Sample Size: Virtual with a Paired Release

The purpose of the program is to determine the release sizes necessary for a target variance on the estimate of survival through a dam, based on release size, survival, and capture probability.

The program can be downloaded from here:

http://www.cbr.washington.edu/paramest/samplesize/

Inputs

The program uses the following information:

V_1: The number released and detected at an array above the dam.

R_2: The number released in the tailrace of the dam.

R_3: The number released at the first detection array below the dam.

S_{DAM}: Survival from the virtual release site, V_1, to second release site, R_2.

S'_{11}: Survival from R_2 to third release site, R_3.

S_{12}: Survival from R_3 to the second detection array below the dam.

P_1: Capture probability at the first detection array below the dam.

P_2: Capture probability at the second detection array below the dam.

λ: Probability of surviving through the reach between the second and third detection arrays below the dam and being detected at the third detection array.

Those parameters are used to calculate the three survivals that can be obtained directly from a release-recapture study using the CJS model. These are as follows:

$$S_1 = S_{DAM} \cdot S'_{11}$$

$$S_2 = S'_{11} \cdot S_{12}$$

$$S_3 = S_{12}$$

where:

S_1 : Survival from the virtual release site (V_1) to the first detection array,

S_2 : Survival from R_2 to the second detection array, and

S_3 : Survival from R_3 to the second detection array.

These are then used to calculate the variance of the estimate of survival at the dam.

Running the Program

An example scenario is given in Figure 1. The figure shows the program being for a specific set of conditions. The results report is shown in Figure 3.

Defining a Range

A range can be defined for any of the release size parameters V_1, R_2 and/or R_3. For instance, the second release size (R_2) in Figure 4 has the input value 600:1000, defining a range from 600 to 1000 fish. Only one parameter can have a range defined for it at a time. For scenarios where the release sizes at R_2 and R_3 are the same, there is an option to link the input and apply the range to both. Click the **Link R2 and R3** check box and enter the range in the R_2 box (Figure 4).

A range can be defined for the probabilities of survival and detection as well, and should be limited to greater than zero and less than 1. Again, only 1 parameter at a time can have a range entered.

Running the program with a range defined creates a text report output and a graph. The text report shows the standard errors for a number of release sizes defined by regular intervals of the given range (Figure 5). This can be copied and pasted directly into an Excel spreadsheet.

The graph shows the same range in a graphical format versus ½-width of the confidence intervals for 90% and 95%, instead of standard errors. Clicking on the graph will cause an "information bar" to be displayed which gives the exact values for the clicked on point.

