

Environmental Education for Climate Literacy and Action in Rhode Island, 2026
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Environmental Education for Climate Literacy and Action in Rhode Island, 2026

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Introduction

“Western and Indigenous knowledges can be - in fact, must be - configured in a way that is complementary rather than contradictory.” (Brayboy, 2005, p.5)

“Education contributes to mitigation through training professionals. But there is often little evidence of its anticipated impact through other channels. For such objectives to be achieved, it is necessary to reconsider how education is delivered, conceive education as an activity that also takes place beyond school and integrate education efforts with the work of other sectors.” (Education and Climate Change, 2024, p. 4)

What can you tell me about a favorite tree that is close to home? In your neighborhood?

In order to secure a healthy, livable environment for ourselves and future generations, Western communities in temperate forest areas that have developed with reliance on fossil fuel technologies must make big changes to residential, commercial, and transportation infrastructure, and we must increase local forests through protection and reforestation.

Communities of the Narragansett Bay watershed, including the 39 cities and towns that make up the state of Rhode Island, are among those who face this challenge. This region is known as the birthplace of the American Industrial Revolution. The first factories were built along rivers here in the 1790s, and as of 2020 we were the 3rd most densely populated state in the nation (US Census Bureau, 2026).

Historically a temperate forest, then almost completely deforested in the 1700 and 1800s, only 56 percent of the region has since reforested (Rhode Island Forest Conservation Advisory Committee, 2019). After intense pollution in the 1900s by industrial activity and dense human settlement, the region saw a cultural shift to environmental awareness in the 1970s including taking the name: “The

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Ocean State.” Since the 1980s, an array of local environmental stewardship efforts have supported partial recovery of ecosystem health and preservation of some biodiversity. Across these efforts, the health of the waters in Narragansett Bay has been a central focus.

Our local ecosystem restoration occurs in a context of a global effort to understand and mitigate the impact of industrial scale human activity, in particular, the impact of greenhouse gas emissions on the climate. While Rhode Island’s greenhouse gas emissions are lower than the United States average (US Energy Information Administration, 2023), they remain at more than double the World’s per capita rate (Global Carbon Budget (2025); processing by Our World in Data). Since 2014, the RI Executive Climate Change Coordinating Council (RIEC4) has been researching and coordinating a wide range of public efforts to reduce greenhouse gas pollution sources, and in 2021, the state passed Act on Climate legislation setting enforceable climate emissions reduction mandates. We have a lot of changes to make to meet our greenhouse gas reduction targets, on a very short timeline, and with few additional resources to support the work.

This paper addresses the educational puzzle of changing our culture to reduce pollution and restore climate health. Setting aside the scientific understanding of climate change (which has been expertly addressed in many other places), this landscape review serves as a general reference text for local adults who want to get ready to work with others to make changes. It summarizes the educational references, records, and materials that shape our relationship to the environment in international, indigenous, national, and local contexts. The summary of what we need to know including basic facts, core program references, and types of materials is followed by an exploration of how programs are evaluated with recommendations for additional evaluation approaches that might drive necessary cultural change effectively.

Setting

This work is specific to communities in the Narragansett Bay region, but findings could be extended to similar developed temperate forest communities. It will support educators working in a system that prioritizes text-based and academic epistemologies to make meaningful progress on a problem that is ontological in nature.

Supervision

The field study was supervised by Dr. Kathy Peno, Professor, School of Education, University of Rhode Island.

Methodology

Environmental education is trans-disciplinary. **References** used to design and **materials** used to deliver programs are diverse in form, and not routinely submitted for academic review. Additionally, there are many ways to qualify as an environmental educator. A descriptive research approach is therefore chosen. Research began with publicly available online documents specific to the Narragansett Bay region including reports from the Rhode Island Environmental Education Association (RIEEA); State of Rhode Island Climate Change Coordinating Committee (RIEC4); non-profits such as Save The Bay; and Federal agencies such as the National Oceanographic Atmospheric Association (NOAA). From this starting point, I used a branching methodology to identify academic and local information sources following inquiries:

- What are knowledge and educational practices regarding environmental education at a global scale, nationally, and locally?

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- What are Indigenous perspectives?
- What essential content (what stories?) should a general education teacher or facilitator know to be prepared for classroom conversation on environmental topics?

In addition to wide reading from sources about international policy and indigenous experiences, I attended conferences on science research for “economic and social growth” (RI-NEST / EPSCoR) and Stormwater Innovation (Rhode Island Network for Excellence in Science and Technology, 2025; RI Green Infrastructure Coalition, 2025) I also drew from 30 years of experience as a community member and educator making connections between non-formal citizen science (ex: Bioblitz, Providence Tree Survey) and formal education at the middle and secondary levels (MET High School and CCRI Bridge Program). I reviewed our department’s chosen texts “Learning in Adulthood” and “Planning Programs for Adult Learners” to identify relevant learning theories and approaches, and pursued additional reading on socio-material and place-based approaches to education. To ensure that the branching approach did not overlook essential scholarship, I finished with a scan of all peer reviewed publications mentioning both “climate change” and “United States” in the Education Resources Information Center (ERIC).

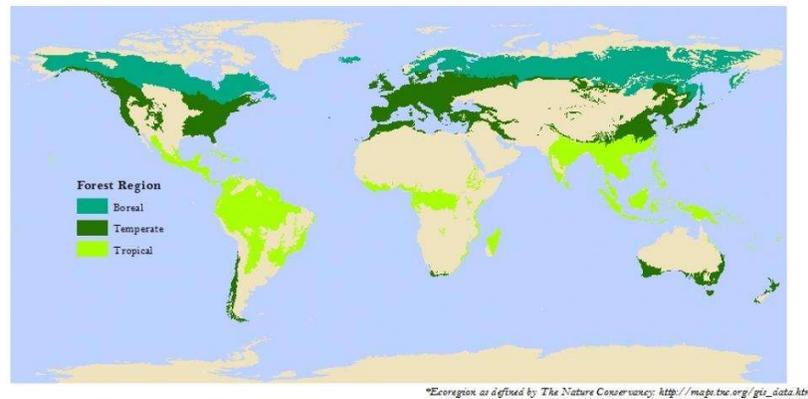
Formally produced standards for K-12 education, the Next Generation Science Standards (NGSS) and National Council for the Social Studies standards were consulted, but not reviewed in detail. Further research aimed at producing materials for classroom use will address these and include notes on coding classroom materials to be searchable by standard.

Analysis and discussion presented here will be transferable to other watershed communities that are located within temperate forest regions and have been colonized or shaped by Western / English

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speaking culture either through history (United Kingdom) or colonization (United States, Australia and Canada)

Forests of the World



Source :(Yale University, 2014)

Positionality Statement

As author, Beatrice McGeoch, she/they, I am a first generation immigrant to the United States, recently naturalized. I am from the United Kingdom with connections to England and Scotland but trained in United States institutions as a translator, writer, and educator. I have been 30+ years resident in the Narragansett Bay region with work and life experience connecting me to institutions and wild/natural places in nearly every city and town within it.

I am a writer and educator first with formal academic practice as a secondary occupation. I digest, summarize, and contextualize academic content and theoretical approaches for general audiences in

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adult education, arts, and professional development settings, creating learning experiences that are accessible without sacrificing rigor.

I research and write for the people who rely on watersheds of the Narragansett Bay for drinking water. When I use the pronoun “we” I'm referring to this group. I hope to contribute to the excellence of public education institutions which have been my livelihood and which stand as the default education resource for our most vulnerable community members.

Justification

This landscape review includes science content, but much of the summary would be taught in school as social studies. “For environmental educators, social studies curriculum is particularly important because it is one of the primary ways a land ethic is created, especially through dominant paradigms related to how national identity and citizenship help construct damaging and unsustainable relations to land.” (Calderon, 2014, p. 28) In order to design education for transition to sustainable practices we need to know the recent history of and response to human-caused (anthropogenic) pollution through policies and programs in addition to knowing about education programs, objectives and measures currently in use.

Definitions

International

Coordinated international research has established the reality of climate change beyond doubt and created a framework for accountability that targets change in polluting nations and communities. The United Nations is the primary international diplomatic group that has been addressing climate change.

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This work is funded by a portion of their \$3.45 billion budget, but international non-governmental organizations with larger budgets are also active in this work. For instance, The Nature Conservancy FY 2024 total liabilities and net assets were \$9.86 billion. (The Nature Conservancy, 2025) To put this funding in context, adults should know that industries driving greenhouse gas emissions represent more than \$900 billion in yearly economic activity (Semieniuk et al., 2024)

International is a term that both includes and excludes indigenous people. While there are currently 193 nation states represented at the United Nations, there are more than 5000 distinct indigenous groups totaling 476 million indigenous people in 90 countries across the world. This group accounts for 6.2 % of the global population (United Nations, 2025b) yet “[h]istorically, Indigenous Peoples have had to appear in most United Nation bodies as non-governmental organizations” (Native American Rights Fund, 2026) In 2016 and 2017 Indigenous Peoples’ governments and representative institutions brought this issue formally to UN member states. The UN General Assembly committed in September 2017 “to continue to consider the issue for the next five sessions, and directed that additional regional consultations take place and that a report be compiled.” (Native American Rights Fund, 2026). The report from the UN Special Rapporteur on this issue was released in August of 2025 and does not appear to grant indigenous people sovereign nation rights within the United Nations, but instead reviews the definition and rights of indigenous people as they are constructed legally by other nations (Barume, 2025). Readers interested in learning more about this rapidly developing issue should consult documents here: <https://social.desa.un.org/issues/indigenous-peoples/unpfii> .

Indigenous peoples

The term indigenous, first used in the 1600s, originated as a classification structure used by settlers arriving to already inhabited places (Etymology Online, 2026). Its meaning, *born in a particular place*,

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has evolved alongside a Western viewpoint that prioritizes legal status secured through documentation over lived relations (Dawson et al., 2023, p. 181). Each of the 5000+ indigenous language communities in our world represents a unique culture interdependent with an ecosystem, and “At least a quarter of the world’s land area is owned, managed, used or occupied by Indigenous Peoples.” (Drissi, 2020) The United Nations formulated a Declaration on the rights of Indigenous Peoples in 2006, and funds a Special Rapporteur to research and furnish regular reports on Indigenous Peoples’ issues to the Commission on Human Rights. “Indigenous peoples” as a legal designation is not fixed, but defined in contexts that vary from nation to nation with a common theme of the rights of indigenous people to define themselves (Barume, 2025).

Indigenous cultures are important to include in work on environmental education because of their traditional relationships with ecosystems. “When land is owned, managed or occupied in a traditional way, the word “traditional” refers to a knowledge that stems from centuries-old observation and interaction with nature. This knowledge is often embedded in a cosmology that reveres the one-ness of life, considers nature as sacred and acknowledges humanity as a part of it. And it encompasses practical ways to ensure the balance of the environment in which they live, so it may continue to provide services such as water, fertile soil, food, shelter and medicines.” (Drissi, 2020)

National

Environmental education in the Narragansett Bay region is impacted by the idea and geopolitical reality of the United States of America. Multiple understandings of what it means to be a nation “coexist and compete within U.S. political culture,” and these understandings are interconnected with ideas of citizenship and rights to land ownership that impact the environment, (Bonikowski & DiMaggio, 2016,

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p. 5). Further, the United States economy and environmental footprint are so large that its' national policies have a significant impact on the earth's climate.

Local

The local in context of this work is the collection of watersheds that make up the Narragansett Bay watershed. These places are also located within the political boundaries of the 39 cities and towns that make up the State of Rhode Island; lands held by the Narragansett tribe; and some areas in bordering states of Connecticut and Massachusetts.

Environmental Education

The definition of environmental education flexes based on context and community goals.

Environmental Education as a concept has its origin in the Belgrade Charter adopted in a United Nations conference in 1975 (NAAEE Guidelines 3, 2025, p. 35) The most recent UNESCO report on education and climate change notes: "Education contributes to mitigation through training professionals. But there is often little evidence of its anticipated impact through other channels," and concludes that formal education needs to transform to advance climate change mitigation and adaptation, stating: "For such objectives to be achieved, it is necessary to reconsider how education is delivered, conceive education as an activity that also takes place beyond school and integrate education efforts with the work of other sectors." (Education and Climate Change, 2024, p. 4) This review follows established educational scholarship including **formal** and **non-formal** education programs- with a generous approach to what qualifies as non-formal. Formal education is "recognized with grades, diplomas, or certificates" (Merriam, 2020, p. 55) according to the Western practice of keeping records held by institutions. Non-formal learning may be recognized within communities (for example: ceremonies marking youth transition to adulthood, respect of elder knowledge), or not recognized at

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all. The distinction is helpful for navigation, but in context of environmental education both hold the potential to be successful.

Environmental Educators, General Educators, and Facilitators

The North American Association for Environmental Education (NAAEE) designs their guidelines for at least six environmental educator roles across formal and non-formal program types (NAAEE Guidelines 3, 2025, p. 9). In environmental education, any person who is formally or informally in a position of authority (parent, teacher, administrative leader, elder, etc.) to guide study and conversation, and to shape the opinions and actions of others influenced by that authority (children, students, employees, community members) is an educator. The term “general education” refers to knowledge that everyone is expected to master by adulthood – typically defined through secondary education standards used by K-12 schools or assessed by the G.E.D. or General Education Diploma. Many people in a community regularly provide general education without being “teachers”: family members; school staff; colleagues in the workplace; etc. The term facilitator refers to an educational role that locates the leader of a learning group as a knowledgeable peer rather than an authority or expert.

References, Records, and Materials

When I need to replace the car windshield wiper, it comes with a diagram and I search videos online of people doing it. Between watching the videos, and consulting the diagram (repeatedly), I am able to do it. These are **materials**. The wiper is a small piece of an entire constructed system (the car), and somewhere there is a technical manual (**reference**) that describes the wiper precisely in context of the

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that system. The car manufacturer will also keep **records** of how many wipers are produced, where they are shipped etc., but I only need **materials** to learn enough to replace the wiper¹.

This is a characteristic of modern life in the developed world: we use media/documents to manage our path through the physical world with abstract representation. The writing, study, and use of media/documents guide whole communities live in a physical reality using **references** and **records** to keep track of and direct the movements of physical things. Education teaches the skills to navigate **materials**, keep **records**, **produce materials**, and at advanced levels, **use and produce references** that guide others.

