***Weighted Average Computation for this lesson plan:***

Suppose we have the following:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Count of Land** | **Count of Water** | **Total Observations** | **Proportion Estimate** |
| **Grid** | 2 | 4 | 6 | 4/6 |
| **Simulation** | 1 | 2 | 3 | 2/3 |
| **Combined** | 3 | 6 | 9 | 6/9 |

We need to demonstrate how much weight is given to the grid and the simulated data in our combined proportion estimate. In this example:

$$\frac{6}{9}=\frac{4+2}{9}=\frac{6\left(^{4}/\_{6}\right)+3\left(^{2}/\_{3}\right)}{9}$$

$$=\left(\frac{6}{9}\right)\left(^{4}/\_{6}\right)+\left(\frac{3}{9}\right)\left(^{2}/\_{3}\right).$$

This is done all through algebraic manipulation. If you would rather avoid angst over fractional manipulation, then the following generalized formula might be more appealing.

$$Combined Prop. Est. in weighted average format= \left(\frac{Grid Total Obs.}{Combined Total Obs.}\right)\left(Grid Prop. Est.\right)+\left(\frac{Simulation Total Obs.}{ Combined Total Obs.}\right)\left(Simulation Prop. Est.\right)$$

For another example:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Count of Land** | **Count of Water** | **Total Observations** | **Proportion Estimate** |
| **Grid** | 2 | 3 | 5 | 3/5 |
| **Simulation** | 11 | 29 | 40 | 29/40 |
| **Combined** | 13 | 32 | 45 | 32/45 |

With weighted average format for combined proportion estimate as:

$$\left(\frac{5}{45}\right)\left(3/5\right)+\left(\frac{40}{45}\right)\left(^{29}/\_{40}\right)$$

which should become:

$$\left(\frac{5}{45}\right)\left(3/5\right)+\left(\frac{40}{45}\right)\left(^{29}/\_{40}\right)=\frac{5\left(^{3}/\_{5}\right)+40\left(^{29}/\_{40}\right)}{45}=\frac{3+29}{45}=\frac{32}{45}.$$

Take notice that in this example roughly 11.1% of the estimate is because of the grid and roughly 88.9% of the estimate is because of the simulation data.