First Detector Game-Outdoors (20-30 minutes)

Students play a freeze tag-style game to experience the positive impacts first detectors and Early Detection Rapid Response (EDRR) have on combatting the spread of invasive species. There are four different rounds, each representing a different invasive species scenario. At the beginning of each round, students must make a hypothesis of how they expect that round will turn out. At the end of each round, students will briefly discuss if their hypothesis was supported and what factors affected the outcome.

Supplies

- Strips of blue cloth or other marker (to indicate Native Species)
- Strips of yellow cloth or other marker (to indicate First Detector)
- A large, flat playing field
- Cones or markers for boundaries of the playing field
- Timer
- First Detector Game Datasheet (1 per class or 1 per student)
- Writing utensil(s)

Roles

At the start of each round, assign students to be Native Species, Invasive Species, or First Detectors and explain what each role can do.

- **Native Species**: These students need to avoid the Invasive Species. If they are tagged, they need to freeze and slowly count out loud to 10. If a First Detector does not unfreeze them in 10 seconds, they then remove their Native Species arm bands and become Invasive Species and start tagging the remaining Native Species. Students must count even in rounds where there are no First Detectors; they may be saved by the time for that round running out.
    - Give these students a blue strip of cloth or other unique identifier.
- **Invasive Species**: These students tag the Native Species players to create as many invasive species as possible, mimicking the spread of invasive species in the wild.
- **First Detector:** The First Detector needs to unfreeze Native Species. When they do this, it represents how real-life First Detectors counteract the negative impacts and spread of Invasive Species.
    - Give these students a yellow strip of cloth or other unique identifier.

Set-Up

Delineate a playing field. Students may not push and they may not block. Assign roles and hand out appropriate cloth strips or other unique identifier.

Procedure

Explain to your students that this game is a way for them to model how different variables impact the effect of invasive species on native species. A model is a way for us to answer questions about things that would be difficult to observe naturally. For example, it would take too long for us to observe the impacts of invasive species on native species in real time. A model allows us to predict how the scenario would play out in a much faster fashion.

Models are made up of different variables, which are factors that you can measure and change. Scientists change variables to see if and how that changes the outcome of their models. In this game, we will change one variable each round. Ask your students why we only change one variable each time (A: you only want to change one variable each time you run a model, otherwise you won't be able to determine which variable caused your outcome).

At the beginning of each round, explain the scenario to your students and have them hypothesize the outcome of that round. Record the round parameters (time, number of Invasive Species, number of Native Species, etc.) and the class hypothesis on the provided datasheet.

At the end of each round, count the remaining number of Native Species and record it on the datasheet. Compare the results of each round to Round 1 to see how the different variables change the impacts of the Invasive Species.

The datasheet is set up for students to calculate the percentage of Native Species remaining at the end of each round. Since you will be changing the number of Native Species you start with between rounds, comparing the percentage of Native Species remaining at the end of each round is more accurate than comparing the number of remaining Native Species. If there is no time to do this calculation, you can compare the remaining number of Native Species at the end of each round for a rough comparison. If your students need help calculating percentage, you can write out this equation for them:

$$\textbf{Percentage } (\%) \textbf{ of Native Species Remaining at End of the Round} = \frac{\textbf{Number of Native Species at the End of the Round}}{\textbf{Number of Native Species at the Start of the Round}} \times 100$$

Round 1: Long Exposure to Invasive Species, No First Detector

Round 1 illustrates the baseline impacts on invasive species on native species when there is no intervention.

- Hypothesize: What do you predict will happen to the Native Species when the Invasive Species go undetected and no one acts to stop them?

  Expected outcome: If nobody takes action to stop the Invasive Species, then most, if not all, of the Native Species will be impacted by Invasive Species.

- Assign roles
  - Invasive Species: 2-3 students
  - First Detectors: 0 students
  - Native Species: Remaining students
- Time this round for **30 seconds**
- Count and record the number of remaining Native Species players.
- Review:
  - *Was your hypothesis supported?*
  - *What are some things that could have slowed down the spread of the Invasive Species? (Ex: Removed/reduced the number of Invasive Species; Given them less time to spread; Introduced some competition)*

Round 2: Short Exposure to Invasive Species, No First Detector

Round 2 illustrates how reducing the amount of time invasive species have to spread changes their impact on native species. We can reduce the amount of time an invasive species has to spread by detecting them early and rapidly responding to an invasive species report.

- Hypothesize: What do you predict will happen to the Native Species when the amount of time the Invasive Species have to spread is decreased?

  Expected outcome: If the Invasive Species have less time to spread, then fewer Native Species will be affected by the Invasive Species.

- Assign roles
  - Invasive Species: 2-3 students (same number as Round 1, for accurate comparison)
  - First Detectors: 0 students
  - Native Species: Remaining students
- Time this round for **15 seconds**
- Count and record the number of remaining Native Species players.
- Review:
  - *Was your hypothesis supported?*
  - *Compared to Round 1, how did having less time change the impact of the Invasive Species?*

Round 3: More Invasive Species, No First Detector

Round 3 illustrates how having a larger number of invasive species impacts native species. For example, when invasive species go undetected and have a chance to breed, their numbers quickly increase as do their negative impacts on native species!

- Hypothesize: What do you predict will happen to the Native Species when there are more Invasive Species to start with?

  Expected outcome: If there are more Invasive Species to start with, then most, if not all, of the Native Species will be affected by the Invasive Species.

- Assign roles
    - Invasive Species: 4-6 students (double whatever you had in Round 1, for accurate comparison)
    - First Detectors: 0 students
    - Native Species: Remaining students
- Time this round for **30 seconds**
- Count and record the number of remaining Native Species players.
- Review:
    - *Was your hypothesis supported?*
    - *Compared to Round 1, how did starting with more Invasive Species impact the Native Species?*
    - *If Round 1 and Round 3 both ended with no remaining Native Species, did this outcome occur more quickly in one of the rounds?*

Round 4: First Detector!

Round 4 illustrates how adding first detectors impacts the effects of invasive species on native species. By reporting invasive species early, we can counteract their negative impacts.

- Hypothesize: What do you predict will happen to the number of Native Species if there are First Detectors counteracting the Invasive Species?

  Expected outcome: If there are First Detectors working against the Invasive Species, then few, if any, of the Native Species will be turned into Invasive Species.

- Assign roles
    - Invasive Species: 2-3 (same number as Round 1, for accurate comparison)
    - First Detectors: 2
    - Native Species: Remaining students
- Time this round for **30 seconds**
- Count and record the number of remaining Native Species players.
- Review:
    - *Was your hypothesis supported?*
    - *Compared to Round 1, how did adding First Detectors change the impact of the Invasive Species?*
    - *In which round were the Invasive Species most successful (i.e. when did we see the greatest increase in invasive species)?*
    - *In which round were the Invasive Species least successful (i.e. when did we see the lowest decrease in native species)?*
    - *Do you think First Detectors make a difference on the impact of invasive species in real life? (YES!)*
    - *If we were to play this game again, what models would you want to run to learn more about the real-life relationship between native species, invasive species, and first detectors (e.g. what questions would you like to answer)? What variables in our model would we need to change or add to test your question?*

Optional extension: Have students track the data collected during each round and then practice graphing the results for work with collecting and organizing data.

Stewardship game adapted from Oregon Sea Grant's "Menace to the West" curriculum:
https://seagrant.oregonstate.edu/sites/seagrant.oregonstate.edu/files/invasive-species/toolkit/lp-t-stewardship-tag-game_0.pdf