References are texts that outline rules and intentions. Ex: standards; laws; editorial guidelines; international agreements; program plans; evaluation frameworks.

Records are locations of raw data. Ex: attendance logs; diplomas and transcripts; farm crop yield data; forest density maps; exam grades; sales reports.

Materials are informational narratives created in context of references and records: magazine articles; newspapers social media; television programs- fictional and “non-fictional”; and textbooks; etc.

Textbooks and other informational media used in education are **materials**. This review looks at references, records, and materials used to educate students about the environment.

NOTE: Resources is a commonly used term in education, but I am avoiding this where possible because it is also used to in environmental science to describe living things that have the potential to be

¹The old wiper and the new wiper’s plastic container are still sitting behind my kitchen garbage. The materials that helped me replace it did not give guidance about how to dispose of it. In a future culture that has fully integrated the Sustainable Development Goals, wiper replacement **materials** will include instructions for disposal.

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used by humans. I make an exception for **Open Educational Resources (OER)** as this term is well established.

Plants, animals and other non-human life.

I use this phrase intentionally to invoke the range of bio-diversity that is potentially at play in a thriving ecosystem. I will also use **non-human life** as shorthand to refer to the entire group (plants, animals, non-human life) for readability.

Framework of Belonging

We live in a globally mobile culture with high rates of immigration and migration in our Narragansett Bay region (Johnson, 2024) Especially in the United States, most Americans have a diasporic origin story: the German ancestors who colonized the plains; the African families brought against their will and who survived slavery; the Italian relatives who came in recently through New York, and on and on. This includes the experiences of members of tribal nations and their ancestors who were displaced from their original lands.

Disagreements over how land should be cared for often activate frameworks of authenticity and belonging that are complicated by these origin stories. Environmental advocates sometimes use the idea of “nativity,” being “from” a place, to legitimize their advocacy (House et al., 2016, p. 2), but this approach is problematic in a globally mobile present grappling with issues of injustice stemming from colonization practices.

We do have evidence of an emerging modern identity that could be helpful in navigating a way forward. This includes belonging to and responsibility for the environmental health of a watershed and the people dependent upon it- regardless of origin story or length of stay. For instance, in Rhode Island,

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the River Council has worked to get rivers named in hospitality and tourism materials ensuring that visitors better understand the landscape they are moving through (RI Rivers Council, 2026) Such a general environmental education approach can develop attitudes that shift away from frameworks of legitimacy and toward frameworks of obligation that begin with simple presence in a watershed as activating a responsibility.

General Education Summary

Context of International Environmental Education

At the global level we have consensus that we must safeguard environmental health through policy and education. This work has been guided through activities and agreements established by the United Nations since the 1970s. The Belgrade Charter in 1975 offered the first definition of environmental education (United Nations Environment Programme, 1975) and the complex process of mitigating environmental degradation caused by human activity has been a constant issue at the United Nations since.

One specific environmental issue, the warming of the earth's atmosphere by human generation of greenhouse gases, has been a major focus for the last 34 years. The United Nations 1992 Earth Summit conference was a milestone for diplomatic recognition of evidence that human activities were causing global warming. The summit led to three Rio Conventions that established generation of greenhouse gases as the driver of climate change; recognized this as an existential threat to humanity; and pledged to "work closely together, with the overlaps in their work becoming ever stronger as the challenges related to climate change, desertification and biodiversity loss grow and cross-cutting solutions are developed." (United Nations, 2026)

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The Rio Framework Convention on Climate Change focuses on human activities that release greenhouse gasses and are causing the overall temperature of the atmosphere to increase through a process known as “climate change” or “global warming.” Scientists measure this increase compared to a reference temperature based on data from 1850 – 1900.

- The last time global surface temperature was sustained at or above 2.5°C higher than the 1850–1900 reference point was over 3 million years ago. (IPCC AR6 Working Group, 2025)
- “During the 20th century, Earth’s globally averaged surface temperature rose by approximately 1.08°F (0.6°C). Additional warming of more than 0.25°F (0.14°C) has been measured since 2000. Though the total increase may seem small, it likely represents an extraordinarily rapid rate of change compared to changes in the previous 10,000 years.” ([U.S. Global Change Research Program, 2009 p.3](#))
- The final amount of temperature increase could be anywhere from 1°C to 5.7°C – depending on how successful we are at cutting emissions - with scientific consensus that anything over 1.5°C should be avoided because the change is leading to “increases in the frequency and intensity of hot extremes, marine heatwaves, heavy precipitation, and, in some regions, agricultural and ecological droughts; an increase in the proportion of intense tropical cyclones; and reductions in Arctic sea ice, snow cover and permafrost” (IPCC AR6 Working Group, 2025) which can catastrophically disrupt water and food systems on which we rely.

The United Nations began meeting yearly to address climate change after the Earth Summit in 1992.

This yearly meeting, the Conference of the Parties, or COP, reviews progress in tracking and mitigating climate change. Since 1992, research teams have collaborated internationally to investigate and document human impact on climate, and they have worked with communities and governments to

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classify types of activity, measure their impact, and share regular reports on their status. There are volumes of records to be found detailing this process, but for general education purposes, adults need to know that these meetings led to the Kyoto Protocol (United Nations, 1997), and then the Paris Agreement (United Nations, 2016).

- The Kyoto Protocol was a first international agreement to reduce greenhouse gas emissions. It listed the gasses to be reduced (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) in Annex A; and in Annex B, it listed countries with percent targets for emissions reduction. Some low emitting countries were not listed, and did not have an obligation to reduce. The United States, the highest emitting country at the time, withdrew from the agreement because the Senate voted against it on the grounds that it was not fair. This led some other countries also to withdraw, but the majority remained. By 2015, “Post-Kyoto, there was both good and bad news. The good news was that the thirty-six compliant Annex B states exceeded the 5 percent expectation, and achieved a total of 22 percent reduction from the 1990 emission levels. The bad news was that none of the top emitters in 2012 were among those 36 countries. Instead, the top 3 emitters, collectively responsible for 51 percent of the world’s emissions, were China (29 percent), the United States (16 percent) and India (6 percent).” (Tsai, 2015)
- The Paris Agreement in 2016 is the first time all nations agreed to track and reduce emissions. In return for developing countries agreeing not to pollute as much the developed countries (historically the largest polluters) already had, developed countries agreed to contribute financially to support developing countries with investments and technology to minimize their increase in pollution. Again, the United States withdrawal from the agreement on two occasions (in 2020 and in 2026) is slowing progress by withholding financial support for the UN and for

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domestic climate and environmental science, and by damaging the accord between nations that frames this global-scale endeavor.

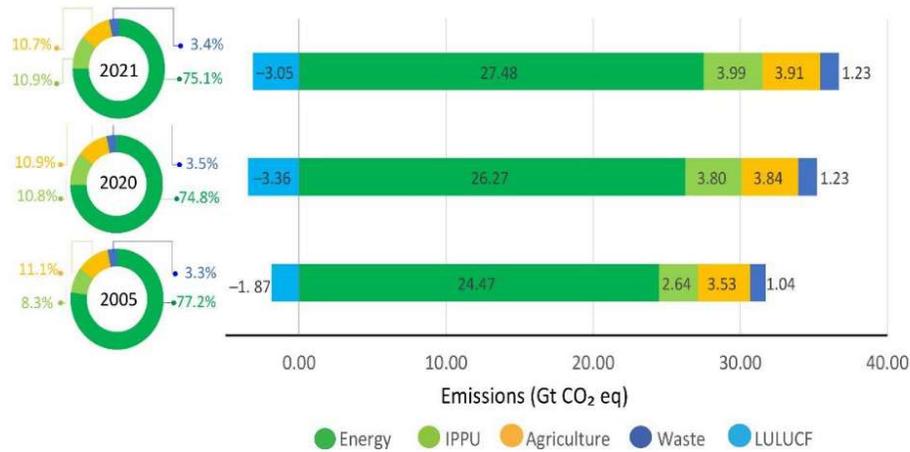
International Metrics for Tracking Greenhouse Gas Pollution Sources

A single action, such as an individual driving a gasoline fuel car on a four lane highway sixteen miles to work, can be described as pollution in multiple ways: as part of a community's inefficient transportation infrastructure; as a greenhouse gas emissions event from fossil fuel; as a replacement of carbon-storing forest with impervious road surface; etc. To navigate this classification challenge, international researchers and diplomats have agreed to use the following major categories as they measure and report on greenhouse gas emissions:

- Energy,
- Industrial Processes and Product Use (IPPU),
- Agriculture,
- Waste, and
- Land Use, Land Use Change, and Forestry (LULUCF).

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Figure 3
Total greenhouse gas emissions in 2005, 2020 and 2021 for 81 Parties, by sector



(UN Framework Convention on Climate Change, 2025 p.14)

Land Use, Land Use Change, and Forestry (LULUCF) is a unique category representing carbon held in the living environment as a “sink.” As seen in this figure, LULUCF is counted as a negative value that offsets other emissions. When absolute value of LULUCF increases, it brings down overall emissions.

The most recent UN Biennial Transparency Report (2025) shows that “deforestation and land-use change was decisive for the rapid increase in 2024 emissions (figure ES.2). Global net land use, land-use change and forestry (LULUCF) CO₂ emissions increased by 21 per cent in 2024, and were responsible for 53 per cent of the overall increase in global GHG emissions.”

Using these categories, nations and sub-national regions can take an inventory of activities that are causing pollution and identify which activities to prioritize for mitigation. The goal is for each region, over time, to change enough of their activities, sector by sector, to arrive at net zero, a state in which the carbon pollution emitted is balanced by the carbon held in the environment.

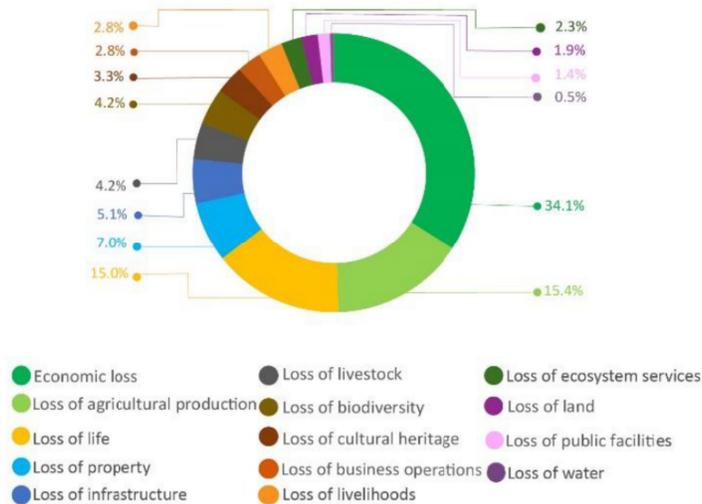
Net Zero Goal

Net zero is the idea of an environment in which there is balance between carbon emissions and carbon sinks. Early attempts to slow greenhouse gas production focused on decreasing use of fossil fuels – which made sense for developed regions that used a lot of fuel per capita, but in less developed regions that were just beginning to use the fuels and were using much less fuel per capita, it was not fair to expect a reduction. This led to the consideration of forests as carbon sinks, with the argument that a developing nation could increase fossil fuel use as long as that use was balanced by the nations' ecosystem capacity to hold carbon (Morgan, 2024). The first agreement between countries to reduce emissions, the Kyoto Protocol, overall failed to reduce emissions enough. The new Paris Agreement is similar but not open ended because it includes the balanced “net zero” target: “to undertake rapid reductions... in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century” (United Nations, 2016, p. 4)

Net zero is an emerging approach which is being defined internationally and within the US through court cases as companies and countries with high greenhouse gas emissions advertise that they “offset” these with a story or documentation of carbon storage and are challenged to prove its accuracy (Tigre & Barry, 2025). Some countries are making great progress in reducing greenhouse gas emissions; however, changes are not yet being made globally at a pace that will meet the 2050 goal and avert the worst losses:

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Figure 20
Loss associated with climate change impacts reported, by type



(UN Framework Convention on Climate Change, 2025 p.42)

Within this global government and community consensus that human activities must change, we have a the framework sets targets for every 5 years with a goal of global net zero by 2050. If we can meet these targets, we may keep the total warming effect to around 1.5 degrees C and stabilize the climate. Millions of people worldwide are working on how to set policies, educate people, and change culture in support of the 2050 goals. Within the United Nations framework, these approaches are known as the Sustainable Development Goals.

Funding Conservation and Creating Circular Economies

“In many countries, climate laws have made climate ambition a legally binding, long-term governance system. Climate laws have also proven important in aligning finance, both public and private, with climate goals, for example by establishing green budgets and redirecting investments to low carbon projects.” (UN Framework Convention on Climate Change, 2025, p. 9) Additionally many countries

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including the United States are promoting the concept of a circular economy as a goal (US EPA, 2021; Wilts, 2022). In this view, the old economy is a “model in which resources are mined, made into products, and then become waste.” to be replaced by a circular economy which “reduces material use, redesigns materials and products to be less resource intensive, and recaptures “waste” as a resource to manufacture new materials and products.” (US EPA, 2021)

The transition away from fossil fuels and toward carbon-neutral, sustainable economies has worldwide implications. Economists estimate that “globally, net income in publicly listed oil and gas companies reached US\$916 billion in 2022” with the United States “receiving US\$301 billion in fossil fuel profits both from domestic extraction and through global shareholding” (Semieniuk et al., 2024, p. 1) These profits will be greatly reduced as fossil fuels are phased out, and communities who work in the fossil fuel economy will be impacted (Kaufman et al., 2024). Deliberately changing the global economy requires working through financial and social institutions and creating new economic models. Financial investment meant to support the Sustainable Development Goals in developing nations is tracked through the World Bank and other multilateral development financial institutions, as well as through the Adaptation Fund, the Global Environment Facility and the Green Climate Fund (UN Framework Convention on Climate Change, 2025)

Institutions with large budgets are not only deploying resources to support the transition to a sustainable economy but also preparing for changes in the flow of resources that will result, and there is a lot of debate and uncertainty about what a final circular, sustainable global economy will look like. Within the Paris Agreement, while developed countries agreed to help developing countries financially, the most recent COP reports put contributions to date at 1.8% of the reported need as “37 developing country Parties reported finance needed for climate action (mostly before 2030), amounting to USD 3,396.23 billion, and 49 developing country Parties reported on climate finance received, amounting to

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USD 60.84 billion.” (UN Framework Convention on Climate Change, 2025 p.7). There are currently debates about how much financing is actually needed, whether a profit-driven finance strategy is appropriate, and whether we will be able to overcome significant institutional resistance to divesting from fossil fuels as they continue to be potentially lucrative. (Cifrino, 2024; Financial Institutions Net Zero Tracker | World Resources Institute, n.d.; Semieniuk et al., 2024; Standing, 2024)

In addition to government and private institutions funding change, nonprofits contribute significantly. Research indicates that nonprofits in the US alone spent between USD 7.8 and 9.2 billion annually on programs and activities that address climate change (Shrestha et al., 2023). The World Resources Institute (\$0.49 billion in 2025) has a staff of more than 2000 who use data to support local communities taking action (World Resources Institute, 2025). Other non-profits such as Sierra Club, Greenpeace, World Wildlife Fund and Audubon Society have financial statements in the hundreds of millions yearly (Greenpeace, 2026; Roberts, 2013; The Sierra Club, 2026; World Wildlife Fund, 2026). Among these, The Nature Conservancy, (net assets of \$9.86 billion in 2024) stands out with a nature bonds program combining debt refinancing with technical assistance. (The Nature Conservancy, 2025). In addition to the nonprofits making economic investments to reduce greenhouse gas emissions and preserve carbon sinks, watchdog groups (see Bankingonclimatechaos.org) track activities of banks in general to hold them accountable for investments that are increasing GHG emissions (Ambrose, 2025). The difficulties ahead for communities around Narragansett Bay as part of a developed, fossil-fuel dependent nation in context of this global change are great, but they are not insurmountable. Experts remind us that humans have made great advances in caring for each other to the point that we now have a much greater rate of children reaching adulthood and living longer lives, and we have refined technologies to be much cleaner than they have ever been before (Ritchie, 2024; Rosling, 2010), so its possible that we will be able to work together effectively to mitigate climate change as well.

