

Nonfiction Reading on Our Shrinking Snowpack

Written for: Middle School Social Studies, Science, Speech and Debate and 8th Grade Language Arts 9th/10th Grade LASS/Humanities Created by: Rich Butler, Anne Kiemle, Donna Shaler, PLMS Pine Lake Middle School, Issaquah SD 411

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PROBLEM STATEMENT

With a shrinking snowpack and big changes coming in the seasonal patterns of our water cycle, how are nonfiction writers communicating the science, the impacts, and the solutions to climate change in our bioregion?

SUMMARY

Who cares about analyzing snowpack data? When it snows, I get to go skiing. I get a day off from school. It always snows. That's called winter.

In this lesson, designed to be used in concert with **Snowpack 102 and 103**, students explore, confront, and reflect on current issues related to our shrinking snowpack. Using articles, web searches, and simple graphs, students build an understanding of the personal implications for our health, our habits, and our habitat as a result of dryer, hotter summers and wetter, warmer winters.

For example, fewer days of skiing at fewer mountain passes, forest fire smoke that forces everyone indoors for a week, shuts down soccer practice, and increases health problems for older people and people with asthma.

Air conditioners and purifiers are out of stock in the big box stores. Higher water bills to maintain gardens and lawns. Higher food prices passed along by farmers who can't secure enough water for their crops. And in the winter, more days of heavy rain. More flooding.

This new normal changes everything. Students analyze the science behind local climate impacts and hypothesize about shifts in our economy and social cohesion, especially where impacts will disproportionately affect people with lower incomes and communities of color.

Students are guided in developing a personal or team **impact project** that demonstrates a clear connection between key learning, personal action, and one or more policy frameworks or performance measures valued by local government, the school district, or a leading community group.

Learning Objectives

- I apply systems thinking to build connections between my personal experience and the range of current and expected local impacts from climate change.
- 2. I understand the basic science behind projected climate impacts in our bioregion.
- I understand how local climate change impacts will disproportionately affect people with lower incomes and communities of color.
- 4. I can take personal action to reduce my carbon footprint.



- An initial personal reflection, mind map or video-self-interview on how local climate changes are already impacted me personally.
- 2. An analysis of Infographics on local climate change science and related impacts.
- Jigsaw notes on analysis of readings, websites, and group discussion on how local climate change impacts will disproportionately affect people with lower incomes and communities of color.
- 4. Review and prioritization of possible impact projects for reducing my carbon footprint.
- 5. A draft impact project plan.



Summative Assessment

Implement a final impact project that demonstrates a clear connection between key learning, personal action, and one or more policy frameworks or performance measures valued by local government, the school district, or a leading community group.

Produce a final personal reflection, mind map, or video-self-interview on how local climate changes are already impacting themselves personally, affecting others in their community, and are projected to drive shifts in our economy and way of life in the near future.

ACADEMIC STANDARDS

ELA: 8th grade Common Core Standards for Information Text

Determine the central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.

Analyze how a text makes connections and distinctions (compare and contrast) for ideas and events.

Determine an author's point of view and purpose in a text.

Evaluate the arguments and claims in a text for sound reasoning and relevant evidence.

Analyze two or more texts that provide conflicting information on the same topic.

SOCIAL STUDIES: WA State OSPI Standards

GEOGRAPHY

G3 - Understands the geographic context of global issues and events. Societies must learn how to manage and replenish their resources in order to maintain their way of life, their culture, and their diversity.

NGSS: MS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

[Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use. Examples for limiting future impacts could range from local efforts to large-scale geoengineering design solutions]

BIG PICTURE

NGSS Global Climate Change

NGSS Human Sustainability Standards

OSPI Environmental Sustainability
Standards

OSPI Social Studies Standards

College, Career, and Civic Life (C3)

Common Core State Standards

COMMUNITY CONTEXT

My family's sustainable practices

My Neighborhood Association

Nonprofits focused on this issue

My School and School District

My City Climate Action Plan

My City Equity Strategy

My County Climate Action Plan

My County Equity Strategy

My Energy and Water Utility

My Waste, Recycling, Compost Company

Watershed Salmon Recovery Plan

Puget Sound Regional Council

Puget Sound Vital Signs

Washington Dept of Ecology

Tribal Treaty Rights

Stakeholders

Who are the people and organizations already engaged with this issue, as well as those who perhaps need to be engaged, or those who have been left out of the decision making process altogether? What about non-human species who have no voice but a significant "stake?" What about the needs of our future children or grandchildren?

