

W I N T E R 2 0 1 3

A newsletter for members of the  
Carbon TIME environmental  
literacy project

The



# arbon TIMEs



## Andy's Message

Hi Folks—

I'll start with a reminder that Zip files for all six units are now available on the MSU website

([http://edr1.educ.msu.edu/environmentallit/publicsite/html/CarbonTIME1314\\_unit\\_zip\\_files.html](http://edr1.educ.msu.edu/environmentallit/publicsite/html/CarbonTIME1314_unit_zip_files.html)). The last two units should also be available on the National Geographic Website shortly after the holidays.

Our next step will be to begin final revisions in the units-- our hope is to have the revised versions of the units up and ready to go in Fall, 2014. As we begin the revision process, we will be looking in particular at two sources of data:

- **The unit pre-post tests.** These will help us assess how well the unit activities are working to achieve our specific unit goals.
- **Your feedback on the units on the NREL site** (<http://ibis-live.nrel.colostate.edu/MSP/Home.php>). We will be looking carefully at your comments to decide where we need to focus our revision efforts and what kinds of changes we need to make.

So all of this is to say that the unit pre-posttests and unit feedback are important to us! We will be reading what you and your students have to say as we start our revisions.

--Andy

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## Alert!

**Switching to PDFs.** The font we have been using in the NGS word documents, Helvetica Neue, can cause formatting problems when documents are opened on certain computers. To fix this problem we are converting the files to PDFs. Look for this change soon!

## Reminder

If you find that you are missing materials you need, or you need materials you didn't anticipate needing at the beginning of the year, send Staci an email ([sharpst5@msu.edu](mailto:sharpst5@msu.edu)) and she can make sure you get what you need.

# New Animations for the Ecosystems and Human Energy Systems Units

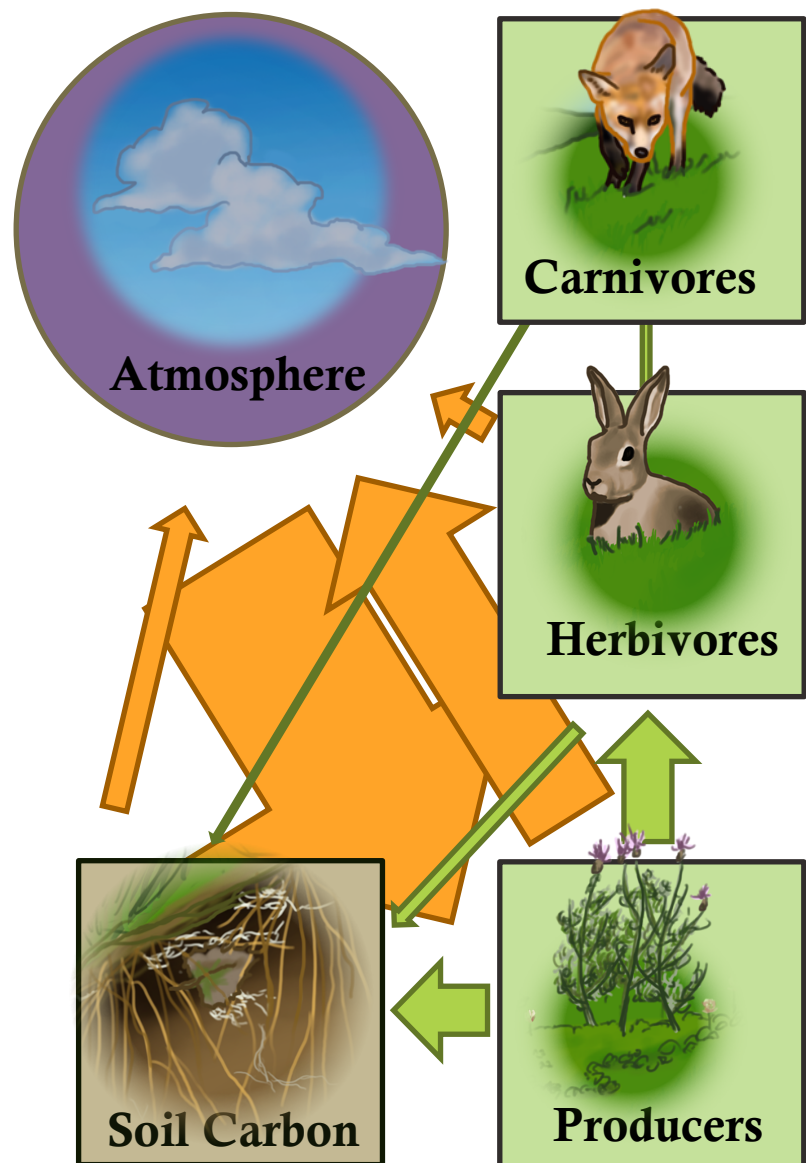
As of November 16, 2013, the Ecosystems and Human Energy Systems Units (our two large-scale units) have had a slight facelift. For those of you who were able to participate in the latest KBS workshop in Michigan and visited the Carbon TIME session, you have seen some of these new animations. For everyone else, this is new!