Environmental impact of military conflict

The Belgrade Charter begins with a note which must not be forgotten:

“We need nothing short of a new global ethic... Significant changes must occur in all of the world's nations to assure the kind of rational development which will be guided by this new global ideal - changes which will be directed towards an equitable distribution of the world's resources and more fairly satisfying the needs of all peoples. This new kind of development will... require the maximum reduction in harmful effects on the environment, the utilization of waste materials for productive purposes, and the design of technologies which will enable such objectives to be achieved. **Above all, it will demand the assurance of perpetual peace through the coexistence and cooperation among nations with different social systems. Substantial resources for reallocation to meet human needs can be gained through restricting military budgets and reducing competition in the manufacture of arms. Disarmament should be the ultimate goal.** [author's emphasis]” (United Nations

Environment Programme, 1975)

General educators teaching the environment should know that “Armed conflicts use large quantities of munitions containing heavy metals and depleted uranium, and explosive chemicals, all toxic even in modest quantities, with devastating impacts on human health and the environment.” (United Nations, 2025a), In addition to the pollution on the ground because of war, militaries in general are responsible for 5.5% of global greenhouse gas emissions (United Nations, 2025a). Among these, the United States Department of Defense is the world's single largest institutional consumer of oil (Watson School of International and Public Affairs, 2025) Also published by the Watson School, Pemberton's recent research on military spending highlights unnecessary projects that are not only inefficient, but environmentally destructive, and includes “a case study showing that it is possible to convert military

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technology to civilian purposes” with “the potential to redirect military economies toward the urgent cause of avoiding climate catastrophe.” (Pemberton, 2023, p. 1)

International Environmental Education Reference Frameworks: the Sustainable Development Goals and Non-Profit Conservancy

Two major reference frameworks shape environmental education internationally: the United Nations and Non-Profit Organizations (also known as Non-Governmental Organizations (NGOs)).

The United Nations influences education as its bodies set standards, report on the state of education in each nation, and often work in collaboration with academic institutions, but they do not credential knowledge. The United Nations Educational Scientific and Cultural Organisation (UNESCO) has been active since 1945 supporting international collaboration between academics and the spread of basic education through lifelong learning programs. UN agreements often include sections dedicated to implementation through education. For instance, Section K of the Kunming-Montreal Global Biodiversity Framework established in 2022 signed by 196 countries, (not including the United States) is dedicated to “Communication, education, awareness and uptake” of the practices and ideals outlined in the main document.

The United Nations adoption of the Sustainable Development Goals (SDGs) in 2015 led to the definition of Education for Sustainable Development (ESD) which “empowers learners to take informed decisions and make responsible actions for environmental integrity, economic viability, and a just society.” Education for Sustainable Development is “holistic and transformational and encompasses learning content and outcomes, pedagogy, and the learning environment itself. ESD is recognized as a key enabler of all Sustainable Development Goals and achieves its purpose by transforming society.” (Education for Sustainable Development | UNESCO, 2026)

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This global reference framework has had wide ranging effects with institutions adopting the framework to varying degrees. For an example, see the University of Strathclyde in Glasgow research portal where all work is tagged according to corresponding SDGs (<https://pureportal.strath.ac.uk/en/publications/>).

Non-profit and Non-Governmental Organizations influence environmental education through Conservancy work and program design requirements tied to aid funding. This international work has a mixed history of blending discriminatory practices and Western priorities with the admirable intentions of protecting and preserving nature. Mainstream best practices in conservation are reference frameworks. For example, the online training platform from The Nature Conservancy (<https://www.conservationtraining.org/totara/dashboard/index.php>) and MIRADI, an associated online conservation project planning tool. Also relevant, but somewhat dated in approach, the Audubon Tools of Engagement publication (Braus, 2011) All current international conservation program planning references include mechanisms to honor and include indigenous and local populations in their work; however, indigenous people themselves report that this is more rhetoric than substance.

In 2021 Indigenous people from across the world gathered at a counter-congress: “Our Land, Our Nature” to the IUCN World Conservation Conference. At this gathering 36 talks were presented, and the collective prepared the *Marseille Manifesto: A People’s Manifesto for the Future of Conservation*. (Dawson et al., 2023) These lectures witness failures of Protected Areas established through conservation efforts to recognize community land ownership; failures of nations to uphold the standard of free, prior and informed consent of the indigenous; and failures of fortress conservation approaches to actually protect ecosystems. From the manifesto:

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“Decades of research and experience have shown that the mainstream approach to biodiversity conservation has had a devastating impact on Indigenous and other local people's lands, livelihoods, and rights. This has largely been based on the flawed thinking that believes in “nature” devoid of human presence. This single-minded focus has led to a model of conservation that is often violent, colonialist, and racist in approach-seizing and militarizing the land, criminalizing and destroying the ways of life of Indigenous and local communities, while ignoring their knowledge. This model, despite the pain it causes, has never prevented the destruction of the ecosystems that it claims to be protecting.” (Dawson et al., 2023, pp. 227–228)

Context of indigenous knowledge systems

At least a quarter of the world’s natural areas are stewarded by indigenous communities (Drissi, 2020), so while Western notions of learning may dominate in education institutions for developed areas, indigenous knowledge holds the key to ecosystem health in many places. These are “major systems of thought and beliefs embedded in entirely different values and epistemological systems” from conventional Western ones (Merriam, 2020, p. 269), and they should be considered as part of any environmental education focused on sustainability.

Indigenous knowledge systems integrate environmental education by valuing “contextualized knowledge that is local and particular to the setting.” (Brayboy & Maughan, 2009, p. 10) Within these systems, “A person understands that [their] actions affect everything else, and [they are] invested in maintaining necessary balance.” (Brayboy & Maughan, 2009, p. 10)

“The process of contextualizing what is being learned and tying it to the actual lives of the children is an important part of Indigenous Knowledge Systems. It is not just a way of teaching but, rather, is tied into a particular pedagogy that more fully nuances the use of knowledge and ways of being... Consider

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the important scholarship of Dakota and mixed-heritage scholar Mary Hermes (2005), who focuses on the importance of context in the language learning of Ojibwe students in schools. One of the elders/teachers in Hermes's (2005) study notes: "I asked them [the elders], 'Is a ma'iingan in a zoo a ma'iingan?' They said, 'No, it is a wolf.' Because ma'iingan requires a context. I can't take it out of context without changing the meaning. Everything in English is taken out of context." (Brayboy & Maughan, 2009, p. 11)

As a descendant from a colonizing culture, I recommend that general educators learn more about indigenous knowledge systems by reading, listening to, and hearing indigenous people directly. Texts that I have found helpful: *Indigenous Knowledges and The Story of the Bean* (Brayboy & Maughan, 2009); *Braiding Sweetgrass* (Kimmerer, 2013); *Decolonize Coservation* (Dawson et al., 2023); and local offerings by members of the Narragansett tribe including an interview about foraging as an inter-generational practice by Wanda Hopkins with Silvermoon LaRose (Hopkins, 2024).

Indigenous Knowledge Systems are recognized for their capacity to maintain environmental health, and Western scientists and Indigenous knowledge keepers, some of whom hold both identities, have documented successful environmental preservation and restoration through inclusion of Indigenous practices, advice, and voice (Brayboy & Maughan, 2009; Cox, 2021; Grossman, 2008; June, 2022; Kimmerer, 2013) The Fifth Climate Assessment published by the United States notes: "The long-term environmental knowledge and socioecological memory held by Indigenous Peoples has helped to detect, understand, and predict complex changes in climate systems. Further, land management approaches based on Indigenous Knowledge have long emphasized flexibility and diversity of resources and serve as successful examples of resilient practices under complex environmental changes." (Crimmins et al., 2023)

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Internationally, the UN Paris Agreement advocates for integration of Indigenous Knowledge Systems (sometimes also referred to as Traditional Ecological Knowledge (TEK)), with parties acknowledging that adaptation action should “be based on and guided by the best available science, and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integration adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.” (Paris Agreement, Article 7, 2015)

This approach is also listed as a best practice in environmental education references, with the North American Association for Environmental Education guidelines recognizing “Overlapping Qualities of Indigenous Knowledge Systems and Science as a Way of Knowing... with common ground that includes habits of mind (e.g., perseverance and open-mindedness), skills and procedures related to observation and pattern recognition, and knowledge (e.g., plant and animal behavior, cycles, habitat needs).” (NAAEE Guidelines 3, 2025, p. 23)

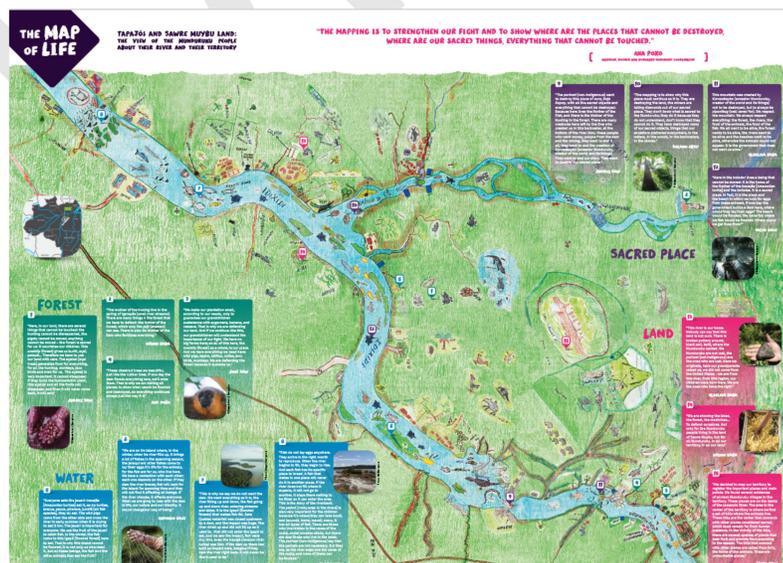
Indigenous peoples as sovereign nations in relation to the United States and United Nations:

In the United States of America, “Reflective of their sovereign status predating the United States, Tribal Nations have government-to-government relationships with the federal government. These relationships bear significant similarities to those which the United States shares with nations around the world. These relationships are evidenced by the numerous treaties... The legitimacy of [which]... has also been affirmed in numerous acts of Congress, Executive Branch actions, and judicial precedents.” (NARF, 2025) The United States has a history of failing to uphold or enforce this legal status (Zinn, 2004), so in addition to defending their traditional lands and ways of life in person, indigenous people have had to advocate and protest against settlement and disruptive resource extraction through Western legislative and legal processes for centuries (Dunbar-Ortiz, 2014).

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Internationally, indigenous people have experiences similar to tribes across North America who have been restricted from their customary lands into reservations by the United States. Sovereign nation status might lead to the assumption that tribes could represent their interests on an equal footing with other nations in the United Nations, but, as mentioned in the definitions section of this work, the United Nations still has not resolved the issue of authentic representation for Native American tribes or any of the other thousands of groups that share indigenous status. Two recent and ongoing struggles: of the Munduruku people in the Amazon forest and of the Dine tribes on the Colorado River illustrate these contemporary issues.

In November of 2025, 50,000 people from 190 countries convened for a conference in Brazil to update our global progress toward addressing climate change. COP30 was the 30th meeting of the Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC), and it was prevented from beginning by a protest blockade- the Munduruku people. They were protesting Brasil's plan to build "São Luizdo Tapajos dam, [which] would cause irreversible damage to one of the last major Amazon rivers free from dams and [their] home." (Munduruku, 2025) In addition to the protest strategy, they had collaborated with Greenpeace to create a map of the resources that they rely on and that will be devastated if this dam is built:



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Map Source: (Munduruku, 2025)

The dam and a railroad are being constructed with the support of an international food corporation, Cargill, whose activities are driving deforestation in the region as locals are incentivized to grow soy and beef for export through their supply chain. As of Feb 2026, the Mundukuru and other allied peoples from the region whose lifeways are going to be destroyed by this development have succeeded in pausing, but not yet defeating the plan through protest at the Cargill site and on the international stage_ (Gustin, 2026). This international issue has a local connection on the Narragansett Bay as Cargill also operates a major meat processing plant here near the Quonset port_(Cargill, 2025).

