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Model Projections

Names: _____

USDA Forest Service *Climate Change Tree and Bird Atlases* modeling and the Michigan Natural Features Inventory:

Online instructions and questions

The United States Department of Agriculture Forest Service created *Climate Change Tree and Bird Atlases* for 134 tree species and 147 bird species. For each atlas, each species was modeled individually to show current and potential future distributions according to two emissions scenarios, high and low using an average of future climate from three models. The three models used were the Parallel Climate Model (PCM), the Hadley CM3 model (Hadley), and the Geophysical Fluid Dynamics Laboratory (GFDL) model. These models combine atmospheric, ocean, sea-ice, and land-surface information to represent historical climate variability and to estimate projected long-term increases in global temperatures due to human-induced emissions. Tree data were obtained from more than 100,000 plots (from the USDA Forest Service's Forest Inventory and Analysis (FIA) Programs) for the eastern U.S. The plots represent data for nearly 3 million trees. Source: USDA

1. Go to the USDA Forest service climate change tree and bird atlas website at: <http://www.nrs.fs.fed.us/atlas/index.html>
 - Under the *Atlas Tutorial Videos* section on the right side of the page, click on "An Introduction to the *Climate Change Atlas: How does it work?*" video to learn about how the atlases were created and what they can tell you about the modeled distribution of many tree and bird species in the Eastern United States.
2. Are the models able to predict suitable habitat for the year 2100? _____
3. Are the models able to predict where the species will be in 2100? _____
4. Under *Browse the Atlases*, click on the *Tree Atlas*.
 - Under the *134 Species Combined/ Compared* section, click on the *Summary of Predictors*.
 - Under the *Predictor Values* section, click on the *Maps of Actual Predictors* used in the model.
5. What range of mean annual temperature conditions will your local community likely experience by 2100 according to the average of the three climate models high emissions scenario (Avg. of 3- high)? _____ What about under the average of three climate models low emissions scenario (Avg. of 3- low)? _____ (Hint: click on the *Climate Scenario Menu* button and select either *Avg. of 3- high* or *Avg. of 3- low*).



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6. How do the models compare with the current mean annual temperatures for your hometown?

7. What other predictors may influence outcomes of tree species models?

(Hint: look at the variables listed across the top of the maps (*climate, soil properties, soil type, elevation, and landscape*) and click on each/ some of them to find more information about each.)

8. To learn about the definitions of these predictors, click on the green circle with a white question mark in it above the predictors. A small new window will pop up. Within the window, click on "*predictors_help.html*" and write down the definitions of one of the predictors that you had listed in question seven.

Predictor: _____

Definition: _____

9. Close the pop up window of definitions, and under the main menu bar, where it says, *you are here*, click on *Tree Atlas*. This will bring up a list of 134 tree species.

10. You will be collecting information about three tree species.

- Select one tree species from this list of common Michigan trees: *white spruce, red maple, Jack pine, eastern white pine, northern white cedar*.
- On the table on the next page, write down the name of the tree and the reliability of the model (the circle color next to the tree: green = high, yellow = medium, and red = low)
- To learn more about the tree species, under *External Species Links*, click on *photos of the tree in the USDA Plants Database*. Write one interesting fact about your tree.
- Then, under *Modelled Future Habitats*, click on *Abundance Change Maps*.
- For the left map, select *Current FIA* from the *Climate Scenario Menu*. FIA stands for the USDA Forest Service's Forest Inventory and Analysis. (This option may already be selected as it is the initial default selection.)
- In the table, write down the abundance of the tree species for your local community (The abundance is shown by the colors on the map)
- For the right map, select *Avg. of 3- high* from the *Climate Scenario Menu*, and fill in the table below for that tree species.
- Then, for the right map, select *Avg. of 3- low* from the *Climate Scenario Menu*, and fill in the table below for that tree species.
- Repeat these steps for two other tree species from the list.



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Tree/ Reliability	Interesting Fact	Current abundance	Avg. of 3 High abundance	Avg. of 3 Low abundance
<i>Example: Sassafras Good</i>	<i>Mature tree height is 75 feet</i>	4-6	1-3	1-3

11. Is the distribution and abundance of the tree species you selected projected to change in the future?
If yes, how so?

12. How will changes in tree distribution and abundance affect the animal species within the impacted ecosystems?



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Land Use <http://mnfi.anr.msu.edu/>

13. Go to the Michigan Natural Features Inventory at <http://web4.msue.msu.edu/mnfi/>. At this website, you will be able to look at changes within each of the Michigan counties for type of land use and ecosystem type.
- Once at the website, from the top menu bar, click on *Data Resources*.
 - Then click on *Land Cover Change 1800- 1978*, and select your county.
 - Using the key at the bottom of the map, look at what parts of the county have remained changed or unchanged.

14. How do you think the land use changes have affected the distribution of tree species you looked at in the climate change tree atlas?

15. If more of the land in your county was changed to urban or agricultural land to serve the growing population on the planet, how do you think the tree species you studied would respond?

16. Will tree distribution change only as a result of climate change, explain.
