

A Tiny Forest as an Outdoor Classroom and a Place for Hope

Dr. Patrick Walsh, Catlin Gabel School, Portland, Oregon

Microforests are small, dense patches of forest plants native to the location of the forest and are being used as a climate change solution.

Photo Credit: Whitney Tree Keepers.

Abstract

According to experts, such as psychotherapist Caroline Hickman (Hickman, 2020), climate anxiety in young people can be countered by engaging them in collaborative work that binds them to the environment and demonstrates for them the power of collective action. Inspired by such work at schools in Brazil, China, and Malaysia, and thanks to funding from the [NOAA Planet Stewards](#) program, our pre-K-through-twelfth-grade school built a so-called “Tiny Forest” on our campus in 2022. Tiny Forests are dense plantings of native plants in a space about the size of a tennis court. Students took key roles in writing the proposal to the school, choosing the plants, preparing the ground, and planting. A year later, the Tiny Forest has become an outdoor classroom, offering a site for age-appropriate lessons about topics ranging from carbon capture to nature poetry. By sharing the positive effects of reforestation and species diversification, students could articulate the possibility of making small but meaningful impacts on environmental problems. At the Tiny Forest we hope our students might experience empowerment rather than anxiety.



Image 1. Students from the Environmental Action Team, preparing the soil, early 2022. Photo Credit: Patrick Walsh

The Tiny Forest Project

Portland, Oregon, home to my school, Catlin Gabel, has made worldwide headlines over the past two years, first because it briefly had the worst air quality in the world due to catastrophic forest fires, and second, because of a deadly heat wave in 2021. For students, these events came in conjunction with the Coronavirus pandemic and many were stuck in houses, learning on Zoom, unable to go outside because of hazardous air quality. Like teachers everywhere, I have noticed rising worry and anxiety about climate change and the disruption it brings. As Anthony Leiserowitz, Director of the Yale Program on Climate Change Communication, has noted, “worry” can be a motivator, but “anxiety” can become “overwhelming and debilitating.” (Yale 2023)

Hoping to counter my students' climate anxiety, and inspired by a story I heard on the BBC during lockdown, I decided to build a Tiny Forest at my school. A grant from the Planet Stewards program made this possible. A Tiny Forest is a dense planting of 600 native trees and shrubs in an area the size of a tennis court. Begun in Japan and now popular in Malaysia, Brazil, China, Tiny Forests offer opportunities for communities and especially kids to reconnect with nature while improving water, soil, and air quality. Tiny Forests create a carbon sink, an outdoor learning space, and a way to reintroduce a diverse range native plants and the animals they attract. Because the soil is prepared and the trees are planted closely together, the trees grow up to ten times faster than usual. Most importantly, Tiny Forests are a space for hope and reflection for students.



Image 2. Students help plant the 600 trees and shrubs on February 21, 2022.

Photo Credit: Tea Bear

My students, colleagues, and I followed the “Miyawaki Method” of planting, named for the Japanese botanist Akira Miyawaki (<https://daily.jstor.org/the-miyawaki-method-a-better-way-to-build-forests/>). This way of planting involves specific steps; first, learning about the plants native to the specific area of the proposed forest and assembling a plant list based on a four-layer model of canopy, understory, shrubs, and herbaceous plants or groundcovers; and second, preparing the soil, making it loose and rich with no chemical fertilizers and by turning it over down to a meter deep.

With the generous support of NOAA and a local water district, I purchased 600 native trees, shrubs, and groundcovers. After the school grounds crew turned over the soil with a tractor and dumped compost on the site, middle-school and high-school students further broke up the soil and mixed in the compost. A pair of sophomore girls pounded fence poles into the soft earth. I divided the site into twenty small sections with rope and short poles; an online sign-up sheet netted almost 200 volunteers. I divided these folks into small groups and gave each one a time and a section for our planting day, so the space wouldn't be crowded, and to make sure the volunteers didn't compact the soil by walking on it too much.

