# Other suggested disturbances that instructors can have students model

**Note:**

* The instructor should consider allowing students to explore the impacts of any of these suggested disturbances on any of the provided ecosystems (or others), but clearly state the objectives of the activity. For example, a maintenance fire disturbance would ecologically be more appropriate for a fire-dependent system like a northern pine oak system. However, fires occur in nearly all ecosystems these days, so it totally makes sense to have students subject say a sugar-maple basswood ecosystem to a fire and see what it does.
* The disturbance given here, and their instructions are for use with the Dry-Mesic Oak library (ecosystem), but instructors should feel free to use this same disturbance with the other two libraries provided (the Northern Pine-Oak ecosystem and the Sugra Maple-Basswood Ecosystem)

## **Disturbance 1: A fungal disease that kills several individual trees every 3 years**

* Remember, making a new scenario (new disturbance) involves making a copy of the original scenario ([2]Reference condition models”) onto the project (“Definitions” ). Right click the “[2]Reference condition models” , click copy, then right click “Definitions”, click paste, then rename your new scenario appropriately (e.g., fungal disease). **Do not copy one scenario and paste it onto another scenario** (e.g., do not copy the insect invasion scenario and paste it onto the fungal disease scenario). Follow this procedure each time you are trying to create a new scenario (new disturbance). It is also a good idea to delete the scenario each time you are done with it, to avoid accumulating scenarios in your workspace, that can cause confusion.
* The disturbance is a fungal disease infestation.
* The return interval is given as 3 yrs. Use this to calculate the probability that you will put in the probabilistic transitions table when customizing the characteristics of your disturbance.
* You want the impact of this disease to move succession from Late 2 CLS to Early 1 All.
* For the disturbance type, use “Insect and disease”
* For the Reset age column, select Yes
* The graph you produce should then have 2 bars for each succession class: one for the original (blue), one for the impact of the fungal disease (red)
* **Assignment # 4:** copy and paste the bar graph for the fungal disease disturbance to your word document and caption it Figure 4. Fungal disease (2 pts)

**Examples of questions for students to respond to**

* 1. Your disturbance was intended to move the ecosystem from late 2 CLS to Early 1 All. Besides Early 1 All, which two other successional stages showed an increase in proportion (2 pts)
  2. Looking at your response for question 1, as well as thinking about what this disturbance is doing to the successional stage that you applied it to (late 2 CLS), why do you think the two stages in question 2 above increased in proportion (2 pts)
  3. If you were a manager of this ecosystem that is now been impacted by this fungal disease and you are now able to see the result of this impact (in your graph), would you say that this disease impacted your ecosystem in a significant negative way or was the impact mild? Explain your reasoning (2 pts)

## **Disturbance 2: An insect invasion that kills several trees every 10 years**

* The disturbance is an insect invasion.
* The return interval is given as 10 yrs. Use this to calculate the probability that you will put in the probabilistic transitions table when customizing the characteristics of your disturbance.
* You want the impact of this disease to move succession from Late 2 CLS to Mid 1 OPN.
* For the disturbance type, use “Insect and disease”
* For the Reset age column, select Yes
* The graph you produce should then have 2 bars for each succession class: one for the original (blue), one for the impact of the insect invasion (red)
* **Assignment # 5:** copy and paste the bar graph for the insect invasion disturbance to your word document and caption it Figure 5. Insect invasion (2 pts)

**Examples of questions for students to respond to**

* 1. Your disturbance was intended to move the ecosystem from Late 2 CLS to Mid 1 OPN. If run successfully, your graph should show some increase in the Mid 1 OPN stage. Given what you know about insect invasions in forests, and the successional dynamics following a disturbance, explain what the insect invasion did that caused the increase in Mid 1 OPN (2 pts)
  2. Ecologically, we should expect the Late 2 CLS stage to be impacted too. Did this stage increase or decrease? How can you explain that observation (2 pts)
  3. If you were a manager of this ecosystem that is now been impacted by this invasion and you are now able to see the result of this impact (in your graph), would you say that this invasion impacted your ecosystem in a significant negative way or was the impact pretty mild? Explain your reasoning (2 pts)