Figure 1. Input parameters for a specific scenario.
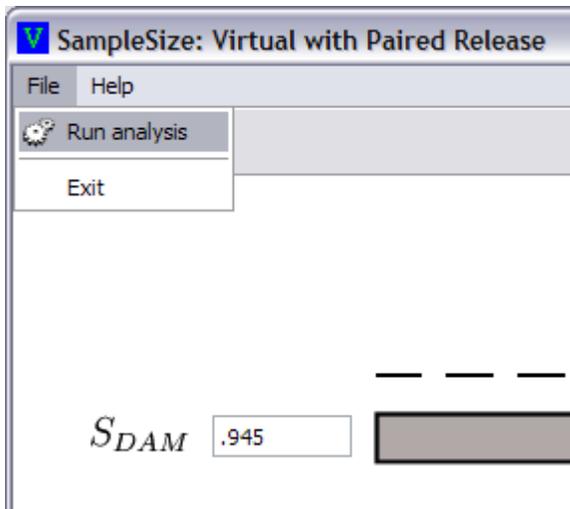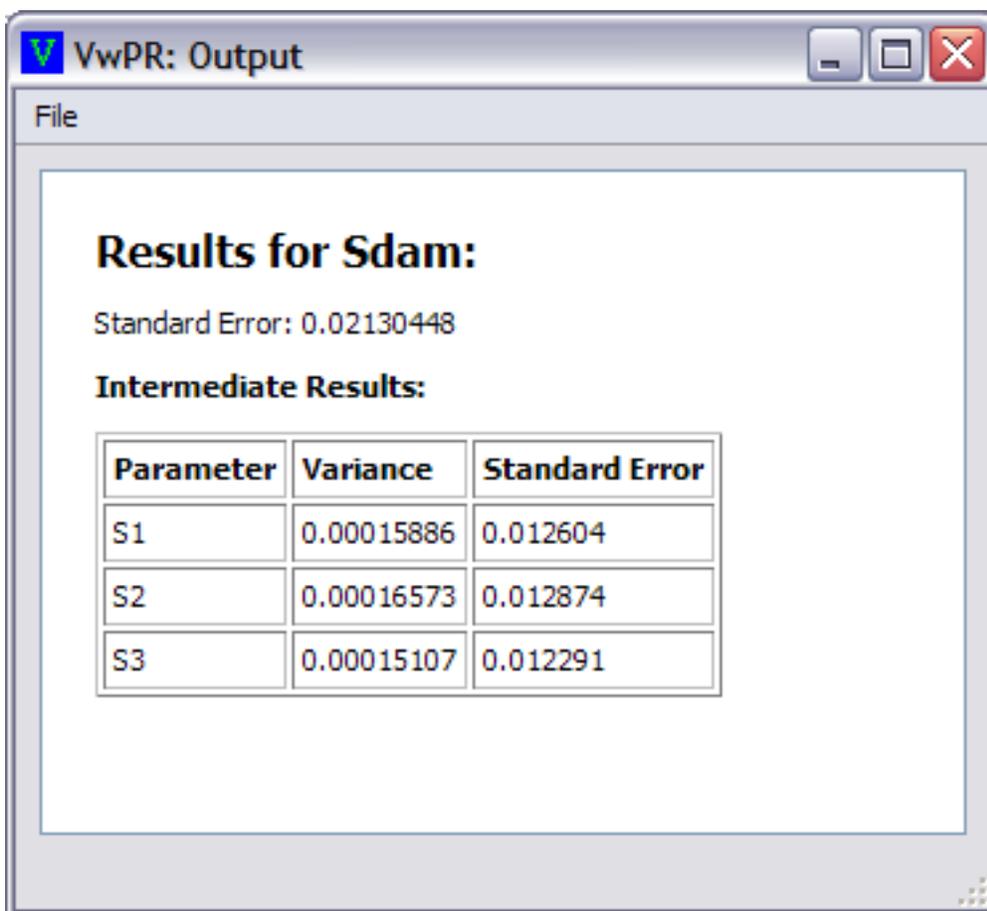
Figure 2. Running the program.

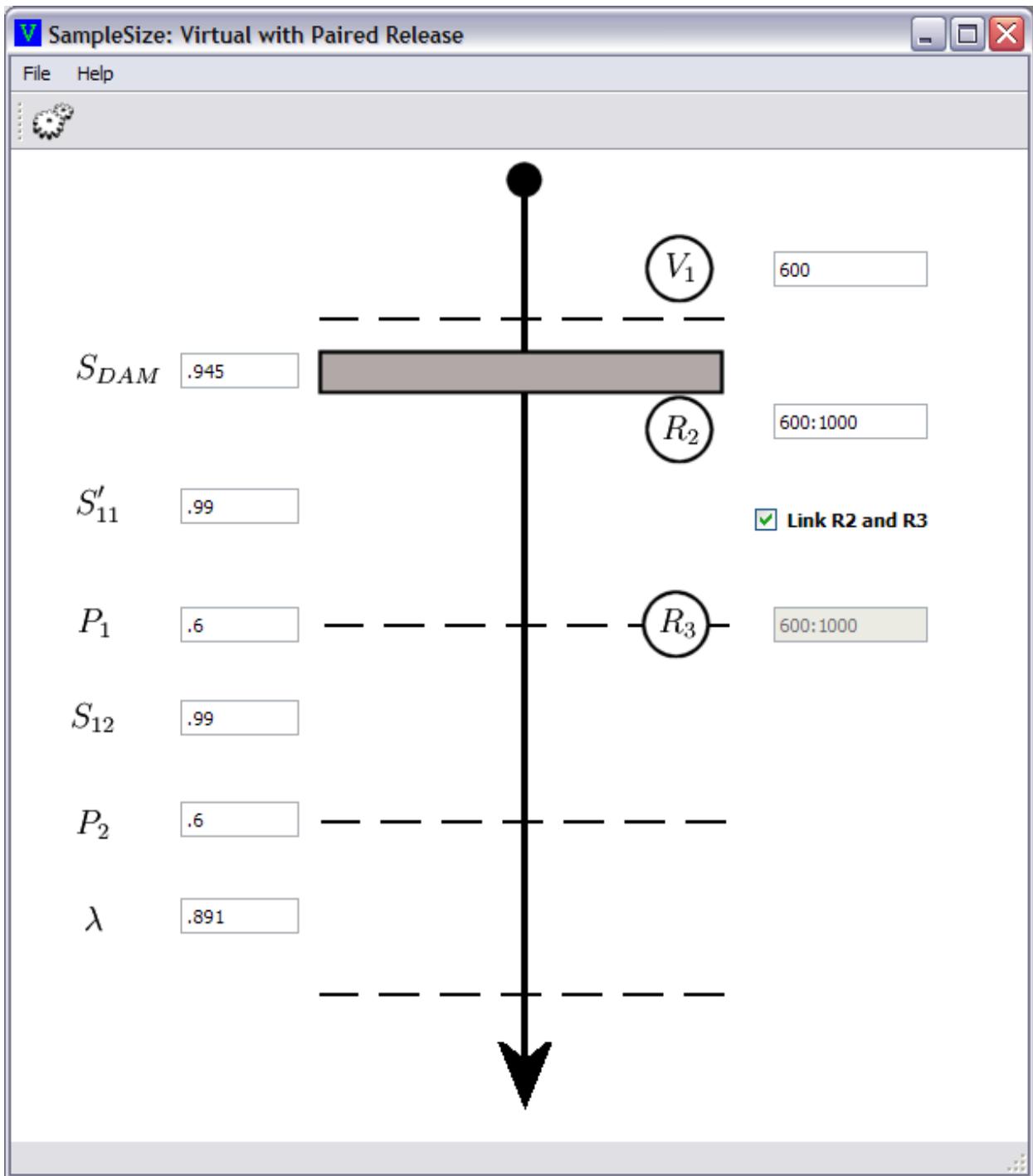**Figure 3. Result report for a run without any ranges defined in a parameter.**