On February 22, 2022, the volunteers—students, parents, alumni, staff, and faculty—came in waves, each group staying for an hour or so while they made a small hole and slipped in their sapling or other plant. In accordance with the Miyawaki method, they didn't tamp down the soil, leaving it loose and ready for quick growth. By late afternoon, the forest was planted and the final work group helped quickly erect a four-foot metal fence. We wore masks and braved a little drizzle, but the mood was light and the morale high. Numerous people told me it felt so good to feel like they were doing something to help the earth after almost two years of the Covid crisis.

Later that spring, seniors in my elective honors course, “American Environmentalism,” made sets of guides for the Tiny Forest, one appropriate for second graders and one suitable for eighth graders. Each guide contained information on about twenty species, including Indigenous uses for the plants, as well as photos of the Seniors in the Tiny Forest, puzzles, and games.



Image 3. A Student Identifies Plants at the Tiny Forest, 2023.

Photo Credit: Teresa Walsh



Image 4. "Beaked Hazelnut." Watercolor by student Eve Cody, 2022.

In the approximately eighteen months since planting day, the Catlin Gabel Tiny Forest has grown quickly. While many of the pine and fir trees are still only two to four feet tall, some of the understory species, including Black Cottonwood and Red Alder, are already well over ten feet high.

Many Academic Uses

The Tiny Forest has quickly become a place on campus where students can connect with Oregonian flora. This school year, second graders investigated different habitats on campus and compared the living things they saw in them. Third graders used the Tiny Forest to learn how to spot toxic plant species. Fifth graders investigated which types of plants they might successfully grow in our small greenhouse, and visited the Tiny Forest to learn about native plants. Tenth graders partnered with first and third graders, meeting in the Tiny Forest, choosing a plant to observe closely and, then, together writing poetry about it.

A Tiny Forest Lesson: the Cross-Grade Tour

Another cross-grade use of the Tiny Forest was led by middle-school teachers Berkeley Gadbaw and Christa Kaainoa. The idea behind the assignment was to link students' experience with the climate fiction they had read in Christa's seventh-grade English classes with the climate change unit in Berkeley's eighth-grade science course. The science students ultimately led their younger peers on tours of the Tiny Forest and of some woodland nearby. For all the students, the same key goals were in place:

- Connect student classroom learning with experiences outside.
- Engineer experiences in which students teach students about fighting climate change.
- Encourage students to bond deeply with the natural environments on campus.

In order to prepare for the tours, Berkeley's eighth-grade students began with what she calls "Wonder Walks." For several days, part of their classroom time was spent outside, sitting and sketching the plants they saw. Berkeley's goal is to establish a connection with nature before students are compelled to learn "facts" about the plants. Berkeley then instructed

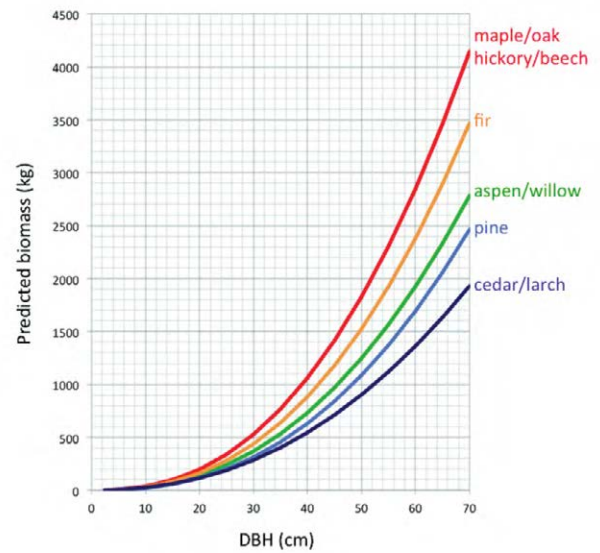
them in the layers of the forest; students used Tiny Forest guides (made by high school students in the Spring of 2022) to learn how to identify most of its forty-plus species. From the guides, they also learned about the interdependence between species in various layers of the forest as well as Indigenous uses for many of the plants.

