

Climate Science Master Materials List

(*on MEECS Climate Change Resource DVD)

Lesson 1: What is Climate?	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>Weather or Climate</i> (answer key) • <i>Midland Precipitation</i> (answer key) • <i>Climagraph Example</i> (transparency master) • <i>Making a Climagraph</i> (answer key) • <i>Climates and Places</i> (answer key) • <i>Michigan Temperature Variability and Midland Precipitation</i> (transparency masters) • <i>What is the Difference?</i> (transparency master) <p><i>per pair</i></p> <ul style="list-style-type: none"> • <i>Weather or Climate Cards</i> (student activity) • <i>Weather or Climate</i> (student activity) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>Midland Precipitation</i> (student resource) • <i>Midland Precipitation</i> (student activity) • <i>Making a Climagraph</i> (student activity) • <i>Climates and Places</i> (student activity) optional 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>What is Climate</i> PPT <p>Adaptations/Extensions/Enhancement</p> <ul style="list-style-type: none"> • <i>Climate Across the United States</i> Word Document • <i>NCDC webquest</i> Word Document
Lesson 2: Earth's Energy Balance	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>Electromagnetic Spectrum</i> (transparency master) • <i>Radiation from the Sun and Earth</i> (answer key) • <i>Option 1:</i> <ul style="list-style-type: none"> – <i>Earth's Energy Budget Parts 1-4</i> (transparency masters) – <i>Earth's Energy Budget Parts 1-4</i> (answer key and PowerPoint Notes) • <i>Option 2:</i> <ul style="list-style-type: none"> – <i>Balancing the Energy Budget</i> (answer key) – <i>*Balancing the Energy Budget</i> (teacher resource, found in kit) • <i>Energy Budget Changes Since 1950</i> (transparency master) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>Radiation from the Sun and Earth</i> (student activity) • <i>Option 1:</i> <ul style="list-style-type: none"> – <i>Earth's Energy Budget Parts 1-4</i> (student activity) • <i>Option 2:</i> <ul style="list-style-type: none"> – <i>Balancing the Energy Budget</i> (student activity) – <i>*Balancing the Energy Budget by Percentage</i> (student handout, found in kit) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>Radiation from the Sun and Earth</i> (QuickTime Movie – 2:17 minutes) • <i>Earth's Energy Balance</i> QuickTime Movie • <i>Earth's Energy Budget</i> PPT • <i>Electromagnetic Spectrum</i> Transparency PPT • <i>Energy Budget Activities</i> <p>Adaptations/Extensions/Enhancements</p> <ul style="list-style-type: none"> • Investigating Energy Balance • Changes in the Earth's Energy Balance

Lesson 3: The Greenhouse Effect

Reproducible Materials

per class

- *Earth's Greenhouse Effect* (answer key)
- *Michigan Greenhouse Gases per Sector in Michigan* (transparency master)
- *Sources of Greenhouse Gases* (answer key)

per student

- *Greenhouse Gases* (student reading)
- *Earth's Greenhouse Effect* (student activity)
- *Sources of Greenhouse Gases* (student activity)

Additional Materials on the Resource DVD

Lesson Materials

- *The Greenhouse Effect* PPT
- *Earth's Greenhouse Effect* (QuickTime Movie -3:29 minutes)

Adaptations/Extensions/Enhancements

- Extension Lesson: *Modeling Greenhouse Gases*

Lesson 4: The Carbon Cycle: Sources and Sinks

Reproducible Materials

per class

- *Carbon Cycle* (transparency master)
- *Explore the Carbon Cycle* (answer key)
- *Michigan Land, Air, and Water* (answer key)

per group

- *Michigan Land, Air, and Water* Placemats

per student

- *Explore the Carbon Cycle* (student activity)
- *Michigan Land, Air, and Water* (student activity)

Additional Materials on the Resource DVD

Lesson Materials

- *Carbon Cycle* PPT
- *Carbon Cycle* QuickTime Movie
- *Keeping Up with Carbon* MP4 video

Lesson 5: Climate Forcing and Uncertainty

Reproducible Materials

per class

- *Changes in Earth's Energy Balance* (answer key)
- *Feedback Cycles* (transparency master)

per student

- *Radiative Forcing* (student resource)
- *Changes in Earth's Energy Balance* (student reading)
- *Changes in Earth's Energy Balance* (student activity)