Figure 4. Run setup with range defined (in R2).

VwPR: Output

File

Range Results for Sdam:

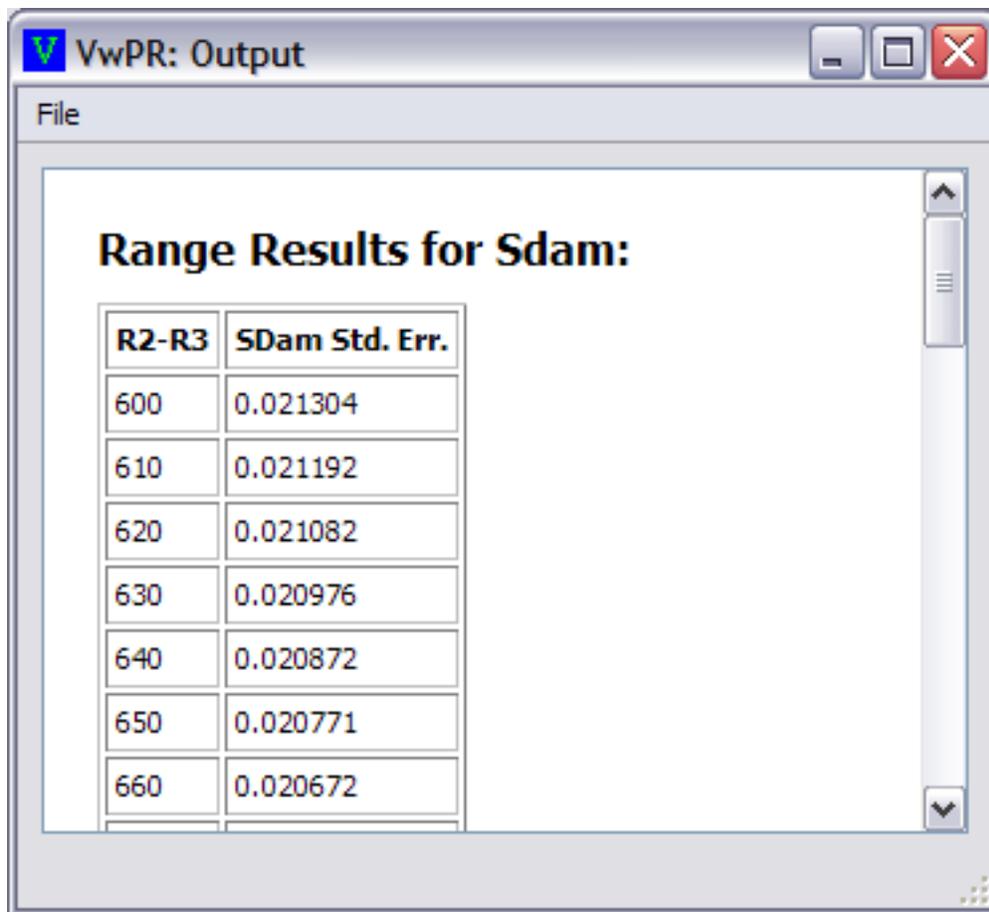| R2-R3	SDam Std. Err.
600	0.021304
610	0.021192
620	0.021082
630	0.020976
640	0.020872
650	0.020771
660	0.020672

