10.00	12.48	6.2	5.2	.12	.52	.3	.01	.07
s.dev.:			15.4	10.9	.21	.89	.6	.03	.13
Cedar misc	10.00	9.84	30.6	16.2	.29	1.16	.7	.03	.12
s.dev.:			57.9	11.4	.21	1.05	.5	.02	.10
DouglasFir	10.00	17.64	5.8	9.9	.34	1.84	.6	.04	.27
s.dev.:			7.4	14.3	.51	2.81	.9	.06	.39
White Fir	10.00	10.00	9.3	5.1	.12	.48	.2	.01	.08
s.dev.:			15.4	6.6	.16	.70	.3	.02	.11
Totals	10.00	12.17	61.9	50.0	1.31	6.21	2.8	.14	.87
s.dev.:			58.9	.0	.36	2.73	.6	.03	.35

STAND AFTER HARVEST growth remaining

Pond. Pine	10.00	24.34	21.1	68.1	2.44	14.57	5.2	.30	2.18
s.dev.:			25.6	75.2	2.55	14.85	5.6	.32	2.27
Sugar Pine	10.00	28.65	7.6	33.9	1.21	7.68	2.5	.13	1.01
s.dev.:			14.7	57.9	1.98	12.36	4.6	.23	1.65
Cedar misc	10.00	23.92	11.3	35.3	.87	4.93	1.7	.06	.41
s.dev.:			5.9	26.1	.73	4.57	1.2	.05	.36
DouglasFir	10.00	28.74	10.8	48.9	2.00	13.24	3.1	.19	1.54
s.dev.:			14.6	68.6	2.88	19.33	4.1	.26	2.11
White Fir	10.00	17.48	4.6	7.6	.25	1.36	.4	.02	.13
s.dev.:			12.1	20.2	.67	3.59	1.1	.05	.34
Totals	10.00	25.33	55.4	193.8	6.77	41.79	12.9	.70	5.28
s.dev.:			20.1	50.7	1.90	14.63	2.6	.13	.99

Pond. Pine	15.00	25.43	20.9	73.7	2.77	17.06	5.6	.33	2.48
s.dev.:			25.4	81.2	2.89	17.42	6.0	.35	2.58
Sugar Pine	15.00	29.81	7.5	36.4	1.34	8.75	2.5	.14	1.07
s.dev.:			14.6	62.4	2.20	14.06	4.6	.23	1.73
Cedar misc	15.00	24.67	11.2	37.1	.93	5.39	1.8	.06	.46
s.dev.:			5.9	27.2	.77	4.94	1.3	.05	.39
DouglasFir	15.00	29.83	10.8	52.2	2.22	14.95	3.3	.21	1.70
s.dev.:			14.5	72.9	3.16	21.59	4.4	.28	2.30
White Fir	15.00	18.10	4.5	8.0	.27	1.48	.4	.02	.12
s.dev.:			11.9	21.3	.72	3.92	1.1	.05	.33
Totals	15.00	26.33	54.9	207.4	7.53	47.63	13.6	.76	5.84
s.dev.:			19.7	51.9	1.98	15.38	2.4	.13	1.03

Pond. Pine	20.00	26.54	20.7	79.5	3.11	19.78	5.8	.35	2.72
s.dev.:			25.1	87.4	3.26	20.25	6.3	.37	2.84
Sugar Pine	20.00	30.89	7.5	38.9	1.48	9.86	2.5	.14	1.11
s.dev.:			14.5	66.8	2.43	15.82	4.5	.23	1.79
Cedar misc	20.00	25.39	11.1	38.9	.99	5.85	1.8	.06	.46
s.dev.:			5.8	28.3	.82	5.31	1.3	.04	.39
DouglasFir	20.00	30.87	10.7	55.6	2.43	16.75	3.4	.22	1.80
s.dev.:			14.4	77.2	3.45	23.95	4.4	.29	2.42
White Fir	20.00	18.68	4.4	8.4	.29	1.60	.4	.02	.12
s.dev.:			11.7	22.2	.76	4.22	.9	.05	.31
Totals	20.00	27.32	54.4	221.2	8.32	53.83	13.8	.79	6.20
s.dev.:			19.4	53.2	2.05	16.08	2.4	.14	1.09

INGROWTH:

Cedar misc	20.00	7.33	15.0	4.4	.04	.02	.0	.00	.00
s.dev.:			.0	.0	.00	.00	.0	.00	.00
DouglasFir	20.00	6.77	10.0	2.5	.02	.00	.0	.00	.00
s.dev.:			.0	.0	.00	.00	.0	.00	.00
White Fir	20.00	7.90	25.0	8.5	.08	.16	.0	.00	.00
s.dev.:			.0	.0	.00	.00	.0	.00	.00
Totals	20.00	7.51	50.0	15.4	.13	.18	.0	.00	.00
s.dev.:			.0	.0	.00	.00	.0	.00	.00

STAND AFTER INGROWTH

includes ingrowth

Pond. Pine	20.00	26.54	20.7	79.5	3.11	19.78	5.8	.35	2.72
s.dev.:			25.1	87.4	3.26	20.25	6.3	.37	2.84
Sugar Pine	20.00	30.89	7.5	38.9	1.48	9.86	2.5	.14	1.11
s.dev.:			14.5	66.8	2.43	15.82	4.5	.23	1.79
Cedar misc	20.00	17.45	26.1	43.3	1.03	5.87	6.2	.10	.48
s.dev.:			5.8	28.3	.82	5.30	1.3	.05	.39
DouglasFir	20.00	22.69	20.7	58.1	2.45	16.75	5.9	.24	1.80
s.dev.:			14.4	77.2	3.44	23.95	4.5	.29	2.42
White Fir	20.00	10.26	29.4	16.9	.37	1.76	8.9	.10	.28
s.dev.:			11.7	22.2	.76	4.22	.9	.05	.31
Totals	20.00	20.39	104.4	236.6	8.45	54.01	29.2	.92	6.39

s.dev.: 19.4 53.2 2.05 16.09 2.5 .14 1.09

TOTAL HARVEST DURING SIMULATION PERIOD

Pond. Pine	20.00	15.80	10.0	13.6	.44	2.20	.0	.00	.00
s.dev.:			12.8	14.2	.44	2.23	.0	.00	.00
Sugar Pine	20.00	12.48	6.2	5.2	.12	.52	.0	.00	.00
s.dev.:			15.4	10.9	.21	.89	.0	.00	.00
Cedar misc	20.00	9.84	30.6	16.2	.29	1.16	.0	.00	.00
s.dev.:			57.9	11.4	.21	1.05	.0	.00	.00
DouglasFir	20.00	17.64	5.8	9.9	.34	1.84	.0	.00	.00
s.dev.:			7.4	14.3	.51	2.81	.0	.00	.00
White Fir	20.00	10.00	9.3	5.1	.12	.48	.0	.00	.00
s.dev.:			15.4	6.6	.16	.70	.0	.00	.00
Totals	20.00	12.17	61.9	50.0	1.31	6.21	.0	.00	.00
s.dev.:			58.9	.0	.36	2.73	.0	.00	.00