Within the United States, most indigenous people have been separated from their customary environments by relocation to reservations. Reservations do not have the same resources that tribes traditionally relied on, and settlers, now known as Americans, have also increased in numbers on the land around reservations that they took during colonization. This history leads to competition for water in the present, and after a period of extreme drought from 2000-2022 exacerbated by climate change, the Dine tribe, also known as the Navajo Nation, filed a suit seeking “to compel the United States to take affirmative steps to secure needed water for the Tribe—including by assessing the Tribe’s water needs, developing a plan to secure the needed water, and potentially building pipelines, pumps, wells, or other water infrastructure. The States of Arizona, Nevada, and Colorado intervened against the Tribe to protect those States’ interests in water from the Colorado River.”(21-1484 Arizona v. Navajo Nation (06/22/2023), 2023) The argument was over whether the original treaty meant that the federal government had an obligation to ensure water would continue to flow to the tribes area instead of being

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used up by Arizona, Nevada, and Colorado. The Dine lost the case in June 2023, but the issue of water rights and stewardship of the land to prevent more severe drought continues to be contested.

“[Indigenous communities](#) are increasingly pushing back against the current State-centric, profit-driven exploitation of nature by introducing principles of interconnectedness and kinship with the environment, drawing on international human rights legislation.” (Bouyayachen, 2024) These arguments extend beyond seeking to protect reservation lands to include a vision of “land back.” In a June 2022 talk, Lyla June of the Dine Nation explains how returning more land to the care of native people could restore ecosystems and potentially avert more catastrophic ecosystem breakdown. In this talk, June also gives four indigenous knowledge approaches for Western people to try: “work with nature, expand habitat, de-center humans, and design for perpetuity” (June, 2022)

In the Narragansett Bay region, environmental educators should visit the Narragansett Tomaquag museum, and not only listen to the stories which are readily available to find online, but hear and act on the requests by indigenous communities for changes in approach to environmental stewardship and land ownership that can revive these ecosystems in collaborations that respect indigenous knowledge.

Indigenous knowledge systems and the rights of nature and non-human living beings:

As a result of indigenous people defending the rights of their cultures to be respected and valued, western culture is integrating indigenous approaches into reference and policy documents by recognizing the rights of nature and non-human living beings.

In 2019, a UN Harmony With Nature report reflecting on the 2009 declaration of International Mother Earth Day provided a digest of national and international opinions and events in support of the Rights of Nature and Mother Earth: ““Nature is no longer just a thing”, stated Justice Antonio Herman Benjamin of the High Court of Brazil. “Granting rights to Nature reflects a profound change from the

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traditional legal wisdom which once considered Nature just a collection of elements and now sees Nature as the meaning and foundation of all life. This shift in paradigm, once the topic of philosophical and ethical circles, now reveals itself as a legal paradigm.””

“Customary and indigenous laws continue to serve as models for the expansion of Western positive law toward respecting Nature and Nature’s rights. An increasing number of indigenous groups have taken formal action to incorporate into their governing laws what they have long understood as the basic truth of life: humans are part of the natural world and must live in harmony with Nature.” (United Nations, 2019, pp. 3, 26) For example, in 2023, Michigan State University College of Law convened a conference considering: “the new global movement known as the “Rights of Nature,” which redefines environmental conservation and shifts the focus from nature as a resource to be exploited to nature as a legal living entity” (MSU College of Law, 2023) These advancements are “paving the way for a shift towards a more inclusive and less government-focused international legal system.” (Bouyayachen, 2024)

“The concept of “rights of nature” encompasses various ideas such as the commons, ecological solidarity, and ecological integrity, among others. This concept has the potential to shift the focus of international law from a social contract to a natural contract, providing a significant catalyst for societal change. Some communities have already enacted laws recognizing the rights of ecosystems, within their territories.” (Bouyayachen, 2024) The legal recognition of the “commons” or customary land use is similar to the legal recognition of accessibility (where, for instance, curb cuts for wheelchairs also make the sidewalk more accessible for parents with strollers) in that it provides a framework whose benefits can extend beyond indigenous land use to issues such as shoreline access for the general public – a topic that is regularly being negotiated in multiple locations around the Ocean State (Haas, 2025).

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The Kunming-Montreal Global Biodiversity Framework is another international reference that integrates this thinking. Signed in 2022 by 196 countries (but not the United States) it has four long-term goals related to the 2050 Vision for biodiversity, summarized here in brief:

- GOAL A to reduce extinctions and maintain genetic diversity, safeguarding adaptive potential
- GOAL B to use biodiversity sustainably
- GOAL C to share the monetary and non-monetary benefits from genetic resources including digital sequence information and traditional knowledge
- GOAL D to ensure adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology “are secured and equitably accessible to all Parties” (Kunming-Montreal Global Biodiversity Framework, 2022)

Indigenous People around the Narragansett Bay

General educators preparing to teach environmental topics in the Narragansett Bay region can honor indigenous knowledge as part of their practice, but in order for this to be ethical, they must:

- be prepared for an accountable telling of history with regard to indigenous peoples who were displaced and attacked by settlers and whose descendants survive in the region.
- be able to place this story in context of indigenous peoples history and role as environmental stewards within a global community; and
- be considerate of the fact that Indigenous peoples around the globe, and here at home in Rhode Island, continue to live with a daily threat of existential elimination (Cox, 2021) because

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settlement, colonization, and genocide, have damaged or removed them from their ecological context (Holocaust Museum Houston, 2023).

Original tribes living in the Narragansett Bay region included the Narragansett, Nipmuck, Niantic, Wampanoag, Manisseans, Sakonnet, and Pequot. The importation of British livestock, diseases, land ownership, and resource extraction practices beginning in the 1600s was devastating to these people. Damage has persisted through American imperialism and continues today with Narragansett people no longer having “access to many areas they have historically inhabited or used for hunting, fishing, or gathering materials.”(Cox, 2021, p. 40). The Narragansett nation had to struggle for recognition by state and federal governments- which did not occur until 1983 (Narragansett Tribe, 2025). They are the only tribe in this region that has been federally recognized. Recently, some other groups who identify with an indigenous lineage have been recognized by local institutions outside of the federal process (Hernandez, 2025). All educators working in the Narragansett watershed should spend some time learning more of this history about which there are many references available.

In addition to the historic displacement, climate change now changes the quality and abundance of plant, animal and other non-human life that Narragansett traditionally use, with specific plants such as Black Ash and cattails becoming rare and certain types of bait fish disappearing from the freshwater ponds. (Cox, 2021) “When there is a disturbance in the natural world, it disturbs the culture of the Tribe. All the problems the Tribe has already faced and will face in the future regarding climate change will impact the Tribal way of life in ways that someone from a colonial descent could never understand.” (Cox, 2021, p. 43)

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Indigenous knowledge and Western environmental education around the Narragansett Bay.

Indigenous knowledge systems are recognized worldwide for their protection of biodiversity and environmental health. Each indigenous culture holds a unique and inherent approach to environmental education that cannot be extracted or adapted for use in Western education; however, western teachers can open their practice to influence from indigenous teachers. With this approach they can adjust their own relationships to the environment; teach others to respect and restore indigenous rights; value the knowledge systems that connect indigenous people to their traditional lands; and spread understanding of legal frameworks that can protect biodiversity and nature.

A first North American location of settlement and colonization, the Narragansett Bay region is one of the most densely populated areas in the nation (US Census Bureau, 2026). Of the 1,112,308 people living around the bay in the State of Rhode Island, 1.4 - 4.6 % are members of federally recognized tribes (though many more may be descended from colonized and displaced peoples). Of these, about 2400 are members of the Narragansett nation (“Perseverance,” 2025) Additionally, the land itself has been radically changed by settlement and development over the past 350+ years.

This environment and population history make a challenging context for developed communities to authentically hear and integrate indigenous knowledge systems in environmental education, especially formal arguments that envision returning environmental stewardship to the care of indigenous peoples and their knowledge systems. For instance, when Dolores Calderon at Western Washington University puts forward an idea of “land education” that “demands that... models for forming relationships with place... delineate and de-construct” the legal landscapes of settler colonialism (Calderon, 2014, p. 26)

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this seems like a quick way to cause anxiety and resistance among descendants of colonists and recent arrivals who have invested full livelihoods into property ownership in the Narragansett region.

That said, there is ample evidence that property ownership structures currently in place are not serving all community members well (Public Development and Ownership of Housing: A Feasibility Study for Rhode Island, 2024; Rolnik, 2010) as our communities struggle with housing affordability, water shortages, legacy pollution, and deforestation. In this context, environmental education programs are potential vehicles for communities to develop new community ownership practices that could meet current needs and become reference documents for future ways of living that reflect and complement customary Narragansett relationships to the land.

International conservation best practices list inclusion of indigenous people as essential to reduce pollution and stabilize environmental health (TNC: Dashboard, 2025), so it is an area that must be explored. “It is not an easy task acknowledging that the place we find ourselves is Indigenous land and that is why it is essential to form relationships with Indigenous peoples to relearn about the place we live.” (Calderon, 2014, p. 28) In context of the Narragansett Bay area, we have a small community, and it is not difficult to attend presentations by tribal members and allies to learn more. Western educators should do this, but with caution not to expect tribal members, who are few, to do the work of educating them 1:1 when there are many references available that they can use for learning on their own. There is a way to build a next chapter of history that integrates environmental health in a way that meets needs of current “non-native” inhabitants as well as the Narragansett tribe.

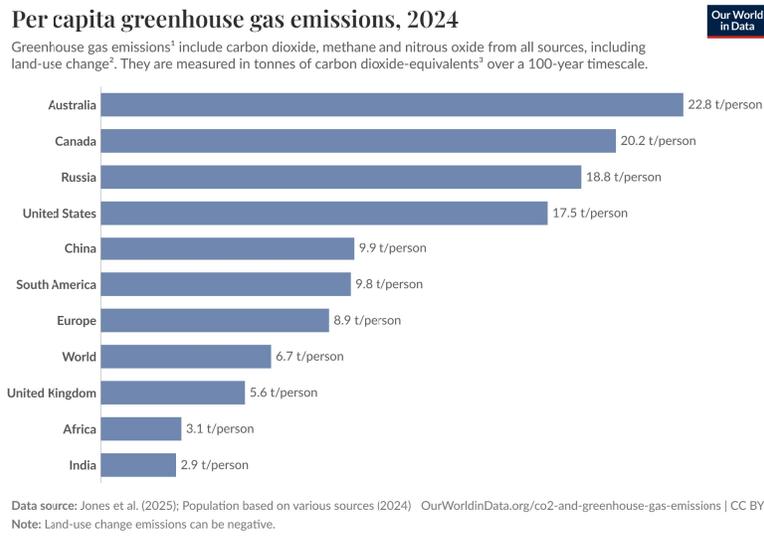
Context of national environmental education:

“The United States is the largest economy in the world and the third largest country in terms of population and geographic area. As such, it faces a unique set of domestic circumstances,

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and plays a singular role in global systems. “ (United States, 2022, p. 9)

The United States has historically been one of the largest carbon pollution sources in the world. (Our World in Data, 2025). From an equity perspective, the per capita greenhouse gas emissions of the United States are much greater than those of many other countries.



(Our World in Data, 2025)

The United States Government has made great contributions to climate science and education, while simultaneously being one of the world’s largest emitters of greenhouse gases. An overview of US contributions to climate science can be found in the History of Climate Change Interactive Timeline (University Corporation for Atmospheric Research (UCAR), 2022).

The U.S. Global Change Research Program (USGCRP) was established with the passage of the Global Change Research Act in 1990. The USGCRP was “charged with coordinating scientific research within the Federal Government on global change and its potential implications for natural environments and communities.” Federal departments that participate in the USGCRP include: Agriculture, Commerce,

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Defense, Energy, Health and Human Services, the Interior, State and Transportation. Additionally the group includes five agencies: the Environmental Protection Agency; National Aeronautics and Space Administration; National Science Foundation; Smithsonian Institution; and the Agency for International Development. Members from each of the departments and agencies are on the Subcommittee on Global Change Research within the National Science and Technology Council.

“The USGCRP is mandated to coordinate federal research on climate change and to assess global change in national assessments... In addition, the USGCRP participates in international collaborative efforts such as the Intergovernmental Panel on Climate Change assessments, the World Climate Research Programme, and the Inter-American Institute for Global Change Research.” (U.S. Global Change Research Program, 2000)

This group has published 3 documents that remain as valuable references:

- 2009 publication “Climate literacy The Essential Principles of Climate Sciences, A guide for individuals and communities” appropriate as general reading (U.S. Global Change Research Program A, 2009)
- “Global Climate Change Impacts in the United States, A State of Knowledge Report” which contains data, graphs and references to studies that should be accessible for teachers and local environmental professionals to interpret and share with community members. (U.S. Global Change Research Program B, 2009)
- The Fifth Assessment of 2023, which is a behemoth document at 1834 pages, but it is well organized, edited and linked for navigation. (Crimmins et al., 2023)

Despite having had a substantial role in funding research contributing to the international understanding of how human activity impacts the environment, the United States engagement from the

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Kyoto Protocol in the 1990s, through the Paris Agreement in 2015 to today has been inconsistent.

Federal leadership has alternately engaged and withdrawn from international agreements and processes, and the Senate and Congress have never managed to unite with a plan to reduce greenhouse gas emissions domestically or to halt deforestation and reforest to increase our carbon sequestration capacity.

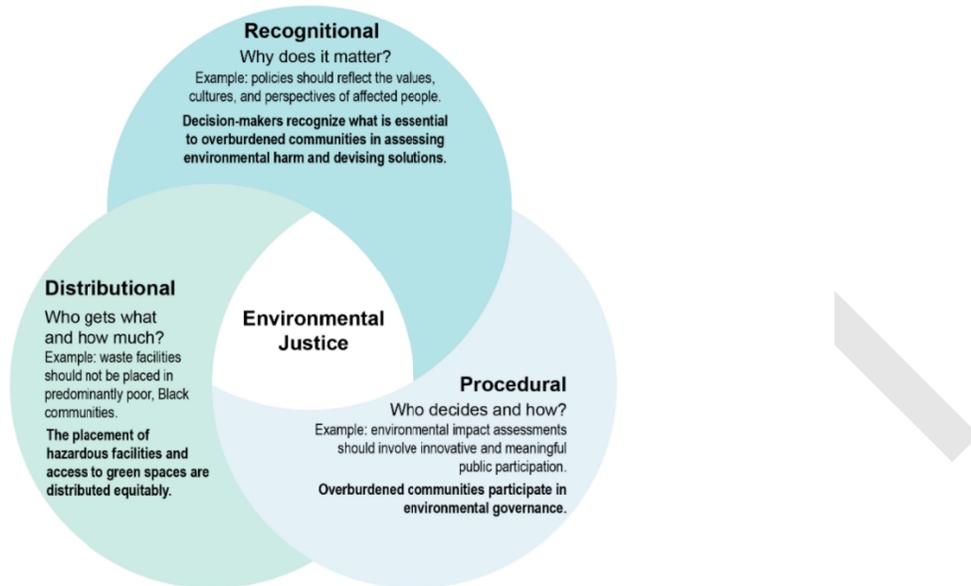
Thousands of professionals nationwide still gather data and collaborate to decarbonize the US economy- taking extra action in the times when climate is a political priority. Most recently, under the Biden administration, there was action to support both rapid decarbonization and a just transition with the Justice 40 initiative: “a portfolio of environmental, climate, and economic justice policies that seek to ensure no one is left behind by climate change and energy transformations.” by aiming “to ensure that 40% of the benefits in [climate] investments flow directly to disadvantaged communities.”

