**Variation in Sagebrush Seed Weights within Populations**

**Home Assignment**

**Introduction**

So far we have explored variation in seed weights among different populations of Big Sagebrush and different subspecies. However, individuals within a population can be quite variable as well. Variation amongst individuals can allow for some to be better adapted to their environment than others - the idea of natural selection (Crispo, 2008). Recall that research has shown that an increase in seed weight can have a positive influence on the emergence and survival of the plant and subsequent generations (Busso & Perryman, 2005). This has led researchers to wonder about this scenario: A bird that inhabits the sagebrush steppe ecosystem prefers to eat larger seeds (the sum of 10 seeds is larger than 1.5 mg) and leaves the smaller seeds alone. If there are many birds around eating the larger seeds, only the smaller seeds remain to germinate, and eventually grow into adult sagebrush plants. Take a look at the seed weight data below and determine which of these populations would be the most successful at surviving hungry birds based on these birds’ feeding preferences.

**Your Task**

Within your group you will explore the seed weight data associated with this scenario. Not only should you identify which population would be the most successful at surviving based on the birds’ feeding preferences, but you and your group members should also discuss why that population will be the most successful. **What is it about the seed weights in a certain population that will allow them to be more successful in survival?** While you will explore this scenario in groups during class, you will need to individually write up responses (that may include a drawing component if that will help you convey the information). To investigate this question, consider the role that sampling location can have on seed weight (Table 1). Then based on your findings, determine a claim supported by the evidence you found in the data. Lastly, provide reasoning for your claim and evaluate your claim.

**Data**

See Table 1 for pertinent information regarding the guiding question such as sampling location, subspecies, climate information, and the weights of 10 seeds for each individual plant. Also, see this [link](https://www.google.com/maps/d/edit?mid=1Jbd0Un-q3-r2v7its-uXYWv_Wn8phwdj&usp=sharing) for a map of the sampling locations.

*Table 1: Seed weights of individual Big Sagebrush (subspecies tridentata) in three different sampling locations.*

| **State** | **Sampling Location** | **Annual Precipitation (mm)** | **Elevation (m)** | **Min Temp**  **(°C)** | **Max Temp**  **(°C)** | **Individual** | **Weight of 10 Seeds (mg)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Oregon | Crooked River | 291 | 1053 | -6.7 | 30.4 | 1 | 1.971 |
| 2 | 1.752 |
| 3 | 1.653 |
| 4 | 2.18 |
| 5 | 1.961 |
| 6 | 2.137 |
| 7 | 1.707 |
| 8 | 2.04 |
| 9 | 1.636 |
| 10 | 2.199 |
| British Columbia | Station | 334 | 347 | -5.0 | 27.7 | 11 | 3.545 |
| 12 | 3.163 |
| 13 | 3.258 |
| 14 | 2.79 |
| 15 | 2.497 |
| 16 | 2.331 |
| 17 | 3.681 |
| 18 | 2.47 |
| 19 | 2.51 |
| Idaho | Gibson Jack | 320 | 1388 | -9.5 | 31.3 | 20 | 0.973 |
| 21 | 2.949 |
| 22 | 0.929 |
| 23 | 1.546 |
| 24 | 2.732 |
| 25 | 4.168 |
| 26 | 0.952 |
| 27 | 2.658 |
| 28 | 2.905 |

**Develop Your Argument**

Similar to your first investigation with your group in class, to explore this question further you also will be developing your own claim to answer the question *What is the importance of variation in individual seed weights within Big Sagebrush (Artemisia tridentata subsp. tridentata) populations?* In your written response you want to make sure to include:

1. The **claim** you want to make about which population(s) is most likely to survive and the variation in the seed weights within these populations.
2. How you **used the data** collected to make your claim. This is the scientific evidence to support the validity of your claim. This could be in the form of a drawing (flowchart, cartoon, sketch, graph, etc) or writing component. Whichever helps you show how you used the data to make your claim about which population will survive and why.
3. A **justification** to convince someone outside of this class that the data collected was biologically meaningful to answer the research question AND the **reasons why** (given what we know about the biology of sagebrush) your claim about variation in seed weights ***within populations of Sagebrush*** is valid based on the evidence. This is important biological reasoning to support the validity of your claim.

Some other questions you may consider commenting on when writing your justification for your claim may be questions such as:

* Why would there be variation within a population of Sagebrush? What are the benefits or disadvantages of a more diverse population? A more similar population?
* Which populations were more variable than others? Why do you think that may be?
* Based on your idea for which population may be most likely to survive, what are some potential long term effects of the bird’s feeding preferences?

**References**

Busso, C. A., & Perryman, B. L. (2005). Seed weight variation of Wyoming sagebrush in Northern Nevada. *Biocell,* 29(3), 279-285.

Crispo, E. (2008). Modifying effects of phenotypic plasticity on interactions among natural selection, adaptation and gene flow. *Journal of evolutionary biology*, *21*(6), 1460-1469.