## Range of Tolerance

## **Graphing Activity**

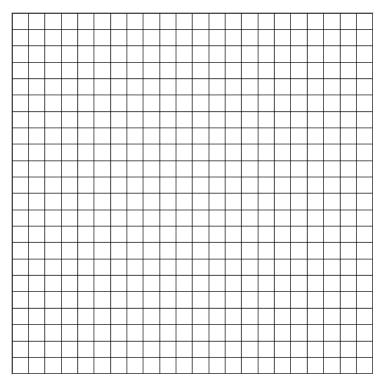
Name:	Date:	Hour:

Steelhead trout, otherwise known as rainbow trout, have seen a population decline in the Western United States over the last decades. There are a wide variety of conditions that are threatening the population, including pollution, climate change, and invasive species. This activity will look at the effects of varying two specific abiotic factors on a controlled population of trout.

Graph the range of tolerance data below for steelhead trout. Water temperature is the independent variable for graph 1 and dissolved oxygen is the independent variable for graph 2, these should be graphed on the x-axis. The number of fish, the dependent variable, should be graphed on the y-axis.

Water	Number	
Temp	of	
(°C)	Fish	
0	0	
1	1	
1 2 3	1 2 5 7	
3	5	
4	7	
5	10	
6 7	15	
7	21	
8	24	
9	20	
10	17	
11	14	
12	12	
13	10	
14	8	
15	5	
16	5 3 2	
17		
18	1	
19	1	
20	0	

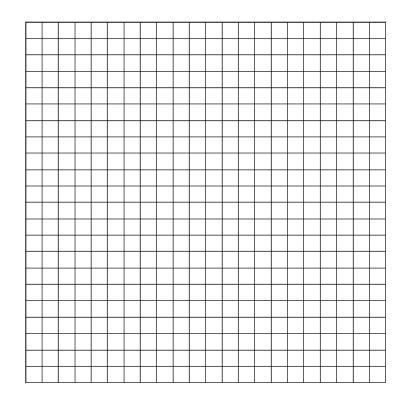




- 1. Label the **optimal range** on the graph. This is the amount of an abiotic factor that produces the highest possible population. For water temperature, this would be about 6-10°C.
- 2. Label the **zone of physiological stress** on the graph. This occurs when an abiotic factor exists at levels that are too high or low to support normal biotic potential. This would be 3-5°C and 11-16°C.
- 3. Label the **zone of intolerance** on the graph. This occurs when a population is absent (or in this case, nearly absent). This occurs at either extreme of our water temperature graph, below 3°C and above 16°C.

Dissolved	Number	
Oxygen	of	
(mg/L)	Fish	
0	0	
1 2 3	0	
2	2	
3	2 3 3 5	
4 5	3	
5		
6	8	
7	11	
8	15	
9	18	
10	22	
11	24	
12	23	
13	20	
14	18	
15	15	
16	12	
17	10	
18	6	
19	3	
20	1	
21	0	

Graph 2



- 1. Label the optimal range, zone of physiological stress, and zone of intolerance on graph 2.
- 2. Biological indicator species are those whose overall health and population numbers can offer a signal of the overall health of an ecosystem. Explain why fish, especially steelhead trout, would be an effective indicator species.