Figure 5. Results report for a run with a range defined in the R2-R3 release size box. In this case, the range is R2-R3 with linked release sizes from 600 to 1000. The standard errors are reported at regular intervals.
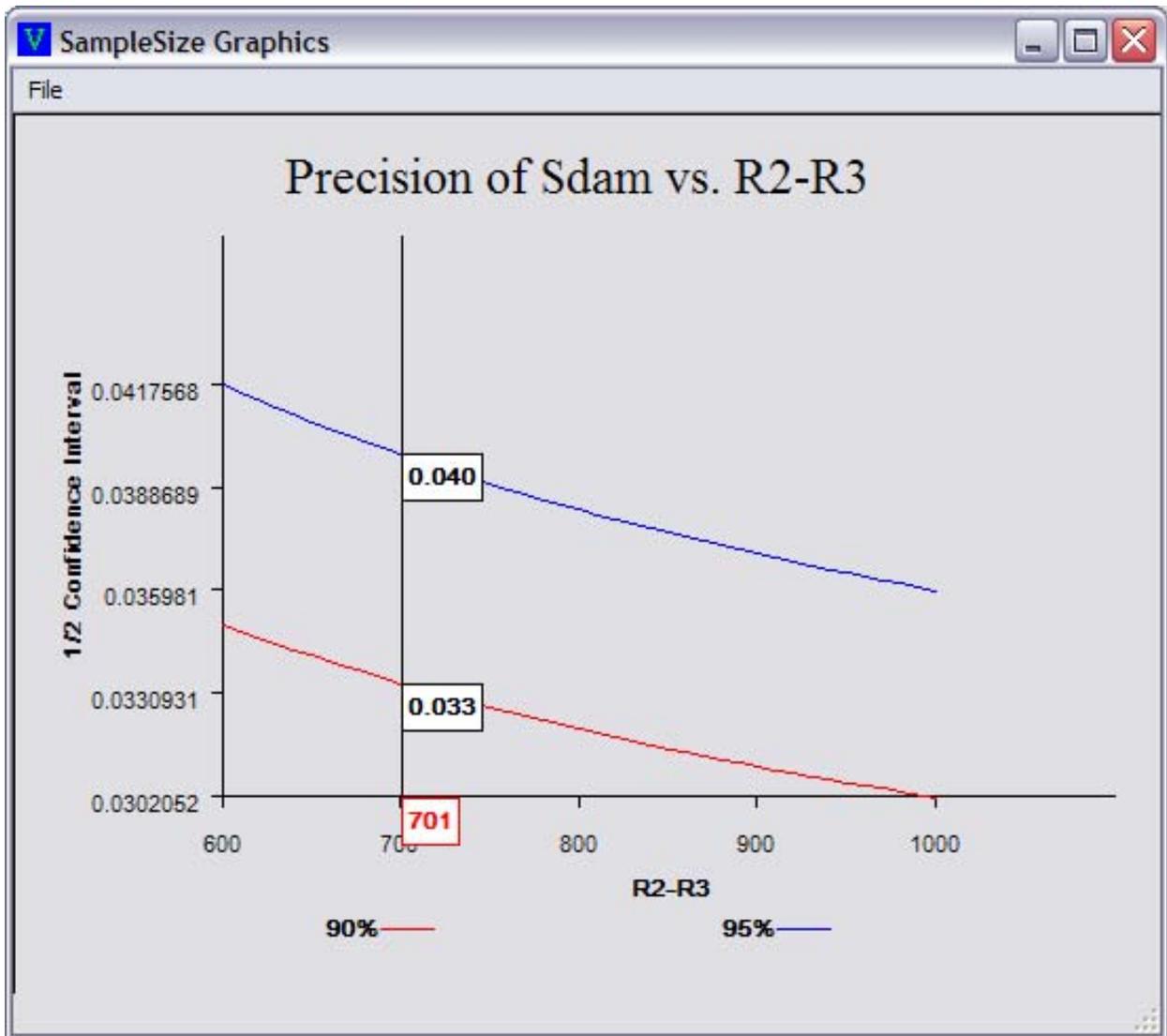
Figure 6. The graph displays confidence intervals at discrete intervals in the defined range. The red line is a ½-width of a 90% confidence interval and the blue line is a ½-width of a 95% confidence interval on the dam survival estimate. Clicking on the graph displays the info bar with specific values for the given release size.