As students identify stakeholders relevant to this topic, they will want to consider each point of view with integrity. This practice provides a critical opportunity to develop social-emotional learning skills and cultural competency by building an awareness of our own internalized biases and empathizing with perspectives different than our own.

FOUNDATION LESSONS: Engaging Stakeholders



County

Government

Watershed

Management

Administration

School Board

Facultu

Tribal

Citu

PTSA

School

State

Federal

BACKGROUNDWe Depend on Snowpack

We have built our economy, here in the Pacifc Northwest, around the assumption of a sustained snowpack. **Our snowpack** is shrinking due to human-caused climate change.

Get the latest science from the University of Washington Climate Impacts Group.

Study the <u>Climate Change infographics series</u> from King County.

We depend on snowpack. Over the last hundred years, we have constructed dams across a number of our cascade alpine cannons to hold water in huge man-made reservoirs that serve the water supply needs of millions of people. In our region it rains a lot, especially at the higher elevations. This rain can be captured and held in our system of reservoirs.

What is not known by most people, is that we have been depending on a certain depth of snowpack each year to serve as a **second**, **natural reservoir** of water... **A frozen one**. This is important, because as we enter the summer months with little or no rainfall until October, our reservoirs would be drained by the water consumption demands of millions of people if not for our snowpack. The snow that packs down through the long winter will **slowly melt through the summer.** We count on this phenomena to supplement and sustain water levels in our reservoirs. We drink snow in August.

But with a shrinking snowpack over the next several decades, water resource managers, policy makers, and each of us within our own families, schools, and cities, need to make critical decisions about how to conserve water right now.

The same amount of precipitation. Part of this strange new reality is that we will actually have the same amount of annual precipitation. The water cycle will continue to lift vapor from Puget Sound and the Pacfic Ocean and drop it across the landscape. But the science points to a much different annual pattern.

We can expect much more rain in the winter (when we don't need it) along with bigger storm events, which can cause flooding and mudslides. And we can expect much less rain in the summer (when we do need it) which can lead to droughts, forest fires, parched streams for salmon, and dangerous heat waves for humans. We will experience the same total amount of precipitation. It's just that, as each decade continues to bring warmer temperatures, less of this precipitation will be held in the form of snow. Diminished snowpack throughout the winter means diminished water supply late in the summer.

At the same time that we are grappling with how to adapt to our shrinking snowpack, we will need a **thousand good ideas** for how to slow, stabilize, and reverse the effects of climate change. This will take a century or more. It is critical to understand the science and make wise decisions together at all scales right now. We are all stakeholders in this challenge.

SNOTEL stations. Water resource managers carefully monitor our snowpack by analyzing daily and weekly data reports from a series of remote sensing SNOTEL stations built on ridgelines throughout the Cascades. The Natural Resource Conservation Service manages a Snow Survey Program that provides "mountain snowpack data and streamflow forecasts for the western United States. Common applications of snow survey products include water supply management, flood control, climate modeling, recreation, and conservation planning."

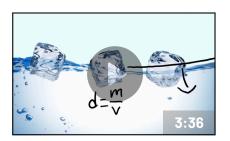
The Washington Snow Survey website includes snow survey data, products, and reports that students can use to understand the science and math behind the need to monitor our snowpack and make critical decisions for the current season as well as 10–30 years out.

Inquiries Across the Curriculum

To understand more about the breadth and depth of curricular concepts using snowpack as catalyst, explore a rich set of <u>additional</u> <u>inquiries</u>.

Youth-voiced tutorials

For additional support, student teams with Sustainability Ambassadors have researched and produced a series of <u>short videos on snowpack issues</u>. All of these videos are voiced by students.