(Crimmins et al., 2023, p. 909)

Environmental Justice is a topic of contention because it requires us to change established power structures. For example, consider these prompts from 5th national assessment:

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Three Dimensions of Environmental Justice



Environmental justice requires three dimensions: recognitional, distributional, and procedural justice.

Figure 20.1. These three dimensions of justice are based on a framework originally summarized by the “father of environmental justice,” Robert Bullard,¹ who pointed to the “ethical and political questions of ‘who gets what, why, and in what amounts?’” Commitments to each dimension are essential to achieving environmental justice, and each dimension can influence the others.^{2,3,4} Figure credit: Puget Sound Partnership, Citizen Potawatomi Nation, and University of Michigan.

The United States does not have a strong record of authentically engaging in environmental justice work, and the executive policy as of 2025 has been one not only of minimizing climate change, but outright suppression of decades of researched information and community building. The US Global Change Research Program web site has been shut down making its foundational science documentation less accessible (ABC News, 2025), and research for this paper was slowed by a regular occurrence of “file not found” results when searching for environmental science and policy documents across multiple United States’ “.gov” sites.

In 2025 “Within the G20, the United States is one of three Member States showing “the least support” for the 2030 Agenda, and was one of six Member States overall that failed to submit a “Voluntary

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National Review” updating “the international community” of its progress with the SDGs” (Strobel, 2025) As they have for the past 30 years, stakeholders in the international community are moving forward with or without the United States and other polluting nations, and the United States risks facing legal and financial consequences for choosing not to curb preventable greenhouse gas emissions that harm the global population.

National Environmental Education Reference Frameworks:

The United States is the only country in the world where 29% of people believe that we should be teaching LESS about climate change, not more. This stands in contrast to the majority of other countries where under 6% have the same position (Flynn et al., 2024). This attitude impacts formal education systems on a national level across post-secondary, K-12, and workforce/adult education- a vast system impacting hundreds of millions of people. Among these, this review will focus on general educational references, records, and materials that the general public could access for personal use or in the course of environmental education work.

Post-secondary

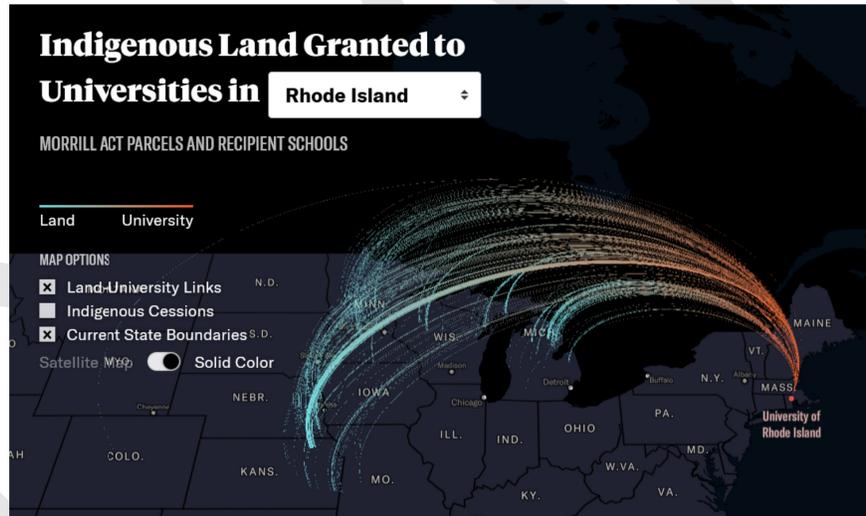
For students in the United States who choose environmental science concentrations, there are plenty of high quality programs offering undergraduate and graduate degrees that treat environmental topics with rigor, but general undergraduate education requirements concerning the environment are not robust.

While most undergraduate programs include required credits in science, research by [Plutzer et al., 2024](#) notes that climate science is only a standard requirement at a few institutions. Even within biology courses where one might expect climate science to be routinely addressed, a team at Columbia Climate school found that “in the 2010s, coverage of climate change decreased. The high point was an average of 52 sentences about climate change in the 2000s, but it dropped to 45 sentences in the 2010s.

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Moreover, solutions to climate change, which had comprised 15 percent of the climate content in the 1990s, fell to three percent. [Also,] Information about climate change was also left to the last two percent of the text, making the topic easier to shortchange if teachers run out of time.”(Colombia Climate School, 2023)

Additionally at the post-secondary level, the United States has a network of universities with a mission that directly impacts the environment: Land Grant institutions. Established through the Morrill Act of 1862, these must all make contributions to agricultural teaching, research, and extension. The U.S. Cooperative Extension Service in particular provides non-formal education to agricultural producers and communities across the nation. These “extension schools” offer a wealth of information about the full array of plants, animals and non-human life specific to their areas through workshops and accessible online publications. These institutions represent a significant body of knowledge that has been accumulated for public benefit. Its also important for adults to know that funding for Land Grant institutions came from sale of more than 10 million acres of indigenous land expropriated by the federal government over decades, with some institutions still holding those lands (Lee et al., 2018). This injustice remains.



source: <https://www.landgrabu.org/universities>

Research on the impact of land grant institutions finds that they increase the rate of patents and funding for research in communities, but “there is less clarity regarding how useful these innovations were or

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how widely they diffused” (Andrews, 2019, p. 6) Additionally while they correlate to increases in crop yield, they do not actually contribute substantive increases in total agricultural output. (Andrews, 2019).

Workforce Innovation Opportunity Act (WIOA)

In addition to supporting post-secondary and K-12 education, federal funds support Workforce Education for adults and out-of-school youth through the Workforce Innovation Opportunity Act (WIOA). Governor’s workforce boards in each state work with employers and employment data to identify skilled jobs that are hard to fill, and then WIOA funds pay to train unemployed workers for those jobs. When environmental jobs are part of the state workforce plan, WIOA funding can be used to pay for this job training. Among these potential environmental roles, higher wage technical roles needed to build and upgrade energy infrastructure typically qualify for this funding, while lower wage agriculture and forestry roles that support carbon sequestration do not. (Rhode Island Occupational Cluster Analysis, 2025)

Kindergarten through Twelfth Grade (K-12)

American K-12 public education receives about 2.7% of federal spending yearly while state and local governments spend closer to 35% - slightly more than 8 local dollars for every federal dollar awarded. (Federal Reserve Bank of St Louis, 2025) The United States government does not prescribe what states will teach students about the environment, but legislation does require states to demonstrate certain practices to qualify for federal funding. Most recently, the Every Student Succeeds Act (ESSA) of 2015 requires every state to measure student performance in reading, math, and science according to standards (Office of Elementary and Secondary Education, 2025), and this has had an impact on environmental education at the national level with 20 states adopting the Next Generation Science

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Standards (NGSS). NGSS include teaching climate change science, so as a result of ESSA “In approximately half the U.S. states, students will learn that climate change is attributable to human activity.” (Osborne et al., 2023, p. 5) Plutzer et al (2024) confirm this, finding that “climate change education in the U.S. is improving at the crucial middle school level and... Teacher attention to climate change—as reflected in the number of class hours devoted to the topic—increased most sharply in states that adopted the NGSS or standards”

24 other states using standards adapted from the older *Framework for K-12 Science Education* are not necessarily teaching climate science. This affects not only students in those states, but also the general production of materials for use in education. “Because climate change has been politicized, textbook publishers often use ambiguous language that avoids controversy to secure approval for their books by the boards of education of the large markets.” For instance, “Texas, the top oil- and natural gas-producing state in the nation, is also the largest market for science textbooks for K-12 and has its own science standards.” (Colombia Climate School, 2023)

Formal environmental education at the national level is not strong overall, with US students scoring only slightly above 40% correct on environmental science questions on the PISA 2015 international science assessment (Kraft et al, 2025). Results of the most recent PISA 2025 are still to be released. It is important to note that these formal education frameworks target academic knowledge, but do not measure knowledge in action.

Non-formal education at the national level:

The North American Association for Environmental Education while not technically a national organization, is included here as its materials are in English and designed primarily for educators working in the United States. The North American Association for Environmental Education

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(NAAEE) summarizes three principal defining approaches to environmental education: Environmental Education (EE); Education for Sustainable Development (ESD); and the idea of an Environmentally Literate Person (NAAEE Guidelines 3, 2025, p. 10). They have published a comprehensive series of six Guidelines for Excellence documents (North American Association for Environmental Education, 2019) (#1 K-12 Environmental Education; #2 Environmental Education Materials; #3 Environmental Educator Knowledge and Skills; #4 Environmental Education Programs; #5 Early Childhood; #6 Community Engagement) in addition to offering a detailed evaluation process (eeVAL) online.

Public records of environmental data are another significant component of non-formal education as they represent the basis for a wide range of potential education materials. The cumulative public environmental knowledge represented in research data sets such as: arcgis; NOAA; land grant extension school publications; and other EPA records are probably one of the greatest national contributions to environmental education. These are freely available online for educators to use as a supplement to published curriculum materials, and many do. Public exhibits and archives at national museums and libraries represent another body of records that include potential environmental education materials, but these do not fall within the capacity of this review.

Context of Local Environmental Education

Despite the chaotic federal environmental policy, there are multiple collaborative environmental efforts between smaller groups of states that have a big impact and which adults around Narragansett Bay should be aware of. In the New England Region, we have The Regional Greenhouse Gas Initiative (CT, DE, ME, MD, MA, NH, NJ, NY, RI, VT),(The Regional Greenhouse Gas Initiative, 2025) a successful agreement between states to reduce greenhouse gas emissions. A companion agreement, The Transportation and Climate Initiative (TCI) has been proposed but not finalized. This would engage 13

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states and Washington D.C. (Rhode Island among them). “taking action through working groups focused on regional priorities, such as clean vehicles and fuels. Several TCI states are also now working together to explore potential regional policies to improve transportation systems and reduce pollution.” (Transportation and Climate Initiative, TCI, 2021)

Additionally, the Rhode Island community has climate legislation and a climate action strategy. We have already made significant changes in response to climate change (Bertolacini, 2025), and we were the first state to permit an offshore wind farm. (New England for Offshore Wind | Overview - New England for Offshore Wind, 2022a) In 2022 we were the only New England state to reduce carbon emissions (Lavin, 2024). Despite federal executive opposition to environmental protection beginning in 2025, the RI 2025 Draft Climate Report states: “Rhode Island will continue to prioritize protecting the health and integrity of its natural ecosystems and enhancing their carbon sequestration and storage through natural climate solutions.(Rhode Island 2025 Climate Action Strategy, 2025)”

Key Elements of Rhode Island's Climate Action Strategy:

Energy Efficiency We will make sure that our homes, buildings, and transportation use energy as efficiently as possible so we need less.

Transition Away from Fossil Fuel We will transition our buildings, vehicles, businesses, and manufacturing away from using oil and gas and towards electricity and alternative fuels.

Green our Energy Supply We will produce energy from sources like wind and solar to make sure that when we transition to electric power it will be clean.

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Remove Carbon from the Air We will conserve open space and forests, plant more trees, and support agriculture so that carbon will be stored in plants and soil.

Just Transition We will help the community to make a just transition to a new energy system by supporting workers to learn new trades, making streets safer for multiple forms of transportation, addressing needs around transit, food, and public green spaces, and supporting local climate resilience plans.

(2025 Climate Action Strategy | Climate Change, 2025)

Rhode Island established an Executive Climate Change Coordinating Council (EC4) as part of the Resilient Rhode Island Act in 2014. This group brings together 13 different agencies from within government and “incorporates consideration of climate change impacts into the powers and duties of all state agencies” (EC4 Overview | Climate Change, 2025) They release regular progress reports and maintain a “Timeline of Climate Actions” which gives a broad overview of reports, plans, legislation, and action that is linked to support navigation.

The work of the EC4 impacts many government sectors. For instance three of fifteen RI Department of Health Equity Measures concern the physical environment (Rhode Island Department of Health, 2025) In addition, housing policy now encourages density and proximity to transportation over breaking up forested land for new housing (Public Development and Ownership of Housing: A Feasibility Study for Rhode Island, 2024).