Next, students returned to the Tiny Forest with the goal of calculating carbon capture during its early years. All the eighth graders measured the circumference of existing trees in established forest, specifically Western Red Cedar, Douglas Fir, and Big Leaf Maple. They tagged twenty individual trees for measurements in future years. Using a great handout from the New York Sea Grant (NYSG) and the Paleontological Research Institution (https://drive.google.com/file/d/1UV_HNr-EwD4I_xZM9QfMRNVeQUx4oRVL/view?usp=sharing), students derived the trees' biomass from their measurements. Students read a graph that shows a species' diameter to biomass ratio, and then divided the biomass by two to discover how much of the tree was carbon. From this they derived the amount of carbon dioxide. They then practiced online graphing tools to indicate their findings.

This baseline of data will be used for the future, something the students could feel proud of. Finally, the eighth graders learned about heat islands and their links to historic racial inequality. (Portland is among the cities with the greatest heat differences between neighborhoods.) With a new understanding of the connection between the built environment and heat, the eighth graders grabbed clipboards and digital thermometers and measured the temperature in several places on campus, including the main parking lot and the Tiny Forest. They cataloged their results and then discussed where in Portland the next Tiny Forest might be planted to most effectively lower the temperature and provide shade where it is most needed.

Importance of forests

By the end of the unit, the eighth graders had been in the forest every single day for three weeks. First, they had had outdoor, direct instruction from Berkeley. "Being out there exceeds anything I can do in the classroom, even if I don't have a particular agenda," Berkeley said. Students then had time to sit in a different place every day, always with a physical journal to take notes and record reflection. In those weeks, they learned about the importance of forests in regulating the earth's temperature and harboring its biodiversity. They became experts on their own campus; they can point out a number of the trees and shrubs that shade the school, and they have found favorite places outside of the classroom to sit and write.



Graph 1: USFS data relating tree diameter at breast height to biomass (Jenkins et al., 2003)

Image 5. Relative Predicted Biomass for a Number of Key Tiny Forest Species. Source: NYC Stern Summer Institute: Climate to Go!



Image 6. Beginning a Baseline. Photo Credit: Patrick Walsh

Results

In the spring of 2023, eighth-grade students from the Catlin Gabel Middle School learned about topics relevant to the Tiny Forest: the Greenhouse Effect, biodiversity, native plants, and heat islands. After three weeks of outdoor instruction and observation, the students led small groups of seventh graders on nature walks, through campus and to the Tiny Forest, in order to share what they had learned.

In many ways, the cross-grade tour was really the culmination of the assignment. This was the best and most meaningful forum for the students to demonstrate their knowledge. The conversation during the tour was the assessment, the transfer task. But since the instructor couldn't be present during the entirety of every tour, and because the interaction between students of different grades has a value a classroom test does not, she was satisfied with feedback from the seventh-grade students after they have been led around the Tiny Forest by the eighth graders and relevant areas of the broader campus. Each guest on each tour had a checklist so the instructor could see if any topics were omitted. She also asked the tour guides to turn in all their documentation. Eighth graders were required to fill out and hand in a guided note sheet (<https://docs.google.com/document/d/1m8D6gNgcaQMhngZUolTAORNYr7jXO8qaAJw2Fz98YuU/edit?usp=sharing>). Later, Berkeley quizzed the students on the content of the tour.

Berkeley and Christa were not with the students on their walks and couldn't correct errors from student tour guides or make sure every student remained focused on the task at hand. Yet entrusting students to teach their peers has more than enough value to offset the lack of teacher control. By having the eighth graders become "tour guides," Berkeley and Christa compelled them to take "ownership" of the Tiny Forest and share its value with younger members of the community.

Connections to the Next Generation Science Standards (NGSS, 2013)

Performance Expectation

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Disciplinary Core Idea

- ESS3.C: Human Impacts on Earth Systems: Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. Changes to Earth's environments can have different impacts (negative and positive) for different living things.