What is Snow Water Equivalent?
Harini Baskar



Introduction to SNOTEL
Rishi Hazra



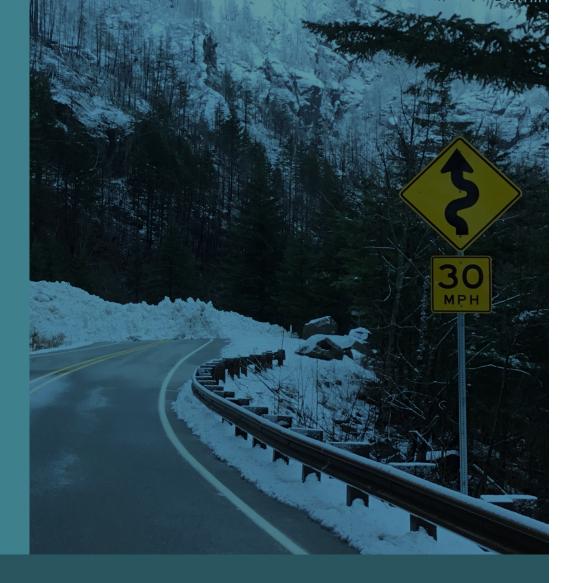
How do SNOTEL Sites Work?
Santoshi Pisupati



<u>Locate Your SNOTEL Station</u> <u>Rishi Hazra</u>



Generating SNOTEL Data Reports
Rishi Hazra



LESSON OUTLINE

Materials Needed

Internet Access

Time Needed

30-minutes every few days over multiple weeks if integrated into a larger unit.

ENTRY EVENT

Show the picture of the water level behind Hoover Dam in this NY Times article. Then challenge students to find a similar picture of Hoover dam where the water level is "normal." Ask students to then search for two comparison photos of water levels at other large lakes in California: Lake Shasta, Lake Tahoe, Clear Lake, Mono Lake. Ask two questions:

Why is this happening in California?

Could this happen in Washington State?

The answer to the first question is brutally clear: Drought due to reduced snowpack levels in the Sierras. The answer to the second question is the purpose of this lesson.

Gathering information from different sources is a very important skill. Review with students the difference between articles and reports designed to inform and text that is designed to persuade (argumentative text.) Tell students that in this lesson, they will develop analytical and "curating" reading skills that will help them to review and select sources for a research project on climate change impacts on snowpack levels and the resulting consequences across different sectors of society.

Additional Instruction Resources:

Info Reading Skills - Outline Card: This tool is a Word template that you use to create 3 cards (when printed on card stock) that students use to ask Before, During, and After Reading questions.

<u>Poster - 3 Questions:</u> The three questions that Notice and Note encourages students to ask when reading for information.

<u>Introduction to Journalism:</u> PowerPoint that describes the different types of journalistic articles that students will encounter.

Introduction to Info Text Structures: A Power-Point that uses graphic visuals to help students understand the different structures that an author will use when writing to inform.

Analyzing Details: A PowerPoint that teaches students to recognize and categorize details in informational text using Logos, Pathos, and Fthos.

<u>Identifying Bias:</u> A PowerPoint that instructs kids on the different types of bias in information and argumentative text.

<u>Bias Analysis Outline Card:</u> A similar template to #1, but this card helps students to analyze an article for bias.

Activity 1

Locating, Surveying, and Analyzing informational Text

SUMMARY. In this activity, students will identify a problem that they need information about. They will formulate a Driving Question, just like they do for an impact project. This activity will use the Problem Statement at the top of the lesson that focuses on snowpack levels and their consequences. Students will search for texts - articles, scientific reports, government website reports, etc. They will then "survey" the text and make a determination about its usefulness. Finally, they will then read their chosen texts carefully, analyzing the information.

STEP 1: LOCATING TEXTS USING A BROWSER.

It's important to assume that many students do not know how to construct "search phrases" when they are using a browser to look for information articles on an issue. Middle school students tend to use only a one to two word expression of the issue – so, for example, they might simply enter "snowpack levels" or "shrinking snowpack."

Teach students to think of search phrases in this way:

Big issue, ex. "Climate Change"

Specific Focus, ex. "Shrinking Snowpack"

Causes or Consequences, in this case "Consequences"

Type of text, "Article," "Scientific Study," "Government Report," "Opinion Piece," etc.

Source Name, ex. "NY Times," "Seattle Times," "Time Magazine,"

So, a search phrase may look like this: Climate Change, Shrinking Snowpack Consequences, News Articles, Seattle Times, for teens.

Explain to students the importance of using commas in a search phrase to tell the search engine to look for those specific words in the source listings that are displayed. Also, within the **Advanced Search** options, you can choose whether or not you want to annotate the search results with **reading level**, or filter the search results by reading level (Basic, Intermediate, or Advanced). ... Next, click "**Advanced Search**," scroll to the bottom, and **filter results by reading level**.

