

# Weather and Climate Unit

## Summary

Students will learn about weather and climate as part of their mission to create a solution that will keep waterways clean and protect biodiversity in the Chesapeake Bay Watershed. This unit incorporates activities created by the [Annapolis Maritime Museum](#), [UCAR](#), [NASA](#), [NWS](#), and me. This unit was designed using the Meaningful Watershed Educational Experience ([MWEE](#)) [Environmental Literacy Model](#) (ELM). Here is the [folder](#) with all of the activities included in this document.

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| <b>Topic</b>            | Weather and Climate   |
| <b>Grade Level</b>      | 6-8   |
| <b>Driving Question</b> | How does climate change impact ecosystems in the Chesapeake Bay watershed?  |
| <b>Key concepts</b>     | weather and climate; climate change; acids and bases; water and carbon cycles; Earth's "spheres;" cause and effect; organism adaptations  |
| <b>NGSS Standards</b>   | <p><b>MS-ESS2-5:</b> Collect data to provide evidence for how air masses' motions and complex interactions result in changes in weather conditions.</p> <p><b>MS-ESS2-6:</b> Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.</p> <p><b>MS-ESS3-3:</b> Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.</p> <p><b>MS-ESS3-5:</b> Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.</p> |

## Learning Objectives

| Intro - Weeks 1-3  | MWEE - Week 4-5   | Action Project - Weeks 6-7   |
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| Students will describe how the cycling of water and energy throughout Earth's systems affects weather conditions and climate. Students will use data to predict future weather and changes in climate. Students will discuss how human activity impacts weather and climate. Students will educate their community about the causes of extreme weather events, how to prepare for them, and how to stay safe during and after the event. | Students will understand that increased carbon dioxide levels are making oceans more acidic. Students will explain how the increased acidity of oceans makes it difficult for shell-building organisms like oysters to create their shells. Students will identify factors that impact stream health and create solutions that improve and protect water quality. | Students will discuss the relationship between human sustainability, climate change, and biodiversity. Students will collaborate to create or refine solutions that minimize human impact on the Chesapeake Bay Watershed. |

## Unit Outline

\*Note: Starred days are optional. Use those days to complete activities started the day before, or do extension or review activities. This document assumes that a class period is 50 minutes and meets 5 days per week.

**Other necessary materials:** Those listed in the outline below, plus: computers with internet access; pencils, pens, markers, colored pencils; notebooks

| Week - Learning objectives | Lessons  | Materials  |
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| 1 -                        | <b>Day 1: Unit Introduction</b><br>Warm-up/do now: <a href="#">Concept inventory</a> <ul style="list-style-type: none"> <li>(Engage) Anchor phenomenon with <a href="#">observations and questions</a> <ul style="list-style-type: none"> <li>Choose one of the phenomena listed below and show it to your class.               <ul style="list-style-type: none"> <li><a href="#">Lightning strikes thrice</a></li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li><a href="#">Concept inventory</a></li> <li><a href="#">Observations and questions</a></li> <li>Introductory activity:               <ul style="list-style-type: none"> <li>chart paper</li> <li>marker</li> <li>Graph paper/Excel</li> <li>pencils</li> <li>ruler</li> </ul> </li> <li><a href="#">UCAR water cycle</a></li> <li><a href="#">Earth wheel</a></li> </ul> |