Additional Materials on the Resource DVD

Lesson Materials

- *Climate Forcing and Uncertainty* PPT

Lesson 6: Evidence of Change

Reproducible Materials

per student

- *Graphing Temperature and carbon dioxide in the 20th century* (student activity)
- *Graphing temperature and carbon dioxide over the last 450,000 years* (student activity)

Additional Materials on the Resource DVD

Lesson Materials

- *Evidence of Change* PPT
- *Temperature Puzzle* MP4 video

Adaptations/Extensions/Enhancements

- *Gathering the Evidence* teacher resource and student activity
- *Taking the Earth's Temperature* Windows Media Video
- *Frequently Asked Questions*
- More NASA Videos

Other Materials

- *Global Warming* – Thomas Karl

Lesson 7: Climate Models Making Global Predictions

Reproducible Materials

per class

- *Modeling the Climate System* (transparency master)
- *Evolution of Climate Models* (transparency master)
- *Relationships in a Climate Model* (answer key)
- *How Much and When* (answer key)
- *Climate Scenarios* (transparency master)

per small group:

- Computer

per student

- *Relationships in a Climate Model* (student activity)
- *A Very, Very Simple Climate Model* (student activity)
- *How Climate Models are Developed and Tested* (student resource)
- *How Much and When?* (student activity)

Additional Materials on the Resource DVD

Lesson Materials

- *Climate Model Transparencies* PPT

Adaptations/Extensions/Enhancements

- *Climate Models* QuickTime Movie
- *Climate in a Box* MP4 video

Climate Impacts Master Materials List

(*on MEECS Climate Change Resource DVD)

Lesson 8: Climate Change Indicators	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>Summary of video series from NASA</i> (teacher resource) • <i>Describing Trends and Writing Hypotheses about Causes</i> (possible answers) • <i>Climate Indicators for Michigan</i> (answer key) • <i>Potential Climate Change Impacts</i> (transparency master) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>Climate Indicators in Michigan</i> (student activity) • <i>Potential Climate Change Impacts</i> (student resource) • <i>Describing Trends and Writing Hypotheses about Causes</i> (student activity set) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>Climate Change Impacts</i> Instructional PPT • <i>Climate Change in the Great Lakes</i> video, script, and time-summary <p>Adaptations/Extensions/Enhancement</p> <ul style="list-style-type: none"> • <i>Climate Change Indicators</i> • <i>Climate Ready Great Lakes PPT</i> <p>Other Materials</p> <ul style="list-style-type: none"> • Additional Lines of Evidence • GLISA: Climate Change in the Great Lakes Region
Lesson 9: Plant and Animal Phenology	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>Comparing Phenological Observations</i> (answer key) • <i>*Michigan Cherries and Climate Change</i> (answer key) <p><i>per student</i></p> <p><i>Phenology Over Time</i> (student resource)</p> <ul style="list-style-type: none"> • <i>Comparing Phenological Observations</i> (student activity) • <i>*Michigan Cherries and Climate Change</i> (student booklet) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>Plant and Animal Phenology</i> Instructional PPT • <i>Michigan Cherries and Climate Change</i> (student booklet) • <i>Michigan Cherries and Climate Change</i> (answer key) <p>Adaptations/Extensions/Enhancement</p> <ul style="list-style-type: none"> • Extension Lesson: <i>Going Outdoors with Phenology</i> • Honey Bees <p>Other Materials</p> <ul style="list-style-type: none"> • Plant Hardiness Zones • Agriculture and Climate Change (teacher resource)
Lesson 10: Ecosystems Relationships	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>*Ecological Habitat Diagrams</i> (transparency master) • <i>*Predicting the Future Ranges of Important Tree Species</i> (transparency masters) • <i>Matching Tree Species with Ecological Habitat Diagrams and Predicting the Future Ranges of Important Tree Species</i> (answer key) • <i>Model Projections</i> (answer key) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>Matching Tree Species with Ecological Habitat Diagrams</i> (student activity) • <i>Background about Tree Species in the Eastern United States</i> (student resource) • <i>Predicting the Future Ranges of Important Tree Species</i> (student activity) <p><i>per pair</i></p> <ul style="list-style-type: none"> • <i>Model Projections</i> (student activity) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>Ecosystem Relationships</i> Instructional PPT • <i>Lesson 10 Transparencies</i> <p>Adaptations/Extensions/Enhancement</p> <ul style="list-style-type: none"> • Materials for Alternate Projections • Extension Lesson: <i>Mixed Pine Ecosystem of Michigan</i> <p>To be provided by the teacher</p> <ul style="list-style-type: none"> • Computer with internet access