If students are not happy with their search results, then they start eliminating the LAST part of the search phrase, one part at a time until they get a list of sources that are acceptable. For example, the next search phrase after the one listed above would be: Climate Change, Shrinking Snowpack Consequences, News Articles

Once the browser results are displayed, teach students to survey the URL addresses for domains: .com, .org, .gov, etc.

STEP 2: LOCATING TEXTS USING APPS AND CURATED LISTS

There are a number of great apps that students can use to help locate texts. Newsela.com is an excellent source that allows limited free searches and also has an extensive subscription service. Upfront Magazine, published by Scholastic and the NY Times, is another outstanding subscription service that has timely information and argumentative articles.

Students can also go to a Wikipedia posting of the issue and use the source list that is at the end of every article. For students who are not strong readers. It is helpful to provide them with a curated list that they can then go through and survey themselves, focusing on the more important reading skill of analyzing the usefulness of a text. For this lesson, a curated list of sources is provided at the bottom. Starting with the easiest and most accessible format - news articles - and progressing to the more complex and difficult sources, government reports.

STEP 3: SURVEYING TEXTS

Most middle school students do not know how to survey and analyze a text for its usefulness. They tend to start reading it, and if the text is complex and difficult, or the issue is unfamiliar, they give up and move on. It is important to train students that reading for information means "surveying" first. Surveying a piece of text utilizes these skills:

Assessing Reading Level - "Can I read and understand it?" If the reading level of the text is too difficult, the student should immediately move on to the next source. REMEMBER, focus on the objective which is to gather information, not learn to read better... that must be addressed with better scaffolds in targeted, highly structured lessons.

Assessing Breadth of Content - "What does this text cover?" If the specific issue is consequences of snowpack levels, then the student has to ask, do I want an article that explains how snowpack levels are measured? Do I want an article that explains about government water programs? In other words, what parts of the text are necessary to helping me answer the driving question?

Assessing Depth of Content - "How much usable info is here?" Some publications - The Guardian comes to mind - are shallow in their reporting of certain issues. So are certain "hard news" events - that is why it is important to give students a basic intro to types of journalism. Students should not waste a lot

of time on a text that will only yield one or two general facts that will most likely surface in a more comprehensive piece.

Assessing Bias - "What is the angle/slant/ focus/purpose of this article?" Just because an article is "informative" does not exclude the fact that it will have bias. Use this visual metaphor, The Lighthouse Analogy, to explain to students how an information article - and the reading of it - has inherent bias. Students need to learn that, with controversial issues (like climate change), they must learn to look for a balanced set of sources. To help students gain this perspective, have them play with these three websites: ProCon.org, Allsides, and Stossel in the Classroom.

In introductory research lessons, it is best to limit students to 3-5 good sources of information. Students should list these sources and their citations.

STEP 4: ANALYZING TEXTS

After students survey and choose sources, it is time to go back and do an in-depth reading of each Information Text, analyzing it for subtopics and details. Or, if students are using Argumentative Text, analyze it for Claim, Argument, Support Evidence - "CASE".

Analysis is a difficult, abstract skill. Middle school brains are at different levels of development, and some students struggle to think in this manner. It is important to help students understand the process of "analysis" as breaking information into parts, examining the parts, and figuring out how the parts fit together. The handouts listed in the Entry Event above are designed to help students develop this skill.

For the purposes of this lesson, here are some examples of the analysis of an Information Text on the driving question regarding snowpack levels and their consequences:

Always start by reminding and focusing on the question at hand: With a shrinking snowpack and big changes coming in the seasonal patterns of our water cycle, how are nonfiction writers communicating the science, the impacts, and the solutions to climate change in our bioregion?

Choose the first source. In this case, we will use the <u>NY Times article</u> mentioned in the Entry Event.

Identify the "Hook" This article does not have a hook. The first sentence is the topic.

Identify the Topic, Focused Topic, and the MIS. Here is the first sentence: Climate change has plunged the Western U.S. into its worst drought in two decades. And a recordbreaking heat wave only made things worse. The topic is "Climate Change." The focused topic is Climate Change and Western Drought. And this sentence is – obviously the Most Important Sentence – it contains the focused topic in it.

