# **Introduction: What is ANeMoNe and what is the purpose of this Curriculum?**

*Project ANeMoNe*

In 2015 Washington’s Department of Natural Resources (DNR) created the Acidification Nearshore Monitoring Network (ANeMoNe) to broaden the state’s understanding of ocean acidification.1 Two of the project’s original goals included monitoring acidification and warming in Washington waters and testing management strategies for enhancing ecosystem resilience.1 The project arose to expand upon a study conducted in collaboration with the University of Washington, which determined that photosynthesis from eelgrass meadows can increase the local pH and thereby counteract some of the negative impacts of ocean acidification.2 This is of critical importance, as ocean acidification is known to harm ecosystems and their inhabitants (especially shellfish), which are critical for ecological, commercial, and cultural reasons.2 As DNR is responsible for the management of 2.6 million acres of Washington’s aquatic lands, it has a vested interest in learning more about and protecting nearshore ecosystems.

By 2018 the ANeMoNe project expanded to include community scientist volunteers, dubbed Site Guardians, who help maintain the various project sites and participate in experiments and data collection.3 The inclusion of community scientists helped DNR move toward another goal: increasing public awareness about ocean acidification and its impacts in Washington waters. Recently DNR was awarded a grant to develop curricula for local schools about climate change and ocean acidification in Washington state, to further public awareness and student engagement.

The purpose of this project is to develop an engaging and interactive climate science curriculum focused on nearshore eelgrass ecosystems in Washington state.

*The Curriculum*

The first module focuses on introducing nearshore ecosystems in Washington and is designed to help students think critically about the type of habitat and many ecosystem services that eelgrass provides. This bridges with the second module, which dives into ocean acidification and asks students to think about how carbon dioxide interacts with the ocean, and how eelgrass can impact this relationship through uptake and sequestration. The final module has students apply what they have learned about the nearshore eelgrass ecosystem and ocean acidification to determine the cascading impacts of ocean acidification on the nearshore environment and ocean as a whole.

The curriculum is sponsored by the Washington Department of Natural Resources (DNR) and is designed to bridge the goals of bringing local climate science into Washington state classrooms by highlighting the department's ANeMoNe project. Specifically, the curriculum will focus on a local climate science issue and incorporate elements of community science to showcase how students can get involved in fighting climate change in their own “backyards”.

# **Prerequisites: What should students have a basic understanding of beforehand?**

* Students should already have a basic understanding of photosynthesis. Photosynthesis is revisited in this unit, but how it occurs is not explained.
* Students should have a basic understanding or introduction to climate change, specifically they should have some familiarity with the greenhouse gas effect and greenhouse gases.
* Students should have a basic understanding of chemistry: more specifically, understanding what molecules are, the differences between types of matter, and polarity
* While this is designed for the middle school level, it may be most suitable for 7th and 8th graders as opposed to 6th graders.

# **NGSS Standards: Which apply to this unit?**

1. **MS-LS-2:** Construct an explanation that predicts patterns of interactions of organisms across multiple ecosystems.
2. **MS-LS2-1.** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
3. **MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
4. **MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

# **Basic Unit Outline:**

**Module 1: Eelgrass Environments and Ecosystem Connections in WA**

* Lesson 1: Eelgrass and Photosynthesis
* Lesson 2: Nearshore Eelgrass Ecosystems and the Importance of Community Science
* Lesson 3: Species Connections in Eelgrass Ecosystem

**Module 2: Ocean Acidification**

* Lesson 1: Introduction to Ocean Acidification
* Lesson 2: Acids and Bases
* Lesson 3: Impact of Increased CO2 in the Ocean on Organisms with Carbonate Structures

**Module 3: Community Science and Local Impacts**

* Lesson 1: Cascading impacts
* Lesson 2: Data Collection and ANeMoNe (coming soon!)
* Lesson 3: ANeMoNe and Local Ecosystems

# **References**

1. Washington State Department of Natural Resources. Engaging the Public With Ocean Acidification Science.
2. Washington State Department of Natural Resources. Eelgrass and Ocean Acidification.
3. Washington Office of the Superintendent of Public Instruction (n.d.). Climate Science Learning. Retrieved from <https://www.k12.wa.us/student-success/resources-subject-area/science/climate-science-learning>