In our research into how students think and learn about carbon transforming processes, we have discovered that students have different types of challenges at the large scale than they do at smaller scales. For example, many of our Carbon TIME teachers have shared observations about this phenomena: students can explain what happens to matter and energy during photosynthesis by balancing equations (atomic molecular scale) and naming the inputs and outputs (macro scale), but when we ask them what that means for carbon cycling on a global scale they have trouble making connections between photosynthesis and the movement of carbon atoms between the atmosphere and biomass carbon pools.

In response to this phenomenon, we have been working to develop tools to help students reason about carbon cycling at a global scale to accompany our two large scale units. For those of you who have taught either *Ecosystems* or *Human Energy Systems* Units, you know that we use a “pools and fluxes” approach to carbon cycling. This means we talk about how carbon moves through large pools of carbon (like the atmosphere pool, the biomass pool, or the fossil fuel pool) as opposed to how carbon moves through one organism (like a plant, animal, or decomposer).

The new animations (developed

by our very talented graphic designer, Craig Douglas) illustrate how molecules and atoms move back and forth between carbon pools (a flux), and what causes the fluxes. Because these activities are new, we would especially love to hear how they work in your classroom. Email Hannah at [hkm@msu.edu](mailto:hkm@msu.edu) with any questions or comments. **Don't forget:** you can find the large scale unit materials on the MSU zip file page (see link on page 4). They will be ready to go on the NGS site this winter.



## Deciding Which Activities to Leave Out

If you teach every activity in every *Carbon TIME* unit, you will find that some of them are repetitive. This occurs primarily in the three organismal units: *Animals*, *Plants*, and *Decomposers*. This is a brief explanation of why this happens, and how you can avoid unnecessary repetition.

We believe that it is REALLY important for students to understand three difficult ideas about how plants, animals and decomposers obtain and use food: 1) *Plants, animals, and decomposers obtain food in different ways*. Plants make their own food (initially glucose) through photosynthesis. Animals digest food (breaking large organic molecules or polymers down into small organic molecules or monomers) inside their bodies. Decomposers (fungi and bacteria) digest food outside their bodies. 2) *Plants, animals, and decomposers use food in similar ways: growth and energy*. Plants, animals, and decomposers all use some of their food to grow and repair body tissues. This is the process of biosynthesis: linking monomers together to make polymers. Plants, animals, and decomposers all use the rest of the their food as an energy source: The process of cellular respiration combines organic molecules with oxygen to produce carbon dioxide and water. This process releases the chemical energy

in the organic molecules for body functions (and ultimately heat). And 3) *Digestion and cellular respiration are different*. Both processes “break down” organic molecules, but in different places, in different ways, and for different purposes.