Cross-Cutting Concept

- Influence of Science, Engineering, and Technology on Society and the Natural World: All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-4)

Conclusions

The activities surrounding the Tiny Forest provided students with ways to experience how human activities have altered the biosphere and to provide avenues for positive action.

As Berkeley shared with me, it's hard to teach climate change and not be pessimistic, "even," she noted, "with a pageful of solutions." She's right: showing students how shifting diets away from red meat or creating a national market on Greenhouse Gas emissions can often exacerbate student anxiety because of our inability, working individually, to make the shifts necessary to prevent catastrophic changes during our students' lifetimes. Berkeley went on to explain that this project was a viable way of lessening climate anxiety by connecting kids to nature and to give them time and structure to notice how learning about their environment feels empowering and motivating. The lesson links students to particular plants at the school. Understanding the positive impact of careful reforestation through the calculation of carbon captured by

trees in the Tiny Forest gives students the opportunity to appreciate the importance of beauty on the campus in a new way and affords their teachers the chance to tell the kids it's not too late to make meaningful change.

Learning about Indigenous uses for native plants, and then sharing that knowledge with other young people, potentially offers hope in the form of a historical connection to Nature. Realizing that other civilizations have flourished in the same place suggests there are other ways to live besides our shared American culture and its reliance on fossil fuels. More importantly, perhaps, is the lesson that climate change can best be addressed through collective action, such as the construction of a Tiny Forest. By planting trees in historically underserved areas which are so often also heat islands, communities can make a real difference in how their neighbors, especially people of color and those with the fewest economic resources, will experience their daily lives in the decades to come.

References

- Hickman, Caroline and Elouise Mayall. 2020. Minerva series: Climate Change, Coronavirus and Anxiety. University of Bath. Vimeo. July 10, 2020. <https://vimeo.com/showcase/5413701/video/442745768>.
- NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. <https://www.nextgenscience.org/search-standards>
- Will, Madeline. 2022. Teens Are Struggling With Climate Anxiety. Schools Haven't Caught Up Yet. Education Week. December 7, 2022. <https://www.edweek.org/leadership/teens-are-struggling-with-climate-anxiety-schools-havent-caught-up-yet/2022/12>.
- Yale Sustainability. 2023 Yale Experts Explain Climate Anxiety. Yale Sustainability. March 13, 2023. <https://sustainability.yale.edu/explainers/yale-experts-explain-climate-anxiety>.



Image 7. The Catlin Gabel Tiny Forest, June 2023, Sixteen Months Since Planting.

Photo Credit: Patrick Walsh

About the Author

Dr. Patrick J. Walsh is the Chair of Social Studies at Catlin Gabel School in Portland, Oregon, where he has taught for seventeen years. At Catlin Gabel, he teaches courses on Civics, American Studies, Globalization, and Environmentalism. Patrick holds a Ph.D. from the University of Texas at Austin, where his graduate work focused on counter-cultural communities and movements in the twentieth-century American West. He has been granted two Fulbright awards, one to teach American Studies at the University of Passau in Germany and a Distinguished Award in Teaching grant for research in Finland. Patrick can be reached at walshp@catlin.edu.



Join the
2023-2024 Book Club with
books of thought-provoking
topics to be discussed at
monthly meetings.



SCHEDULE

| | |
|---------------------|--|
| Sep 12, 2023 | Don't Look Up |
| Oct 10, 2023 | Diary of a Young Naturalist |
| Nov 14, 2023 | There's Something in the Water: Environmental Racism in Indigenous and Black Communities |
| Dec 12, 2023 | Escape Undersea |
| Jan 9, 2024 | Fragment, a climate crisis novel |
| Feb 13, 2024 | Engage, Connect, and Protect: Empowering Diverse Youth as Environmental Leaders |
| Mar 12, 2024 | The Only Woman in the Room: Why Science is Still a Boys' Club |
| Apr 9, 2024 | Consumed: The Need for Collective Change: Colonialism, Climate Change, and Consumerism |
| May 14, 2024 | Fen, Bog & Swamp |