## **Disturbance 3: A mixed severity surface fire that returns every 10 years**

* The disturbance is a surface fire of mixed severity.
* The return interval is given as 10 yrs. Use this to calculate the probability that you will put in the probabilistic transitions table when customizing the characteristics of your disturbance.
* You want the impact of this disease to move succession from Mid 2 OPN to Early 1 All.
* For the disturbance type, use “Mixed fire”
* For the Reset age column, select Yes
* The graph you produce should then have 2 bars for each succession class: one for the original (blue), one for the impact of the surface fire (red)
* **Assignment # 6:** copy and paste the bar graph for the surface fire disturbance to your word document and caption it Figure 6. Surface fire (2 pts)

**Examples of questions for students to respond to**

1. Your disturbance was intended to move the ecosystem from Mid 2 OPN to Early 1 All. If run successfully, your graph should show some increase in the Early 1 stage. Given what you know about the type of fire you implemented, and the successional dynamics following a disturbance, explain what the fire is doing that causes the increase in Early 1 All (2 pts)
2. Ecologically, we should expect the Early 1 All stage to be impacted too. Did this stage increase or decrease? How can you explain that observation (2 pts)
3. If you were a manager of this ecosystem that is now been impacted by this fire and you are now able to see the result of this impact (in your graph), would you say that this fire impacted your ecosystem in a significant way or was the impact pretty mild? Explain your reasoning (2 pts)

## **Disturbance 4: A high severity fire that returns every 10 years**

* The disturbance is a high severity fire.
* The return interval is given as 10 yrs. Use this to calculate the probability that you will put in the probabilistic transitions table when customizing the characteristics of your disturbance.
* You want the impact of this disease to move succession from Late 2 CLS to Early 1 All.
* For the disturbance type, use “Option 1” **Do not use the “Replacement fire” option** because severe fires do not always have the same impact as replacement fires.
* For the Reset age column, select Yes
* The graph you produce should then have 2 bars for each succession class: one for the original (blue), one for the impact of the high severity fire (red)
* **Assignment # 7:** copy and paste the bar graph for the high severity fire disturbance to your word document and caption it Figure 7. High severity fire (2 pts)

**Examples of questions for students to respond to**

1. Your disturbance was intended to move the ecosystem from late 2 CLS to Early 1 All. Besides Early 1 All, which two other successional stages showed an increase in proportion (2 pts)
2. Looking at your response for question 1, as well as thinking about what this disturbance is doing to the successional stage that you applied it to (late 2 cls), why do you think the two stages in question 2 above increased in proportion (2 pts).
3. If you were a manager of this ecosystem that is now been impacted by this fire and you are now able to see the result of this impact (in your graph), would you say that this fire impacted your ecosystem in a significant way or was the impact pretty mild? Explain your reasoning (2 pts)

## **Disturbance 5: A disturbance of your choice**

* Decide on what disturbance you want to subject your system to.
* Decide on the return interval for this disturbance. Use this to calculate the probability that you will put in the probabilistic transitions table when customizing the characteristics of your disturbance.
* Decide on the successional stage you want to move the system from and the one you want to move it to.
* For the disturbance type, select one of the choices in there that closely describes your disturbance. If there is nothing in the list that is close to your disturbance, select “Option 1” for this column
* For the Reset age column, decide whether to select Yes or No
* The graph you produce should then have 2 bars for each succession class: one for the original (blue), one for the impact of this disturbance (red)
* **Assignment # 8:** copy and paste the bar graph for this disturbance to your word document and caption it Figure 8. My disturbance (2 pts)

**Examples of questions for students to respond to**

1. What was your disturbance? (1 pt).
2. What successional stage did you move your system from, AND which one did you move it to? (1 pt).
3. What was your return interval? (1 pt).
4. In which successional stages did you notice the biggest change? (1 pt)
5. Can you explain what your disturbance might have done to bring about the change in the stage you indicated in 4 above (2 pts).