Identify Subtopics. The first subtopic is "Examples of How Bad the Temperatures/ Drought Are." This section of the article does not have a subheading because it comes right after the MIS. It acts kind of like a hook for that reason. They are vivid concrete examples that catch the reader's attention. The only other subtopic is "Solutions" and it does have a subheading. Different solutions are listed, most of them with links to other articles in the NY Times.

We see now that this example of Online Journalism has a "Category Structure" that is designed to get readers to help readers connect with other articles by the NY Times on this topic.

Analyze Support Details for LPE. The article does not have a lot of depth. It is designed to lead readers to other more detailed and

focused articles. It does have a few strong, clear examples:

LOGOS DETAIL - Wildfires raged in Montana and Utah. The article has mostly "logos" details. These are details that are facts, events, descriptions. They are designed to appeal to the reader's need for knowledge, logic.

PATHOS DETAIL - In Arizona and Nevada, it's been so hot that doctors warned people they could get third-degree burns from the asphalt. This particular detail is included to get an emotional response from the reader. The emotion evoked here is "surprise" with maybe just a tinge of "horror." The reader says, "Really" Wow! This is bad!"

ETHOS DETAIL - And that's just in the U.S. Experts say global temperatures will keep rising as countries — and companies — fail to limit their planet-warming emissions. Smaller countries often pay the price for wealthier nations' **pollution** through extreme weather. "Most of these gases have come from the United States, China, the European Union, Russia and other developed countries," Bernard Ferguson writes. Yet islands like the Bahamas, where Ferguson is from, "are on the front lines of the climate crisis." Ethos details are included to illustrate the "right/wrong" of the issue, the moral aspect. In this case, there is a social equity question of smaller countries paying the price for the excesses of larger countries.

Analyze for Bias. On one level, the bias is clear. The article is designed to get readers to explore other NY Times articles online, which will expose them to more advertising. But there is a subtle form of bias here. The article assumes that the current weather conditions are a result of climate change. It doesn't really make an effort to present an alternative view that the current weather pattern is just part of a natural cycle - the Bias of Omission.

Activity 2

Creating an Annotated List or Resources

Use the following lists as a place to start, but be sure to engage your students in the development of your own classroom wiki of the most useful resources and most trusted sources.

READING NEWS ARTICLES & BLOGS

How Severe Is the Western Drought?
See For Yourself

<u>Amid Historic Drought, a New Water War</u> in the West

Where's the Water? Drought Threatens
California's Lifeline

<u>Disastrous - Low snow, heat eat away at Northwest glaciers</u>

We're melting! Climate change and the snow sports industry

From skiing to salmon runs, the national climate report predicts a Northwest in peril

<u>Fires, Floods, Destruction: Washington Copes</u> <u>With Worsening Climate Change</u>

Wildfire smoke brings clarity on climate

<u>How Climate Change Threatens Our Health In</u> <u>the Pacifc Northwest</u>

Oregon Water War

SCIENCE COMMUNICATION

State of Knowledge: Climate Change in Puget Sound: This excellent report provides the most comprehensive, scientific assessment to date of the expected impacts of climate change on the Puget Sound region. Students can click on any section that interests them. They might also ask themselves as writers, "How does the Executive Summary of this larger report organize, synthesize, and paraphrase key ideas?"

Climate Impacts in Brief for our Bioregion

The University of Washington Climate Impacts Group has done an excellent job in developing a few, crisp paragraphs summarizing what the science tells us about likely impacts from climate change in our bioregion. What do you notice about the word choice and sentence structure that this writer has used when trying to paraphrase so much sophisticated information in a single paragraph?

The National Climate Assessment summarizes the impacts of climate change on the United States, now and projected into the future.

A team of more than 300 experts guided by a 60-member Federal Advisory Committee produces reports every four years. The report features sections on different topics, response strategies, as well as a chapter for each region of the country.

2014 U.S. National Climate Assessment
Northwest Highlights | Full National 2014 Report
Frequently Asked Questions

2018 U.S. National Climate Assessment
Northwest Chapter | Full National 2018 Report

READING ABOUT CLIMATE JUSTICE and ADVOCACY

"We need a Just Transition away from digging, dumping, and burning fossil fuels." says Yolanda Matthews, Climate Justice Organizer at Puget Sound Sage and Co-Lead of Front and Centered "Climate justice won't be won by listening to big oil, but instead by listening to those in the field, working in the industry, living in high pollution areas, and marching in the streets demanding real change."