The EC4 also coordinates with the Department of Environmental Management to prepare yearly reports on greenhouse gas emissions and the state of our Natural and Working Lands/ Land Use, Land Use Change and Forests, so that we can track our progress The Rhode Island greenhouse gas emissions report does not present data in categories identical to United Nations reporting, but the methods are

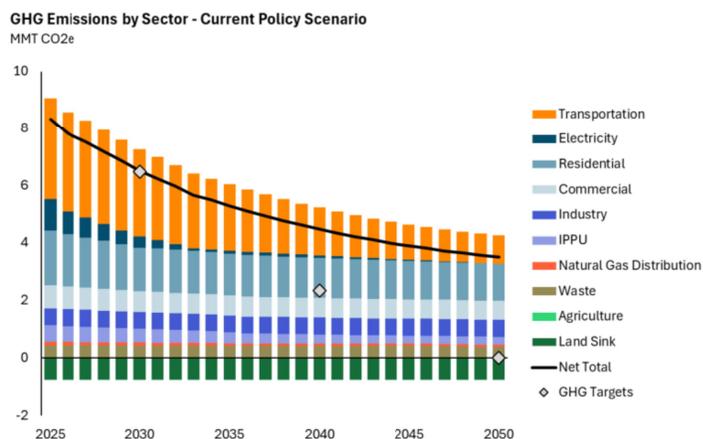
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aligned as part of our national reporting process from the times when the federal government was participating in the Paris Agreement. (RIDEM, 2025):



The Act on Climate law of 2021 sets pollution reduction targets of 45% below 1990 levels by 2030, 80% by 2040, and net-zero by 2050; however, emissions reductions in the Current Policy scenario only reach 62% below 1990 levels by 2040 and 70% below 1990 levels by 2050:

Figure 3: Emissions Projections Under Current Policies



From (Rhode Island 2025 Climate Action Strategy, 2025, p. 12)

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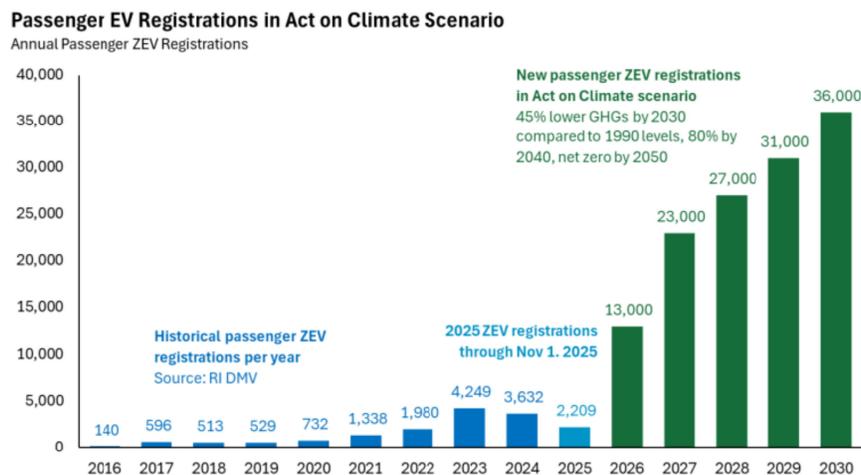
So, we are not on track even in the best case scenario with our current approach to reach net zero by 2050, and to complicate this, the current federal administration has undermined the plan we do have with recent budget cuts- a cascading impact de-funding decarbonisation (Lavin, 2026).

Priority Areas for Pollution Reduction and Environmental Stabilization in Rhode Island:

Transportation

“Transportation is currently Rhode Island’s highest emitting sector, contributing 3.65 MMT CO₂e in 2022, around 35% of total gross GHG emissions. In the transportation sector, transitioning from internal combustion engine vehicles powered by gasoline or diesel to EVs will be fundamental to reaching the state’s climate goals. In the Act on Climate scenario, it’s assumed about 142,000 EVs would be on the road by 2030, necessitating the annual sale of 13,000 EVs sold in 2026 increasing to 36,000 EVs sold in 2030” (RI 2025 Climate Action Strategy, 16) Adults need to know that this strategy assumes a six and then ten -fold increase in EV sales for the next two years, and even if this is possible, we will still not be on track for net zero, so additional solutions must be explored.

Figure 5: New Annual EV Registrations Needed to Reach Act on Climate¹³



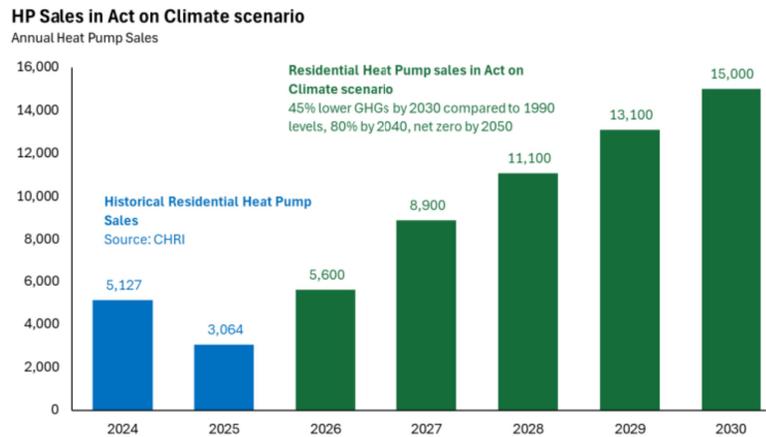
Heating and Cooling

After transportation, the energy use of residential and commercial buildings is the next greatest pollution source in Rhode Island. “In the near term, the modeled pathway in the Act on Climate scenario results in roughly 70,000 total heat pumps installed by 2030 – requiring an increase in annual sales from about 3,000 heat pumps sold per year in 2025 to about 15,000 sold per year in 2030.” (RI 2025 Climate Action Strategy, 17) As with transportation, the scale of infrastructure change needed to address heating and cooling pollution is immense.

Underlying all transportation, heating, and cooling changes is the matter of electricity generation. Rhode Island is not alone in making these changes, and surrounding New England states all have electricity grid plans anticipating an enormous increase in electricity use as fossil fuels are phased out. This includes wind, hydro, and solar through upgraded lines that can source renewable energy from as far away as Canada in times of need. (Lenzen, 2025; New England for Offshore Wind | Overview - New England for Offshore Wind, 2022b) In Rhode Island, wind farm energy is a significant piece of the puzzle, as the wind agreements anchor long term electricity rate agreements to keep electricity costs low. “Electric rate relief and stability are essential for achieving the Act on Climate, because without confidence that electricity will remain affordable, households will not fully embrace the economywide electrification, like winter heat-pump use, instead reverting to cheaper fossil fuel options, undermining emissions goals and slowing the broad consumer adoption needed for real progress.” (RIEC4 Action Plan, 2025)

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Figure 6: Annual Heat Pump Sales Required to Reach Act on Climate Scenario¹⁹



Deforestation

“Rhode Island loses 838 acres per year of forest from conversion of forest to other land uses, which also results in carbon losses since natural ecosystems store more carbon than developed lands. In 2016, the Rhode Island Greenhouse Gas Emissions Reduction Plan, prepared by the Executive Climate Change Coordinating Council, advised that meeting the state’s emissions goals could be compromised by continued loss of forested land and recommended exploring a “no net-loss of forests” policy, down from the 2 acres per day average loss experienced in Rhode Island from 1990-2010. The 2018 Statewide Climate Resilience Action Strategy (Resilient Rhody) identifies forests as a natural system that provides crucial services to communities and recommends that Rhode Island protect remaining forest cover, particularly large, unbroken tracts of forested land, and support the development of Forest Management Plans to guide landowners in healthy forest management practices.” (Sparks & Boudreau, 2020, p. 25)

The RI Climate Action Plan assumes that we will maintain a level rate of forested area throughout the course of transition with no plan to increase forested areas or other carbon-holding ecosystem

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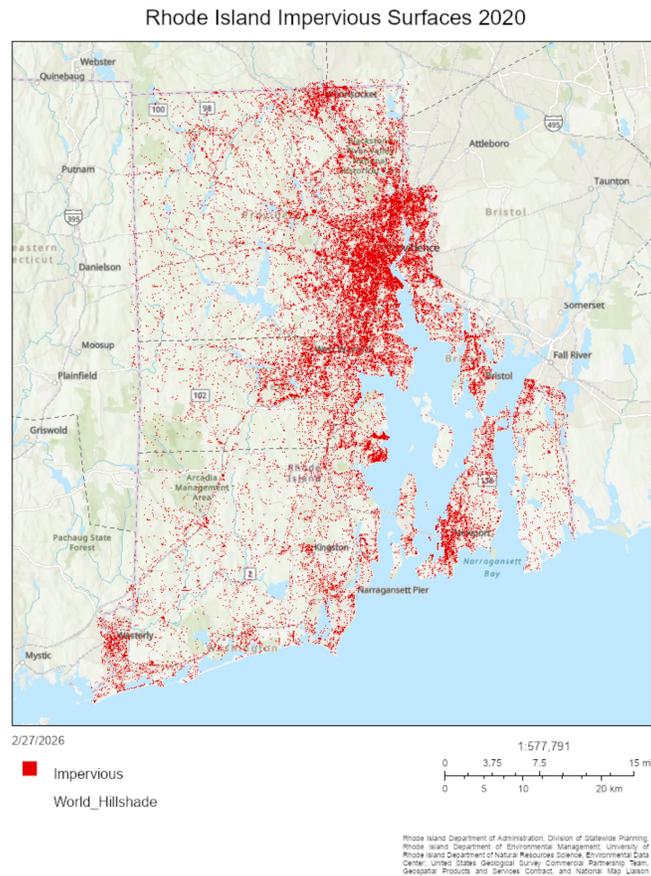
components. This is sometimes listed as “Land sink” in our greenhouse gas reporting. Given the current impossibility of achieving our net zero goals with reduction alone, the path of increasing our “Land Sink” or Land Use, Land Use Change and Forestry (LULUCF) efforts to counterbalance our emissions must also be pursued.

Watershed and Coastal Resiliency

The state of Rhode Island encompasses a collection of watersheds all feeding into Narragansett Bay, and this includes “approximately 1,420 miles of rivers, 20,749 acres of lakes and ponds, and approximately 15,500 acres of freshwater swamps, marshes, bogs and fens as well as close to 72,000 acres of forested wetlands” in addition to the Narragansett Bay and coastal ponds. (RI Department of Environmental Management, 2025)

We have built transportation infrastructure, including more than 1200 bridges (Meet Our Bridges -RIDOT, 2025), across this landscape in addition to dense residential and commercial development- in many cases too close to water.

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In context of sea level rise and increasingly intense storms due to climate change, communities across the state face an increase in flooding and other challenges. The original Resilient Rhode Island Act in 2014 had a strong focus on resilience actions to protect critical infrastructure from these risks. This work continues today with the Resilient Rhody 2025 plan. Additionally the Stormwater Innovation Center, a collaboration between non-profits and government based in Providence “addresses stormwater challenges through green infrastructure projects, professional training, and community science programs” (Stormwater Innovation Center, 2025)

On the other side of this coin, with climate change and increases in population and water use, we now have droughts and water shortages more often than before. “Rhode Island’s average temperature has

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already climbed more than 3°F since the beginning of the 20th century, outpacing the global average...

During summer, this means soil moisture is depleted much faster after a rain event.” (Seymour, 2025)

For these reasons, general education in the state must also include the use and maintenance of local water systems.

In summary, there are four priority physical goals for general education efforts in the Narragansett Bay that are crucial to protecting environmental health, locally, and globally:

1. reduce transportation use
2. support electricification of heating and cooling / building efficiency
3. increase forest and other carbon-storing biomass: thickets, biodiversity etc.
4. secure water quality and supply

Local Environmental Education Reference Frameworks:

In this section we spiral to our final destination: general education around the Narragansett Bay that changes our culture to reduce pollution and restore climate health.

The history, references, records, and materials from international, indigenous and national contexts that have been reviewed thus far all shape the customs, lives, and work of thousands of people in Rhode Island who intentionally connect with and care for the environment: Narragansett tribal members; outdoor program leaders; farmers; fisherfolk²; foresters; landscape maintenance crews; boating instructors; river council workshop facilitators; water and wastewater system operators; artists;

² This review is focused on land-based programs, and therefore does not reference the immense topic of ocean fisheries regulation and ocean health. Educators working with fishing and aquaculture communities should seek additional information on these.

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classroom teachers etc. Their actions will impact hundreds of thousands more who rely on local waters, but who may not have in depth knowledge of their social and environmental history or yearly cycles.

Formal environmental education around the Narragansett Bay occurs at post secondary institutions and in K-12 school programs. Most post secondary institutions have environmental undergraduate degrees, and research institutions offer graduate study as well. Of these, a few stand out:

- University of Rhode Island has a wide range of environmental science undergraduate and graduate programs in part because of its role as a land grant institution since the late 1800s. URI offers Masters and Certificate programs in environmental communication, and in 2025 they launched a new undergraduate degree in Environmental Education for non-formal settings. Additionally the Extension School offers training, programs, and conferences on agricultural and natural science topics – including training for volunteers with citizen science projects.
- Brown University hosts a dedicated group called Institute at Brown for Environment and Society (IBES) which was launched in 2014 and offers regular workshops and panels.
- Rhode Island School of Design offers a Concentration in Nature-Culture-Sustainability Studies.
- CCRI offers Global Wind Organization Basic Safety Training for those preparing to work in offshore wind in addition to an Associates Degree in Environment, Sustainability and Management.

Environmental education occurs in a wide range of formats in the Rhode Island K-12 system. Most K-12 public schools integrate environmental education as part of the Next Generation Science Standards science curriculum. Some charter schools have a dedicated environmental culture such as the Greene School, Compass School (charters) and the Meadowbrook Waldorf School (private). Teachers, of course, play a big role in how much environmental content is brought into schools through their

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curation of supplementary materials and their participation in professional development extras such as GEMS Net; iPlan; and other offerings by the Rhode Island Environmental Education Association (RIEEA).

Green school designations, awards to build outdoor classrooms, and composting programs provide incidental environmental education in multiple districts across the state through programs led by the Rhode Island Department of Education (www.ride.ri.gov).

Non-formal

Outside of post-secondary and K-12 institutions, there is a wide range of **non-formal** programs offered.

Non-profits offer most of these with after school, family, and summer programs in recreational, hands-on learning, and citizen science formats:

- Land-Based: Northern, Southern and Eastern Conservation Districts; Land Trusts; Audubon sites; Nature Conservancy Sites.
- Watershed based: Save the Bay, Narragansett Bay Estuary Program, River Councils
- Workforce Training: Groundwork; Garden Time; RINLA Green jobs; Building Futures, Growing Futures
- Youth Education: Movement Education Outdoors; Scouts; YMCA; Youth in Action;
- Agricultural: Farm Fresh; Southside Community Land Trust; Casey Farm; 4H

Given that human interaction with the environment is a universal theme, many museums, galleries, magazines and podcasts offer cultural programs that include environmental components.

- Museums (Natural History, Haffenreffer, Work and Culture, RISD)
- Galleries at State Buildings, City Halls, Murals (see Avenue Concept)

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There are also podcasts and news outlets that focus on the environment and our relationship to it, including:

- the Possibly podcast, the Southern Conservation District Radio Hour,
- News: EcoRI.
- Magazines: (41° North; Edible Rhody)

Additionally, there are records available from State and Local Government that are searchable by environmental themes:

- Public Libraries, State Archives
- Published research and data sets on University web sites
- Department of Environmental Management, Forestry, Water Quality, Climate Change Data
- City and Town Websites, Public Parks, Water District Data and Newsletters

Finally, the Rhode Island Environmental Education Association (RIEEA) offers a comprehensive searchable data base on their site.

Problem Statement: Standards and Evaluation in Environmental Education

Climate change is an emergency, but it's not a surprise emergency. It's an emergency that is the result of erasure, denial, and neglect by communities in fossil-fuel dependent economies. In case of the US, the mainstream culture has resisted reducing greenhouse gas emissions effectively for 30 years despite significant efforts by the international community and environmentalists to bring about change.