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|     | <ul style="list-style-type: none"> <li>■ <a href="#">YouTube</a> - Eric Hultgren phenomenon</li> <li>■ <a href="#">Year at Gates Glacier</a></li> </ul> <ul style="list-style-type: none"> <li>○ As the students observe, they should fill out their T-charts. It's ok if they discuss it with someone near them while you're showing the phenomenon.</li> <li>○ Have the students share their observations and questions with the class while you write their responses on chart paper.</li> <li>○ Keep the chart paper on display for the duration of the lesson.</li> </ul> <ul style="list-style-type: none"> <li>● (Explore) <a href="#">Introductory Activity</a></li> <li>● Exit ticket: What is one thing you learned today that you are most curious about?</li> </ul> <p><b>Day 2: Winds</b></p> <ul style="list-style-type: none"> <li>● <a href="#">Wind currents</a></li> </ul> <p><b>Day 3: Jet stream</b></p> <ul style="list-style-type: none"> <li>● Jet stream <ul style="list-style-type: none"> <li>○ <a href="#">Lesson</a></li> <li>○ <a href="#">Original doc</a> - more details, printables for the stations activity.</li> </ul> </li> </ul> <p><b>Day 4: Ocean currents</b></p> <ul style="list-style-type: none"> <li>● Intro</li> <li>● notes: <a href="#">slides</a>; <a href="#">notes handout</a></li> <li>● <a href="#">El Niño ArcGIS levels 1 and 2</a> <ul style="list-style-type: none"> <li>○ <a href="#">student handout</a></li> </ul> </li> </ul> <p><b>Day 5: Ocean currents</b></p> <ul style="list-style-type: none"> <li>● <a href="#">Modeling salinity and deep ocean currents</a></li> </ul> | <ul style="list-style-type: none"> <li>● Ocean currents notes</li> <li>● NOAA ArcGIS El Nino map, interactive and accompanying worksheets</li> </ul> <p>*For the purposes of this unit, students will complete levels 1-3 (out of 5) of the interactive. If you want your students to at least be exposed to levels 4 and 5, assign them as homework, extra credit, or a summative project, depending on time and the students' abilities/interests.</p> |
| 2 - | <p><b>Day 6: ENSO</b></p> <ul style="list-style-type: none"> <li>● Intro MWEE action project</li> <li>● <a href="#">El Nino in the Pacific UCAR</a></li> <li>● <a href="#">Investigate El Nino using NASA data level 3</a></li> </ul>   | <ul style="list-style-type: none"> <li>● El Nino fish tale story and graphic organizer <ul style="list-style-type: none"> <li>○ El Nino case study</li> </ul> </li> <li>● Weather data notes</li> </ul>  |

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|     | <p><b><u>Day 7: Weather</u></b></p> <p><b><u>Day 8: Weather map</u></b></p> <p><b>Day 9: Quiz</b></p> <ul style="list-style-type: none"> <li>Quiz - weather, ocean currents, winds             <ul style="list-style-type: none"> <li><a href="#">google doc</a></li> <li><a href="#">google form</a></li> </ul> </li> <li>If you have extra time after the quiz,             <ul style="list-style-type: none"> <li>Start day 11 or</li> <li>Review the quiz with the class/students can review in small groups</li> </ul> </li> </ul> <p><b>Day 10: Weather Forecasting</b></p> <ul style="list-style-type: none"> <li><a href="#">Weather forecasting - teach engineering</a></li> </ul>   | <ul style="list-style-type: none"> <li><a href="#">Weather data collection worksheet</a> <ul style="list-style-type: none"> <li>thermometers</li> <li>anemometers</li> <li>rain gauges</li> </ul> </li> <li>NOVA Cloud Lab interactive</li> </ul>                                      |
| 3 - | <p><b>Day 11: Extreme weather</b></p> <ul style="list-style-type: none"> <li><a href="#">NOVA Cloud Lab</a> <ul style="list-style-type: none"> <li>Cloud lab videos</li> <li>Storm prediction</li> </ul> </li> <li>NOVA Cloud Lab elaboration and/or extension</li> </ul> <p><b>Day 12: Extreme weather</b></p> <ul style="list-style-type: none"> <li><a href="#">Lesson 1: Disaster research project</a> <ul style="list-style-type: none"> <li><a href="#">project intro</a></li> <li><a href="#">Student research worksheet</a> (pg 2 optional)</li> <li><a href="#">rubric</a></li> </ul> </li> </ul> <p><b>Day 13: Extreme weather</b></p> <ul style="list-style-type: none"> <li>Work on disaster research project</li> </ul> <p><b>Day 14: Extreme weather</b></p> <ul style="list-style-type: none"> <li>Finish the disaster project and/or presentations</li> </ul> <p><b>Day 15: Extreme weather</b></p> <ul style="list-style-type: none"> <li><a href="#">Lesson 2: Preparing for disasters and emergencies</a> <ul style="list-style-type: none"> <li>Skip <b>#3</b> (Fires), <b>#6</b> (communications plan), <b>#7</b> (family meeting)</li> <li>The sections listed above are not directly related to weather and climate, but could get them thinking about solutions for the ELM project.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li><a href="#">Ready.gov lesson</a> not all resources are where they claim to be.</li> <li><a href="#">Cloud lab worksheet</a></li> <li>Other sections of the NOVA cloud lab can be done as extra credit, homework, or as an extension.</li> </ul> |
| 4 - | <p><b>Day 16: Climate</b></p> <ul style="list-style-type: none"> <li>Notes:</li> </ul>  | <ul style="list-style-type: none"> <li>climate notes</li> </ul>  |