-See Just Transition Report

Front and Centered has authored the excellent report: Accelerating a Just Transition in Washington State - Climate Justice Strategies from the Frontlines.

In 2016, <u>Got Green</u> and <u>Puget Sound Sage</u> co-authored the landmark community-based report <u>Our People</u>, <u>Our Planet</u>, <u>Our Power</u> outlining a path toward climate resilience in South Seattle.

Climate Justice Alliance - "Formed in 2013 to create a new center of gravity in the climate movement by uniting frontline communities and organizations to mobilize capacity for building a Just Transition away from extractive systems of production, consumption and political oppression, and towards resilient, regenerative and equitable economies."

<u>Community Climate Justice</u> - Governor Inslee's Plan for Environmental & Economic Justice in an Inclusive Clean Energy Economy

READING DIFFERENT POINTS OF VIEW

Download the Executive Summary from the point of view of the Northwest Treaty Tribes: Climate Change and Our Natural Resources. How does this document use bullet points to list the main ideas detailed in the larger report. What is the voice in this piece?

Analyze the nonfiction literary devices used in the various legislative agendas, initiatives and policy frameworks features in some of these organizations

King County Cities Climate Collaborative

Washington Environmental Council

READING INFOGRAPHICS

The Skagit Climate Science Consortium has organized this excellent, one page systems map that shows the relationship between: Climate Drivers, System Impacts, Human Challenge.

Explore King County's excellent <u>Infographic</u> <u>Collection</u> on Climate Change.

Notice that the graphic on the landing page "Our Changing Climate" has been translated into five languages. And here is a foundational infographic that shows how climate change will <u>affect our region</u>. Could you write a report, news article, or opinion essay based on the information presented in these infographics?

Challenge Inquiry: Can you make connections between King County's **Equity Infographics** in context of the climate change infographics featured above?

READING ABOUT SOLUTIONS

Project Drawdown is a nonprofit organization and coalition of scholars, scientists, entrepreneurs, and advocates from across the globe that is mapping, measuring, modeling, and communicating about solutions to global warming, with the goal of reaching drawdown, the point in time when the concentration of atmospheric greenhouse gases begins to decline on a year-to-year basis. Project Drawdown's research program has developed realistic, solution-specific models, technical assessments, and policy memos projecting the financial and climate impacts of existing solutions deployed at scale over the next thirty years.

Climate Solutions is a regional nonprofit driving strategies and investments at every level of government, throughout the private sector, and in our communities. The broader West Coast region, spanning from California to British Columbia, stands as the world's fifth largest economy and innovations here can make a significant difference around the globe. Climate Solutions focuses its work on 100% clean electricity, cleaner fuels and electrification to power our transportation, and clean and energy-smart buildings where we work and live.

READING ABOUT LOCAL GOVERNMENTS LEADING THE WAY

Washington State Leads the Nation on Climate Action

King County Strategic Climate Action Plan

City of Seattle Climate Action Plan

Search in your community for - City (Name) Climate Action Plan

Search in your community for - City (Name) Environmental Stewardship Plan

See Examples and Keyword Searches



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Thank you **Cascade Water Alliance** for supporting student and teacher research on SNOTEL data analysis as a foundational understanding for water resource management decision making. And for supporting the original design of the PBL Curriculum Design Lab and Teacher Fellows Program.



Thank you **King County WaterWorks Grant Program** for supporting additional partnership building and curriculum design related to water quality.

About Sustainability Ambassadors

Sustainability Ambassadors is a professional development program for student leaders, teacher leaders and community leaders committed to rapidly advance a sustainable future by aligning classroom rigor with community relevance for real world impact.

We support a year-round training program for over 60 highly motivated youth, a paid Equity Advocacy Internship, a Green Jobs Youth Pathways Portal, and a Teacher Fellows Program, working with hundreds of educators to design new models of problem-based, place-based learning around a shared vision of *educating for sustainability*.

We focus on middle school and high school youth, the teachers and school districts that guide their learning, and the community stakeholders, local government and business leaders who are relying on the next generation to be engaged voters, informed taxpayers, conscious consumers, and employees who can create and lead sustainability initiatives.

<u>Visit: https://www.sustainabilityambassadors.org/</u>