**Part I: Control an Epidemic**

Welcome to the United Snakes of America! Unfortunately, we’re having a devastating (and imaginary) mass snake mortality event in Florida. As you’ll soon see, your goal is to investigate and control this disaster. But fortunately, your evaluation on this assignment won’t depend on whether you fail or succeed to control the epidemic. Instead, you will be evaluated on your ability to apply what you’ve learned to analyze this situation, recommend reasonable solutions based on what you learn about this situation, and evaluate how your proposed solutions affect the situation. Throughout this activity, you’ll get to practice two new management skills: **Balancing and Justifying Your Budget** and **Adaptive Management.**

**Balancing and Justifying Your Budget:**

Nearly every action that your team takes will have a price tag. At the start of the activity, your team is given $500,000. As you spend this money on actions, you must keep track of your budget. If you spend your whole budget, you will not be able to do any more actions unless you acquire more funding. Later, I’m going to ask you to justify how you spent this budget, because it’s important that scientists/managers use taxpayer money in cost-effective ways. In the spreadsheet below, you can keep track of how your budget changes each time you perform an action (each time you click to a new page on the website). You can also keep track of what time step you are on in the model and your charisma points (i.e., your public/political/scientific trust and support). I’ve filled in the first row for you to indicate what you’re starting with.

**Adaptive Management:**

Managers often need to make decisions with limited information. Doing nothing is a management action; sometimes doing nothing is a good idea, and sometimes it is catastrophic. To balance costs, risks, and outcomes, managers often need to perform an action (or no action) that they think will be successful based on available evidence, and then evaluate what happens to see if it worked. If it doesn’t work, they adapt, and try something different. In this activity, you’ll need to use adaptive management to control a disease outbreak. To monitor the consequences of each action and adapt your approach accordingly, **take notes on the outcomes of each decision —how do outbreak dynamics change? Was the action effective or not?** (There is space to write what intervention/decision you did in the Action column, so don’t just repeat that in the outcome column.)

Ready to start? First, you need to download NetLogo (<https://ccl.northwestern.edu/netlogo/>). After opening NetLogo, you can click File -> and load the Snake Outbreak Model.nlogo file. Then click File -> Import -> Import patch colors, and load the ModelBackground.png file. Check that “see-all-snakes” is set to “off”. Then, when you’re ready to begin, click “Setup” a single time. You should see a bunch of red and black dots appear in Florida, representing reports of sick and dead snakes. Go to the website (<https://srhopkin.wixsite.com/unitedsnakes>) to start controlling this disaster! All the instructions you will need from here will be on the website, but don’t forget to keep track of your time (number of weeks, also known as “ticks” in the model), budget, and charisma in the table below. **Note: the model is computationally large, so each time you click Advance One Week, it will take a moment for the model to advance.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | Action | Outcomes | Time | Budget | Charisma |
| 0 | START | -- | 3 | $500,000 | 7 |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  |  |  |
| 6 |  |  |  |  |  |
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| 9 |  |  |  |  |  |
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| 12 |  |  |  |  |  |
| 13 |  |  |  |  |  |
| 14 |  |  |  |  |  |
| 15 |  |  |  |  |  |
| 16 |  |  |  |  |  |
| 17 |  |  |  |  |  |
| 18 |  |  |  |  |  |

When you’ve run out of charisma or reached 200 weeks (which are tracked by time steps or “ticks” in the model), take a screen shot of your graphs and map and paste it into this document. Your team is informed that it is the most dreaded time for any researcher or manager: it is time to submit a project report. Answer the questions below to report what you have accomplished so far and what plans you will make for the future.

[Paste your screenshot here]

1. **What scientific information did your team collect and how did this advance our knowledge of this system?**
2. **How did your actions affect this outbreak? Which actions had the biggest impacts?**
3. **If this team continues to lead the control effort for this disease for the next 5-10 years, what research and management activities would you prioritize?**

**Part II: Learn from Your Mistakes**

1. **Controlling wildlife disease epidemics is *hard*. In fact, we’ve never eradicated a wildlife disease! So don’t feel bad if your team didn’t eliminate the pathogen from Florida or the United States. If we cannot achieve elimination, what are some useful conservation goals that we can try to achieve instead? If your team adopted some of the goals, how would you evaluate your success?**
2. **Did you make any decisions during this outbreak that you wish you could have changed because they did not go well? If so, describe those decisions and the decisions you wish you would have made instead.**
3. **Was there any research that you wanted to do or interventions that you wanted to try, but you couldn’t because you didn’t have enough resources or I didn’t give you the option to try them? If so, what were they and why do you think they would be effective?**
4. **In NetLogo, you can start over by clicking “Setup”. You can run through the simulation continuously, instead of one week/tick at a time, by clicking “Run Full Simulation”, and you can increase the simulation speed in the top panel of the app. Play around with the model and different intervention combinations. Can you completely eliminate the outbreak? What interventions have the biggest impacts?**