Because of this we have a global pollution crisis today, so before we intensify efforts and convene

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emergency classes to address it (again), we must examine our environmental education approaches, and find how they are reproducing or failing to address the cultural practices that have driven climate change in the first place. These must be replaced with new practices grounded in evidence that can change culture, reduce pollution, and restore climate health. Environmental education programs are similar to other educational programs in that their approach is driven by standards and how they will be evaluated, so this review will end with a three part analysis of standards and evaluation approaches from established environmental reference materials. Based on the analysis, it will propose revisions and additions to standard evaluation questions used for environmental education specific to the Narragansett Bay region. These should be tested for their ability to curb pollution and support environmental health.

Representation of Ways of Being (ontologies) and Value Systems (axiologies) in Environmental Education (Erasure)

Given arguments for inclusion of indigenous knowledge in environmental education, indigenous perspectives must inform a first analysis. This selection from Juan Pablo Gutierrez of Organización Nacional Indígena de Colombia is representative of themes running across multiple indigenous texts: “The importance of Indigenous Peoples in the protection of nature is fundamental and the numbers confirm it. Despite having been territorially colonized, we have not been epistemologically colonized, which has allowed us to maintain an ontological relationship with nature, which means that 80 percent of the biodiversity that remains in the world today is in indigenous territories. Thanks to the existence of the people in these territories, we can still live on this planet, in the midst of an unprecedented climate crisis. These people who were called “backward” now hold the key that could save all

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humanity from the disaster we are heading towards with climate change. It is based on their lived experiences rather than on theories and books.” (Dawson et al., 2023, p. 183)

Following this line of thinking, we can review how evaluation language elicits “lived experience” versus knowledge from and by “theories and books” using:

- the quality of verbs used; and
- the presence or absence of non-human life within text

as indicators. When we look at environmental education reference texts from Western culture since the 1970s, we find approaches biased toward theories and books over lived experience, but still including some references to lived experience. These gradually become more abstracted over time. Current reference texts routinely separate the student grammatically from the web of ecological interdependence that they could belong to instead locating them as an observer and analyst. We will begin by comparing an original reference work about environmental education from 1977, with a recent reference about environmental literacy from 2025:

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| | <p>UN Tibilisi declaration, 1977 Established three broad goals for EE. These goals “provide the foundation for much of what has been done in the field since 1977” (NAAEE Guidelines, p. 35)</p> | <p>2025 NAAEE Guidelines for excellence An Environmentally Literate Person (130 pages)p.10</p> |
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| <p>VERBS</p> <p>Verbs used in 1977: “foster” “provide” and “create” are all generative in nature. Further, all are actions that <u>connect</u> beings in caring or reproductive relationships. One can foster or provide for another, and create new life.</p> <p>Verbs used in 2025: “make” “be” “participate” are succinct and do not carry connotations of connection or generation.</p> <p>PRESENCE OF NON-HUMAN LIFE</p> <p>In 1977 “ecological interdependence” evokes relationships between human and non-human lives. Not strong, but present.</p> | <ul style="list-style-type: none"> • To foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas • To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment • To create new patterns of behavior of individuals, groups, and society as a whole toward the environment | <p>makes informed decisions concerning the environment; is willing to act on these decisions to improve the wellbeing of other individuals, societies, and the global environment; and participates in civic life</p> <ul style="list-style-type: none"> • the knowledge and understanding of a wide range of environmental concepts, problems, and issues; • a set of cognitive and affective dispositions; • a set of cognitive skills and abilities; and • the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts.” <p>(NAAEE Guidelines 3, 2025, p. 10)</p> <p>NOTE: This definition is followed by a list of qualities that can be possessed.</p> |
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| In 2025, <u>no</u> non-human life is referenced. | | |
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Categories from 1993 and 2018 research on climate change knowledge:

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| CLIMATE LITERACY | <p>1993 Boyes et al</p> <p>How do high school students perceive global climatic change: What are its manifestations? What are its origins? What corrective action can be taken?</p> | <p>Armstrong et al, communicating climate change 2018, pp 25-31</p> <p>Communicating Climate Change, released by a team at Cornell, cites a USGCRP “climate literacy” definition, then defines types of climate education outcomes.</p> |
| <p>VERBS</p> <p>Verbs used in 1993:</p> <p>“exacerbate”</p> <p>“ameliorate” “make”</p> <p>“eat” “keep” “use”</p> <p>“reduce” “plant”</p> <p>“protect” “not waste”</p> <p>“not use”</p> <p>1993 verbs include:</p> <p>“eat” – a fundamental</p> | <p>“we have surveyed students in high school concerning three aspects of their beliefs about global warming:</p> <ol style="list-style-type: none"> 1. The consequences for the planet and its biota, 2. The factors which might exacerbate it, 3. Those personal and communal actions which might | <p>A climate-literate person:</p> <ul style="list-style-type: none"> • understands the essential principles of Earth’s climate system, • knows how to assess scientifically credible information about climate, • communicates about climate and climate change in a meaningful way, and • is able to make informed and responsible decisions with regard to |

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| <p>physical activity that connects us to nature, and “exacerbate / ameliorate” which invoke value judgments in ways that a technical modern approach would not find “neutral” enough.</p> <p>Verbs used in 2009/2018: “understand” “know” “communicate” “be” “install” “turn down” “plant” “reduce” “purchase” “restore” “form” “work” “slow” “maintain” “foster”</p> <p>2009/2018 verbs are similar to the 1993 group. Inclusion of “foster” the connecting, caring verb only appears</p> | <p>ameliorate it.</p> <p>In particular, we wished to quantify the extent to which certain viewpoints were held or denied or not known, and hence identify the strongly held views and possible ignorance of students on this topic.”</p> <p>From the survey:</p> <p>“The greenhouse effect can be made smaller:</p> <p>25. by nuclear power stations instead of coal power stations</p> <p>26. by eating healthy foods</p> <p>27. by keeping beaches clean</p> <p>28. by using unleaded gasoline</p> <p>29. by reducing number of nuclear bombs in the world</p> <p>30. by planting more trees in the world</p> | <p>actions that may affect climate.</p> <p>(U.S. Global Change Research Program, 2009a, p. 3)</p> <p>Three types of outcomes [excerpts from 5 pages, 1700 words]:</p> <p>Outcomes focused on individuals</p> <ul style="list-style-type: none"> - Climate Literacy [quoted above] - Attitudes and Emotions - Self Efficacy - Environmental Behaviors “installing solar panels on one’s home, turning down the heat, reducing consumption, or purchasing a fuel-efficient vehicle.” <p>Outcomes focused on Communities</p> <ul style="list-style-type: none"> - Youth Assets - Social Capital “allocating green space” - Collective Efficacy - Collective Action “volunteer groups restoring dune habitat to enhance shoreline stability, or a neighborhood forming a renewable energy collective or |
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| <p>in reference to connections between humans.</p> <p>PRESENCE OF NON-HUMAN LIFE</p> <p>In 1993: “biota” “foods” “trees” “rare plants and animals”</p> <p>In 2018: “green space” “dunes” “trees” “mangroves” – lists <u>plants only</u></p> <p>Note, also, that the 2018 definition of climate literacy does not include any reference to non-human life. Non-human life does not appear until plants are mentioned in</p> | <p>31. by making our electricity from wind, waves, tides</p> <p>32. by using recycled paper more</p> <p>33. by protecting rare plants and animals</p> <p>34. by not wasting electricity</p> <p>35. by reducing starvation in the world</p> <p>36. by not using cars so much”</p> | <p>working with a city or town to improve infrastructure for bike commuters.”</p> <p>Outcomes Focused on the Environmental</p> <ul style="list-style-type: none"> - Climate Change Mitigation “planting trees and switching to renewable energy” - Climate Change Adaptation “installing permeable pavement to reduce flooding or restoring dunes to slow shoreline erosion” “restoring and maintaining mangroves” <p>Resilience “fostering community” [mentioned in context of natural disasters]</p> |
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| illustrative examples. | | |
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The use of more sticky verbs and references to non-human life in older reference texts speaks to a past where genuine connections between humans and nature were more highly valued as outcomes. The newer focus on abstract concepts and relations sends the message that connection is valued more in theory than in practice. This linguistic distancing is found across current environmental education texts:

- In Cornell’s “Communicating Climate Change”:

“Positive youth development is an asset-based approach to promoting young people’s well-being physically (e.g., through good health habits), intellectually (e.g., through critical thinking), psychologically (e.g., through building confidence), and socially (e.g., through trusting others).” (Armstrong et al., 2018, p. 28)

The descriptors: “Physical well-being” and “good health habits” are interchangeable in their lack of specificity, but they could be replaced with concrete descriptions such as: “working outdoors with friends”; “caring for plants and animals”, or “testing the quality of the local water supply”. These would point to physical integration with the environment in a way that the original text does not.

- The NAAEE contribution to the PISA 2015 environmental literacy evaluation framework used the verbs: “know”, “identify”, “analyze”, “evaluate”, “propose”, “justify” and “respond”. (Hollweg et al., 2011, p. 5–18) The intellectual verbs “know” “identify” “analyze” and “evaluate” locate the student as separate from and observing non-human life. Further, the verbs “propose” “justify” and “respond” place the student in a combative debate framework even with regard to other humans.

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- The MIT Climate Action Through Education (CATE) searchable records and references are sorted by categories that also prioritize abstract academic skills: Civic Knowledge; Communication; Critical Thinking; Evaluating for Credibility; Modeling; Presentation of Knowledge and Ideas; and Use of Primary Sources, (MIT, 2026). Its not a joke to wonder how the outcomes of programming might change if one category was: “Keeping Plants Alive.”

Others have observed that this trend toward increasingly abstract terminology is also a feature of the Next Generation Science Standards. While it is possible for science education to be experiential and provide students the skills to use science information effectively, the adoption of NGSS and the associated objectives and assessments emphasize academic preparation for college and scientific degrees at the expense of students “exploring how the science they are learning is relevant to their personal and social concerns” (Osborne et al., 2023, p. 14)

Our frameworks for environmental literacy favor abstract skills, and over time these frameworks have become more abstract with fewer affirmative benchmarks scaffolding lived relationships with the environment. Its not surprising as we live in the culture that almost exterminated the beaver, deer and turkey from the land through overhunting (all are now reintroduced) that we experience this challenge. We live with an environmental wound that is difficult to heal: what kind of relationship should inhabitants of developed areas around the Narragansett Bay have with beaver, deer, and turkey? The local Narragansett people who know how it was in the past cannot be consulted without an acknowledgment of history that is uncomfortable, and this is how we come to erasure. Increasingly technical, disconnected language takes the place of remaining present with difficult truths. Our next environmental education efforts could prioritize students learning the history and developing a reciprocal relationship that begins to repair the local natural environment. Doctors don’t stop advising people to eat fresh vegetables just because some people vehemently refuse to³, and educators must not stop advising for environmental connection despite the difficulty of acknowledging history that must

3 This one is for my Pirate who says she is going to read this ;).

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come with it. At this time, the environment needs our presence. For every abstract, book learning objective, we need an equal number, if not more, of evaluative approaches that can get us closer to the advice from indigenous knowledge: “work with nature, expand habitat, de-center humans, and design for perpetuity” (June, 2022).

Based on this analysis, we could propose more specific standards to evaluate climate literacy:

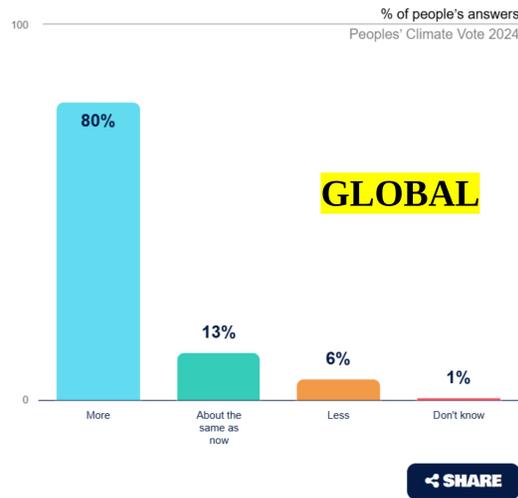
- **Describes** local **ecological health** with specific examples, and able to describe how these local examples relate to customary and historic Narragansett lifeways as well as global conditions
- **Fosters healthy growth** of **plants, animals and other non-human life** in their area
- **Knows the names** of **plants, animals and other non-human life** in their area, and **can tell you about the lives** of specific individuals among them and what role they play in the ecosystem.

Finally, adjusting standards to include a meaningful connection to the immediate local environment through lived experience does not mean the abandonment of technical skills. The amount of data about environmental locales that is accessible online has increased exponentially over the past 20 years, and we have sophisticated science education approaches for teaching navigation through data and records that are from the actual environment the students live in. Environmental education can ensure that loops of learning connect students physically and directly to the local environment with by referencing simple versions of real records, so that students are prepared for the extended focus necessary to read and navigate environmental records at the secondary and post-secondary levels when needed.

Rhetorical / Dialogic Approaches in Environmental Education (Denial)

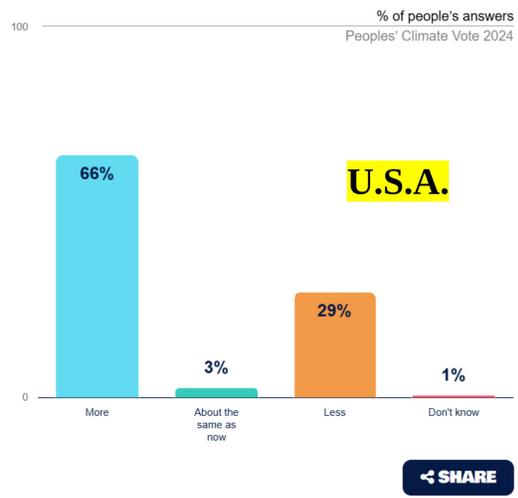
It is true that in the United States there is polarization on the topic of climate change that is paralyzing us, and preventing us from taking action:

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Should schools in your country do more or less to teach about climate change?

Learning about the causes and impacts of climate change can help people prepare for the future, but countries across the world do not have equal access to this kind of education. We asked people if they want more climate education in their schools.



