LESSON PLAN: Interactive Model of Leaf Decomposition
Part Four: **Interactive Leaf Decomposition Activity http://imold.utoledo.edu/model.html**

Models are great to use to make a concept easier to understand, to visualize a process or outcome, and also to allow a scientist to test selected variables. IMOLD is a great model of leaf decomposition, because it allows the students to interact with two variables affecting decomposition rates, and test those variables in many more ways than they could at their own local research site. The fact that IMOLD uses real data collected over many years to populate the data points of the graphing activity highlights the fact that data collected for one experiment has uses to other groups in different ways. It is important that students design and carry out their own hands-on experiments with litter decomposition, but this model will help them understand the concepts behind decomposition better, and also give them ideas for multiple questions they can pursue on their own.

Plant litter decomposes at different rates depending upon many factors. Two such variables are the chemical composition of the litter itself, and the type of climate it is in. IMOLD applies knowledge learned in three animations and then allows the student to test the decomposition rates of various litter types with different chemical compositions in different environments, or test rates of decomposition of different litter types in one environment.

In this model, students can decide upon a question to investigate, choose the variables they are testing, and learn very directly how chemical composition of the litter and climate can affect decomposition rates. They can also choose to look at the effects of soil temperature and soil moisture on the decomposition rates. Finally, students can choose among 25 different types of vegetation, and seven different ecosystems. In the process, they will be learning about different climate regions in the US, and also about the representative plant species from these ecosystems.

The chemical compositions of the leaf litters in this model come from the NSF-sponsored program called LIDET (Long-Term Inter-site Decomposition Experiment Team) of the Oregon State University and the Andrews Forest LTER (Long Term Ecological Research) Site. http://andrewsforest.oregonstate.edu/research/intersite/lidet.htm The LIDET project itself is worthy of study; a painstaking, 10 year, 28 site experiment to gather data about factors affecting long term decomposition and nitrogen accumulation of leaf litters. The information about their methods, the biomes involved, and the plant species themselves, all available through the IMOLD website, are a treasure trove of data that an inquisitive student could use to pose further questions of their own.

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Using the model:

I. Open the front page of the Interactive Leaf Decomposition Activity
http://imold.utoledo.edu/model.html
Look at the graph as pictured. Note what information is on the x-axis, the y-axis, what each different colored line represents, and what the default variable is (litter carbon)
   1. x-axis:
   2. y-axis:
   3. Blue line, default litter and site:
   4. Orange line, default litter and site:
   5. Green line, default litter and site:

   Using the litter carbon tab, run the default model a few times. Which litter has the least carbon left at the end? Which litter decomposed the fastest? When during the time period are decomposition rates the highest? Does the season seem to make a difference? Given the measurement of the carbon left over in the leaf litter after 1 year has passed, and your knowledge about the carbon cycle from the animations, where do you think the rest of the carbon has gone?

II. Possible questions for investigation:
   1. What happens to decomposition rates when you move a plant litter from one type of ecosystem to another?
   2. How does the composition of different plant litters affect how fast they can decompose?
   3. What are the decomposition rates when temperatures are the highest for a given litter? The lowest?
   4. Which litter contains the most lignin? Predict how that might affect its decomposition rate.
   5. How do different ecosystems affect how fast a particular type of litter decomposes?
   6. How does season affect the rate of decomposition for different litter types? In different ecosystems?
   7. Do you think climate change will affect litter decomposition rates? For all types of litter? For all ecosystems? How?

III. Conducting your investigation
   1. Complete a lab report about your investigation. Be sure to include:
      a. An introduction…what information has led you to your question. Also, explain how what you learn from your model will relate to a natural world phenomenon.
      b. The question you wish to answer and the variables you are testing
      c. Your hypothesis or prediction of outcome
      d. Your methods…what were the constants in your experiment? How did you set up your model to test your question(s)?
      e. Your outcome
      f. Your analysis of the results…did the results support or refute your hypothesis?

g. Your conclusion: what have you learned from your experiment? What does the information tell you about a possible scenario in the natural environment?
h. Knowing what you know now, what further question can you think of to investigate?
i. Include reference material that you used for background information.

2. Share your results! Prepare a poster or electronic presentation of your experiment. Include relevant background information that led you to this investigation, and explanation of your experiment, and connections to the natural world cycles that you have learned about.