Lesson 11: Water Balance and the Great Lakes	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>Climagraph of Detroit and Climagraph of Detroit, redesigned</i> (transparency master) • <i>Level of Lake Michigan</i> (transparency master) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>How Climate Change Can Alter the Water Balance</i> (student activity) • <i>Water Level in Lake Michigan</i> (student activity) • <i>Climate Change and the Great Lakes</i> (student resource) • <i>Effects of Climate Change on the Great Lakes</i> (student activity) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>Water Balance and the Great Lakes</i> Instructional PPT <p>Adaptations/Extensions</p> <ul style="list-style-type: none"> • <i>Making Climagraph 2 Solve Water Balance</i> PPT
Lesson 12: What Can I Do?	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>Six Reasons Why We Should Prepare for Climate Change in Michigan</i> (transparency master) • <i>Michigan's Greenhouse Gas Emissions by Sector</i> (transparency master) • <i>Guiding Principle for Informed Climate Decisions</i> (teacher resource) • <i>Template for DOT Tree Leaves</i> (teacher resource) <p><i>per group</i></p> <ul style="list-style-type: none"> • <i>Climate Change Review</i> (student activity) • <i>Education Campaign Preparation</i> (student activity) • <i>Campaign Follow-Up</i> (student activity) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>Adaptation or Mitigation</i> (student activity) • <i>Climate Change Check Sheet</i> (student resource) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>What Can I Do</i> Instructional PPT <p>Adaptations/Extensions</p> <ul style="list-style-type: none"> • <i>EPA's Emissions Calculator</i> • <i>Climate Literacy Principles</i> <p>To be supplied by the teacher (optional activity)</p> <ul style="list-style-type: none"> • Poster board • Materials to create education materials • Paper or access to computer spreadsheet • Access to computer
Lesson 13: Community Conversation	
<p>Reproducible Materials</p> <p><i>per class</i></p> <ul style="list-style-type: none"> • <i>*Student Participation Rubric</i> (teacher resource) • <i>Some Effects of Climate Change in Michigan</i> (teacher resource) <p><i>per student</i></p> <ul style="list-style-type: none"> • <i>Before-the-Conversation</i> (student activity) • <i>After-the-Conversation</i> (student activity) • <i>*Community Conversation Cards</i> (student activity) • <i>What's the Impact?</i> (student activity) 	<p>Additional Materials on the Resource DVD</p> <p>Lesson Materials</p> <ul style="list-style-type: none"> • <i>Dialogue Preparation: Dialogue, Debate, & Careful Listening</i> (student resource) • <i>Community Conversation Cards</i> • <i>Revolving Conversation Guidelines</i> (Teacher Resource) • <i>Student Participation Rubric</i> <p>Adaptations/Extensions</p> <ul style="list-style-type: none"> • <i>The Global Climate Game</i> • Carsey Report Climate-Change-2011 <p>Other Materials</p> <ul style="list-style-type: none"> • Lesson 13 References

Lesson 14: Climate Change in the News

Reproducible Materials

per class

- *Three Prong Approach to Climate Change Research* (transparency master)

per group

- *Climate Change Headlines* (student activity)

per student

- *Making Sense of Climate Change* (student resource)
- *News Analysis* (student activity)
- * *Newspaper Research* (student activity)

Additional Materials on the Resource DVD

Lesson Materials

- *Three Prong Approach to Climate Change Research* (transparency master)
- *Newspaper Research* (student activity)

Adaptations/Extensions/Enhancements

- *Natural Inquirer*
- *Scientist Profiles*
- *Meet the Researcher* (student activity)