**Survival is Just a Roll of the Dice**

It is twenty years in the future…

You and your colleagues have just discovered a pack of gray wolves-wolves that were believed to be extinct!

In the late 1990’s, gray wolves were on the endangered species list. Great efforts were made to protect gray wolves: they were moved to areas where they were protected and hunters who shot wolves were heavily fined. Ranchers were compensated for livestock that wolves killed.

As the gray wolf population grew, the wolves were removed from the endangered species list. Biologist continued to monitor the populations by tracking some wolves with radio transmitter collars. However, without the protection of the Endangered Species Act, the wolves faced too many challenges and died out.

Or did they? Your team has just spotted a pack of gray wolves! Back at camp, you develop a model of this wolf pack’s population and use it to determine what must be done to make sure this pack survives.

**Objective**

Model the changing population of a wolf pack. The team with the largest pack at the end of 15 years wins.

**A Game Called Life**

1. Place eight beans on the table. Two beans represent adult wolves, and the other six represent a litter of pups.
2. Roll the dice to represent the passage of 6 months. Count the dice, and read what happens to your pack on the Game 1 table. Fill in the Record-Keeping Table. Adjust the number of beans accordingly
3. Repeat step 2 for the second 6 months. Count the number of wolves you have in your pack. And fill in the rest of year 1 on the table.
4. **Reproduction**: After year 1, add six pups at the beginning of year unless a food shortage occurred the previous year. Adjust the number of beans accordingly.
5. **Maturation**: When the pack gets too large, the mature pups leave. Subtract six wolves if your pack has more than nine wolves. Adjust the number of beans accordingly, and record the pack total in the last column of the table.
6. **Repeat steps 2-5** until you complete 15 years of play or until your pack dies out, whichever comes first.
7. Play this game again, only this time use the Game 2 table below. Record your answers on the table provided.

**Analyze the Results**

Answer the following questions. Total: 8pts

1. Did any team’s pack die in either of the games? How? 1pt
2. Considering what you learned in the game, could wolves overpopulate without human interference? Explain. 2pts
3. How could the disappearance of wolves from their ecosystem affect the population of other species? Give 2 examples. 2pts
4. Do you feel this game accurately modeled the changing population of a wolf pack? Explain your answers. 2pts
5. What could be done to improve the potential survival of your pack? Be specific. 1pt

**What Will Happen?**

**Game 1: With Human Interference**

|  |  |  |
| --- | --- | --- |
| If you roll: | You: | Reason: |
| Double 2s, 3s, 4s, 5s | subtract 3 | high pup mortality rate; three pups die |
| 2 | divide by 2 (round down) | disease kills half the pack |
| 3 | subtract 1 | one pup dies |
| 4 (1+3) | subtract 1 | one wolf dies of natural causes |
| 5 | subtract 2 | hunter kills two wolves |
| 6 (2+4 or 1+5) | make no changes | pack lives well for 6 months |
| 7 | make no changes | pack lives well for 6 months |
| 8 (2+6 or 3+5) | subtract 1 | food shortage occurs, one wolf dies |
| 9 | subtract 2 | rancher kills two wolves |
| 10 (4+6) | subtract 1 | wolf hit by car |
| 11 | subtract 1 | wolf killed in an attack by another wolf pack |
| 12 | add 1 | new wolf joins pack |

**Game 2: Without Human Interference**

|  |  |  |
| --- | --- | --- |
| If you roll: | You: | Reason: |
| Double 2s, 3s, 4s, 5s | subtract 3 | high pup mortality rate; three pups die |
| 2 | divide by 2 (round down) | disease kills half the pack |
| 3 | subtract 1 | food shortage occurs |
| 4 (1+3) | subtract 1 | one wolf dies of natural causes |
| 5 | subtract 1 | wolf killed in an attack by another wolf pack |
| 6 (2+4 or 1+5) | make no changes | pack lives well for 6 months |
| 7 | make no changes | pack lives well for 6 months |
| 8 (2+6 or 3+5) | subtract 1 | one pup dies |
| 9 | make no changes | pack lives well for 6 months |
| 10 (4+6) | subtract 1 | wolf killed in an attack by another wolf pack |
| 11 | make no changes | pack lives well for 6 months |
| 12 | add 1 | new wolf joins pack |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Last Year’s Total | Add a litter (+6) | First 6 months | | Second 6 months | | Pack Subtotal | Subtract matured pups? | Total pack for year |
| Reason | Effects on Pack | Reason | Effects on Pack |
| 1 | 2 | +6 |  |  |  |  |  | No |  |
| 2 |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |

**Game 1: With Human Interference**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Last Year’s Total | Add a litter (+6) | First 6 months | | Second 6 months | | Pack Subtotal | Subtract matured pups? | Total pack for year |
| Reason | Effects on Pack | Reason | Effects on Pack |
| 1 | 2 | +6 |  |  |  |  |  | No |  |
| 2 |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |

**Game 2: Without Human Interference**