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|     | <ul style="list-style-type: none"> <li>◦ <a href="#">slides</a></li> <li>◦ <a href="#">notes - pdf</a></li> <li>◦ <a href="#">Notes</a> - editable</li> </ul> <p><b>Day 17: Climate</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Recipe for a region</a></li> </ul> <p><b>Day 18</b></p> <ul style="list-style-type: none"> <li>• Review</li> </ul> <p><b>Day 19: ELM project</b></p> <ul style="list-style-type: none"> <li>• Quiz - disasters, climate</li> <li>• Intro/discuss ELM project</li> </ul> <p><b>Day 20: ELM project</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Investigation #1: Climate Survival</a></li> </ul>  | <ul style="list-style-type: none"> <li>• climate survival <ul style="list-style-type: none"> <li>◦ cards</li> <li>◦ large dice</li> <li>◦ animal cards</li> <li>◦ wooden tokens</li> </ul> </li> </ul>  |
| 5 - | <p><b>Day 21: ELM project</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Investigation #2: Shell Shock</a></li> </ul> <p><b>Day 22: Investigation #3</b><br/>(Ideally, this investigation is designed by students.)</p> <ul style="list-style-type: none"> <li>• Plan investigation #3: <ul style="list-style-type: none"> <li>◦ <a href="#">Asking questions worksheet</a> (MWE student worksheet tool kit)</li> <li>◦ Plan materials, procedures, data tables, etc.</li> </ul> </li> </ul> <p><b>Day 23*: Investigation #3</b></p> <ul style="list-style-type: none"> <li>• Conduct experiment</li> <li>• analyze data</li> </ul> <p><b>Day 24: CER</b></p> <ul style="list-style-type: none"> <li>• <a href="#">CER worksheet</a> - use data from investigation #3</li> </ul> <p><b>Day 25: Action project</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Lesson</a></li> </ul> | <ul style="list-style-type: none"> <li>• Shell shock materials</li> <li>• Investigation 3 materials <ul style="list-style-type: none"> <li>◦ asking questions worksheet</li> <li>◦ materials depending on students' planned experiments</li> </ul> </li> <li>• CER worksheet</li> <li>• <a href="#">from claims to informed action worksheet</a></li> <li>• <a href="#">Choosing an action project worksheet</a> and <a href="#">explainer</a> (toolkit)</li> </ul> |
| 6   | <p><b>Day 26:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Task management</a> and <a href="#">Budget</a></li> </ul> <p><b>Day 27:</b></p> <ul style="list-style-type: none"> <li>• Work on project</li> </ul> <p><b>Day 28:</b></p> <ul style="list-style-type: none"> <li>• Work on project</li> </ul> <p><b>Day 29:</b></p> <ul style="list-style-type: none"> <li>• Work on project/present</li> </ul>   | <ul style="list-style-type: none"> <li>• Choose an action project worksheet (above)</li> <li>• <a href="#">environmental planning packet</a></li> </ul>   |

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|                        | <b>Day 30*:</b> <ul style="list-style-type: none"><li>• Work on project/present</li></ul> |  |
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| <b>Differentiation</b> |   |  |

Guide students who need extra support by offering practice activities aligned to their skill level and one-on-one tutoring as needed. For advanced learners, assign tasks that encourage critical thinking, like independent research and leading group discussions.

## Extension

- Have students present their projects as proposals to their school principal and/or community, or to local government if you can swing it.

## Assessment

Assess students' understanding through their participation in the investigation, completion of worksheets, and ability to explain concepts.

## Sources

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