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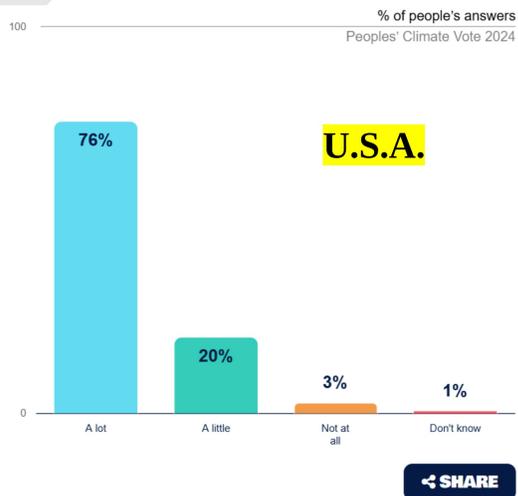
Source: (Flynn et al., 2024)

No other country has a graph with such a high rate of negative responses to the question: “Should schools in your country do more or less to teach about climate change?” than the United States; however on the general topic of protecting and restoring nature, US is much more in line with the rest of the world.



How much should your country protect and restore nature, for example, by planting trees or protecting wildlife?

Nature not only underpins our well-being, our economies, and our societies but also plays a key role in absorbing and storing carbon dioxide. Slowing climate change, therefore, depends on protecting and restoring nature. We asked people how important that was for them.



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What educational approach can drive behavioral changes necessary for emissions reduction and carbon capture in a context where denial is such that 29% are opposed to teaching the facts?

A considerable amount of research has been done on how to convince people of climate change. We have framed the issue as one of belief or non-belief and examined it using political and demographic criteria (E. Diamond et al., 2020; Leiserowitz et al., 2025); investigated whether or not people are worried and how to address anxiety (Davenport University Library, 2026; Schapira, 2024); and examined it as a justice issue. (Stanford University, 2024), but insight from research on conflict indicates that an effective response to strong, outraged, opinions such as: “we should teach less about climate change” will be to sidestep direct conflict; worry less about everyone understanding climate change; and focus more on making space for dialog in which people can explain what they know. (Steven Sloman | Cognitive and Psychological Sciences | Brown University, 2026), Professor Sloman’s beautiful, theoretical lecture on the topic (Brown University, 2025) is echoed in a more digestible form by the Possibly podcast which summarizes:

“Use phrases everyone knows like pollution, instead of technical terms.

Don’t talk in partisan terms. Just saying “it’s not political” instantly lowers people’s defensiveness.

And focus on how climate change will affect what people love.” (Hall & Hardy, 2025)

Our nation agrees with the rest of the world that we should protect and restore nature, so effective environmental education will focus on nature and prioritize dialog that explores concrete community needs around issues that are connected to mitigation and resilience:

Question bank for environmental dialog in the Narragansett Bay region:

- When does transportation break down? Where is it too expensive? Inefficient?

- Where could there be more trees and shade, if trees have to be cut, where could others grow?
- How are heating costs? Efficiency? What help is needed?
- Where is it flooding? When is there a water shortage? How could this be helped?

Also important to consider when planning environmental education: dialog can happen in so many settings outside the K-12 science classroom structure. In museums, “Adults and children, for example, often have a social dynamic that leads to more time at exhibits and more in-depth experiences.” (J. Diamond et al., 2016, p. 20), and for non-formal workshops, we have to remember that people “who have the opportunity to play “spend more time with [materials]... and manipulate them in unexpected ways, which can lead to a more thorough knowledge of ... phenomena” (J. Diamond et al., 2016, p. 22)

Socio-material Considerations in Environmental Education: Location, and Place

Attachment (Neglect):

Finally, a socio-material consideration of education within the developed area around Narragansett Bay illuminates how infrastructure formed by priorities of the past influences environmental education today. We have to begin with a summary of the physical conditions:

The Narragansett Bay region started as temperate forest surrounding a bay with river and coastal ecosystems connecting the two. These ecosystems were mediated by the lifeways of indigenous people. European settlers stripped resources for export and attempted to establish farming practices incompatible with this ecosystem for several hundred years- in the process razing the pre-existing landscapes and ecology. Also, they dammed rivers across the region to generate power for factories (which produced toxic chemical pollution). Following this, fossil fuel powered international trade and

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imperialist interventions on a global scale relocated most industrial production (food, clothes, furniture, cars etc.) elsewhere while ensuring trade patterns that continued to supply the region. Most supplies now arrive through the Bay's major ports and over the federal highways, made from resources extracted elsewhere, already processed into a usable form, for consumption in the medium, large, and mcmansion sized dwellings that now cover about half of the land that once was forest⁴.

Within this system, plants, animals and other non-human life have historically been managed as either an impediment or an aesthetic backdrop to industrial life. Along highways and around industrial and commercial zones plant life is cut back with no consideration of species or plant function. Around our homes and schools we have prioritized lawns (essentially outdoor carpet) and decorative trees and treated animals as intruders and pests. We have designated "wild" areas in separate parks, trusts, and preserves where human intervention is discouraged and nature is expected to take care of itself. These are all forms of neglect. Additionally, we support seasonal ritual landscapes that loosely conform to a fiction of New England farm life and self-reliance: small herds of cows grazing within stone walls; pick your own apples; farmers markets; craft fairs; and local breweries. Living in an environment managed in this way shapes our understanding of the ecosystem as optional; and our selves as both separate from and able to control the environment to meet our needs.

This is evidenced in the following examples of knowledge and attitudes of K-12 environmental educators identified through the 2018 RIEEA Inventory of Current Practices:

⁴ This infrastructure, with its excessive heating, cooling, consumption and transportation requirements, is a significant contributor to greenhouse gas emissions.

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| SURVEY FINDINGS CENTERING HUMANS | POTENTIAL REPHRASING DE-CENTERING HUMANS |
|--|--|
| We “care for the world” (p. 17) | The world provides for us. |
| We have an “impact on the environment” (p.20) | The environment impacts us. |
| We protect natural resources (p. 20) | Healthy ecosystems protect us. |
| We explore and solve environmental issues (p23) | We can work with nature to increase biodiversity and resource abundance. |

It is true that at present, our local environment does not provide the majority of the food we eat, clothes we wear, or things we use. In this consumer context the complex, non-human living world is not understood or taught as an essential physical part of local human lives; however, the local environment does sustain us and we are interdependent with it- at minimum because of the basic fact that we need clean water to live and that the temperate forest around us can protect us by filtering and retaining that water close by. Plants, animals and other non-human life continue to live and grow here, and new education routines restoring reciprocal physical relationships with them might drive local ecosystem restoration and support human health.

In course of preparing this review, I found more than one request from indigenous representatives that the developed world, the West, would turn its apparatus of conservation back on itself. This reasoning

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is well illustrated through the following interview segment between a British Broadcasting Corporation host and the President of Guyana:

Stephen Sackur, host of BBC's HardTALK

It is expected that there will be \$150 billion worth of oil and gas extracted off your coast. That means, according to many experts, more than 2 billion tons of carbon emissions will come from your seabed, from those reserves, and be released into the atmosphere. I don't know if you as a head of state went to the COP

President Dr Irfaan Ali

Let me stop you right there. Let me stop you right there.... Do you know that Guyana has a forest forever that is the size of England and Scotland combined? A forest that stores 19.5 gigatons of carbon?

A forest that we have kept alive. A forest that we have kept alive.

Sackur

Does that give you the right, does that give you the right to release all this?

Dr Ali

Does that give you the right to to lecture us on climate change? I am going to lecture you on climate change because we have kept this forest alive- that stores 19.5 gigatons of carbon- that you enjoy! That the world enjoys! That you don't pay us for, that you don't value, that you don't see a value in- that the people of Guyana has kept alive. Guess what? We have the lowest deforestation rate in the world, and guess what? Even with our greatest exploration of the oil and gas resource we have now, we will still be Net Zero. Guyana will still be Net Zero. With all our exploration we still be Net Zero.

Sackur

A couple of points. Powerful, powerful words Mr President, but a couple...

Dr Ali

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No, no, I am not completed as yet- I am not finished as yet. I am just not finished as yet because this is the hypocrisy that exists in the world. We, the world in the last 50 years, has lost 65% of all this biodiversity. We have kept our biodiversity. Are you valuing it? Are you ready to pay for it? When is the developed world going to pay for it? or are you in the pockets- are you in the pockets of those who have damaged the environment? are you in the pockets? are you and your system in the pockets of those who destroyed the environment through the Industrial Revolution and now lecturing us?

(TRT World, 2024)

Indigenous people and the global south point out, with good reason, that the developed world should worry about its own ecosystems before telling others how to care for theirs. Persistent observers of landscapes around the Narragansett Bay will not have a hard time seeing it as a conservation area. We live in an ecosystem deeply damaged by colonization and suffering from multiple wounds: the loss of migratory salmon, herring, eels due to river dams; the loss of beavers as shapers of waterways and the associated biodiversity and density of wetlands, grasses, marshes that birds had populated in the millions; deforestation and the disappearance of porcupines, wolves and bears; incursions of new plants, animals and disease from afar; and the exclusion of the Narragansett and other indigenous people who understood all these other lives.

We can address this by modeling for students how to be more present and attentive to the ecological realities of our immediate environments. People being attached to place is beneficial for their physical and mental health, and people feeling attachment to a place leads to them being more active in caring for the place. (Wolf & Collier, C, 2023) “By emphasizing relational ties to the environment, nature-based and Indigenous-informed education can strengthen students' sense of responsibility and support for sustainable ways of living.” (Kraft, Matthew A. et al., 2025, p. 28)

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In addition to teacher training, efforts must “take place beyond school” and “integrate education efforts with the work of other sectors.” (*Education and Climate Change*, 2024, p. 4)

Why beyond school? The K-12 classroom structure elicits a certain mindset because it is part of an evaluation process. Content must be mastered, and there will be grades- starting in middle school, and more and more so with high school. This can make school into a space which inspires only a temporary performance (you do what you have to do to get by) (Waltz, 2006). Students may know how to answer questions about environmental science while in school, but then, because leaving the building disengages the “school” behavior, actions supporting the health of the environment that have been “learned” are less likely to be acted on.

Instead of “teaching the environment in school” we need to build a place consciousness that includes the school and that persists as students are finding their way around the community. The goal is to replace knowing nature as “something I have to do” (i.e. an additional assignment in an already hectic culture with many demands) with “a way I enjoy being.”

What could environmental education look like using this approach? “Space is transformed into “place” when humans give it bounds and believe it has value.[and] Place is constructed and reconstructed over time by different groups of people.” (Wolf & Collier, C, 2023, p. 3) Schools and communities can intentionally teach maps of green spaces and common spaces that start on school grounds, and then expand them as widely and as far afield as youth are traveling. If map reading is accompanied by field trips and/or visits from community members who work at locations featured on the maps, the instructional process of learning map reading becomes a lived experience. Students and community members can even update and add to maps for the benefit of future classes. The same maps taught to youth can be used to welcome and orient new-comers to a community. Basically 100% of the environment that is not privately developed could be included. Places where there are traditional trails,

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in addition to parks, sidewalks, public buildings “the full spectrum of naturalistic, nonconstructed sites, as well as highly designed and engineered spaces, such as streetscapes or pocket parks.” As long as they are “outdoor situations that are somewhere apart from their residences that people can visit” even “brownfields, though not necessarily “green” in a planned sense” can be included. (Wolf & Collier, C, 2023, p. 3)

When place attachment develops in a community, this is a win win. By creating scenarios where people can attach to place, you increase support for the environment, and by creating scenarios where people can connect with the environment either as stewards or even through regular visits, you provide opportunities for them to attach to place. Across “forty years and thousands of published studies, there is extensive evidence of both the apparent and sub-conscious health benefits of nature experiences” in addition to evidence that they can improve general mental function and cognition. (Wolf & Collier, C, 2023, p. 1) Place attachment has further benefits as “Residents who are more attached to their community create higher levels of social cohesion and social control, express less fear of crime, and contribute to the vitality of the neighborhood.”(Wolf & Collier, C, 2023, p. 6)

Schools and communities can support a widening of community placemaking with two best practices:

- scaffolding repeat patterns of place use (visiting some places regularly); and
- investing in modest infrastructure to signal community care (signs, maps, named places)

Question bank for community greenspace map making:

- Where are public greenspaces in the school community and what kinds?
- What kinds of plants, animals and other non-human life can be seen here?
- Are there any spaces where edible gardens / gardening / foraging are permitted (also, any

spaces that are polluted and dangerous to eat from)?

- What else is near these (schools, libraries, town buildings etc.)?
- What transportation is available to access them?

Conclusion

“UNESCO has been using a heuristic of ‘learning dimensions’ for more holistic and transformative approaches to sustainability instruction and learning. These interconnected dimensions include cognitive, social and emotional, and behavioural or action learning (or ‘head, heart, and hands’). The cognitive dimension is considered to encompass the acquisition of knowledge on sustainability issues, from various disciplinary backgrounds and in relation to local and global contexts. The social and emotional dimension includes the capabilities required to manage the emotions that arise from increased knowledge of climate change and sustainability challenges, as well as the ability to collaborate and communicate with others about issues and action. The behavioural or action dimension includes being enabled to take and advocate for climate and sustainability action, both at individual and societal levels.”(UNESCO Greening Communities Guidance, n.d., p. B37)

This review of references, records and materials treating climate change and environmental education around Narragansett Bay has demonstrated that in our education context we have a record of prioritizing the cognitive dimension and marginalizing the social, emotional and behavioral.

Additionally, while indigenous knowledge is referenced across domains, we have yet to formulate an environmental education approach that values “lived experience” as modeled by indigenous people, and this is a barrier to development of culture that supports the environment holistically. Analysis of environmental education references supports the adoption of approaches that prioritize social,

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emotional and action learning as identified in UNESCO guidance. Specific to the Narragansett Bay region, new program offerings can complement the wide range of local education activities with designs specific to: reductions in transportation use; heating and cooling gas emissions; water quality; and forest health. Evaluation questions and frameworks that value lived experiences; drive community conversation; and scaffold place attachment can move communities practically toward circular and sustainable economies that honor indigenous ontologies and are the foundation of a stable climate future.

Kraft et al note that schools are “uniquely positioned to drive community-level awareness about the impacts of climate change given the important role they play in our society” (Kraft et al 2025,3). A companion paper to this review will propose three adult education programs leveraging the efforts of environmental educators already at work in the region to “seed” the K-12 experience with locally specific materials that scaffold place attachment.

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