So how does this translate into choices you need to make in teaching the units? Here are some thoughts from Andy:

- *The parts of the units about how organisms obtain food are different*. Each unit has unique parts about the specialized components of the organisms that obtain food (leaves, digestive tracts, outside decomposer bodies) and how food is distributed within the bodies of organisms. So you may want to leave these in.
- *The parts of the units about how cells use food are similar*. Each unit has similar lessons about how cells use food for biosynthesis (growth) and cellular respiration (energy). So you may want to leave some of these out.
- *You can choose levels of detail*. You will need to choose how much detail about specific organic molecules and how they are transformed to include in your units. Our judgment is that all the details in the units are likely to be confusing to middle school students, and the details are not as important as the three points above.

## Announcement: Upcoming Interviews with Rose!

Some of you have met Rose Shaw, Carbon TIME’s external evaluator. As our external evaluator, Rose provides very important information and feedback for the Carbon TIME researchers about how the program is going and what we can improve to make the project better.

Some of you might have given Rose feedback after workshops or through email in the past. Rose is beginning to conduct phone interviews with all of our Carbon TIME teachers. She is interested in knowing about your experiences teaching Carbon TIME. In particular, she is interested in learning about which features (materials, websites, etc.) you find most useful and which you are finding less useful. We want the Carbon TIME project to support our teachers in a few key areas: 1) using

learning progressions for formative assessment (pre/post tests, worksheets), 2) using investigations (videos and inquiry), and 3) supporting student explanations and making student thinking visible. We’re interested to know if you have any successes, challenges, questions, or comments about this so far as you’ve taught the units.

Here’s how to make sure you don’t miss out on this opportunity to talk with Rose:

1. Look for an email from Rose asking to schedule a time to talk.
2. Set up a time to talk with Rose on the phone.
3. Be honest with Rose about challenges and successes you’ve had with Carbon TIME so far – your feedback will help us make the program better!

## Spotlight on the graduate student

Join us in welcoming a new graduate student to the Carbon TIME research team, Wendy Johnson. Before coming to MSU to pursue a PhD, Wendy taught high school biology in Lansing for the past six years. During that time she was very active at MSU, participating in many professional development programs for teachers and earning her M.S. Now she is at MSU full time working on a degree in Curriculum, Instruction, and Teacher Education with a specialization in science education. So far Wendy is involved in analyzing interviews and written assessments to study how students develop their understanding of carbon-transforming processes and the practices of science (and the interaction between the two). Wendy explained why she was interested in environmental literacy: "An understanding of how science develops and uses knowledge is vital for productive citizens of our society. Of course, the application of scientific knowledge for addressing environmental concerns is one of the main reasons that scientific literacy is so important." Wendy lives in Clarksville with her husband and two energetic daughters – in their spare time they enjoy exploring Michigan together.



Welcome, Wendy!

# Carbon Comics

## Links You Need

Testing Website and Dashboard:

<http://ibis-live.nrel.colostate.edu/MSP/home.php>

- Give feedback
- Order Materials
- Shipping information

Group Spaces Workshops:

[www.groupspaces.com/CarbonTIME](http://www.groupspaces.com/CarbonTIME)



Find us on Facebook: Email Staci ([sharpst5@msu.edu](mailto:sharpst5@msu.edu)) to request to join our group.



Follow us on [Twitter](#): @CarbonTIME

National Geographic Website:

[http://education.nationalgeographic.com/education/msu/carobontime/staff/?ar\\_a=1](http://education.nationalgeographic.com/education/msu/carobontime/staff/?ar_a=1)

New Videos on National Geographic website:

[http://education.nationalgeographic.com/preview/education/media/growing-plants/?ar\\_a=1](http://education.nationalgeographic.com/preview/education/media/growing-plants/?ar_a=1)

MSU Teaching Materials (Now with the new *Ecosystems* and *Human Energy Systems* Units animations):

[http://edr1.educ.msu.edu/environmentallit/publicsite/html/CarbonTIME1314\\_unit\\_zip\\_files.html](http://edr1.educ.msu.edu/environmentallit/publicsite/html/CarbonTIME1314_unit_zip_files.html)

