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LEAD Program Intern

Eva Araujo
Western Washington University

COLLEGE OF THE ENVIRONMENT

WESTERN WASHINGTON UNIVERSITY
MAKE WAVES.

Internship Title: LEAD Internship

Organization Worked For: Learning Environment Action Discovery

Student Name: Eva Araujo

Internship Dates: 10/10/22 6/2/23

Faculty Advisor Name Angela Strecker

Department ESCI

STUDENT SIGNATURE Eva Araujo

DATE: 6/2/20

Introduction:

LEAD (Learning, Environment, Action, Discovery) is an organization at Western Washington University that has been involved on campus for at least 30 years. The group works to help the campus community get involved in restoration projects and environmental education. There are two graduate students who co-direct LEAD every year, who also teach a two-credit restoration seminar in the Department of Urban and Environmental Planning and Policy. This year I worked with Ava Stone and Brandon McWilliams. They host weekly restoration parties around campus and help grounds crew with the removal of invasive species. At the beginning of this year, Ava and Brandon decided they wanted to take on a bigger project than LEAD ever has. LEAD has historically partnered with organizations like the City of Bellingham or Whatcom Million Trees on restoration efforts, but hasn't led a big project recently, and certainly not since the COVID-19 Pandemic made in-person restoration efforts much more difficult.

I first became interested in LEAD when I saw that they were looking to take on a team of interns for the 2022-2023 school year. I've always enjoyed volunteering in restoration projects, but I was interested in learning more about what goes on behind the scenes to help such projects run. I decided to apply in September. Conflicted about which position to apply for, I wrote in my cover letter that I'd be interested in both the Education and Native Plant specialties, knowing both could be great learning experiences for me. I hoped to learn more about communicating with and teaching the community about the environment, as well as the system and research behind deciding how to reforest an area. Luckily, I was chosen to work in both education and plant logistics.

The Miyawaki Method:

When I interviewed, Ava and Brandon introduced me to the Miyawaki Method. Their idea was to finish the invasive species removal of a severely overgrown site to the north of campus, and to replant it with an afforestation method which hasn't yet been used in many places in the United States. It was developed by a Japanese botanist, Dr. Akira Miyawaki. The Miyawaki Method seeks to build a mini-forest, representative of what climatic forests of the natural environment would be like. To start, you build a list of the species which are typically found in an undisturbed forest. Then, you make amendments to the soil to help give the plants the best possible start, and account for the fact that this method is often used in urban areas. In the Miyawaki Method, you also plant individual plants very close together, three plants to each square meter. This is much denser than I had ever planted in previous volunteer reforestation efforts. After planting, a thick layer of mulch is laid down to help prevent weeds and keep the plants moist (Lewis, 2022). Typically, when reforesting an area people plant with more space in between, and mulch afterwards, but rarely make soil amendments. For example, Oregon State University recommends planting trees spaced from 10 to 14 square feet (Fitzgerald 2008). Both the co-director's enthusiasm and this novel planting method excited me about LEAD.

The Miyawaki Method is exciting because by planting so densely together, it has different goals than typical reforestation methods. These forests are generally self-sufficient in two to three years, and because they are planted so densely together, they can have more of an impact in a smaller space. More trees capture more carbon, filter more water, and prevent more erosion. This method has been used successfully in the Netherlands, Japan, and France,

but isn't very common here in the United States, and we were the first to implement it here in Bellingham (Lewis 2022).

My Duties:

Throughout this internship, I got to work closely with a team of two graduate student co-directors and three other undergraduate interns. I worked to help make decisions about how we would work towards the goal of reforesting the worksite, lead both the LEAD and City of Bellingham volunteers at work parties, and create curriculum to give to volunteers and be featured on the LEAD website.

At the start of the school year much of my work was close with Tegan Keyes, the other Native Plant intern at LEAD. We attempted to identify the existing species at the work site, which helped strengthen my plant identification skills here in Bellingham, as I have previously lived in a less coastal climate. Working with Ava, Tegan and I also tried to assess if it would be possible to source some of the plants for our final planting from small pioneer saplings, such as those that sprout up on their own in roadway medians and gardens. We eventually decided that most of the plants would have to be purchased, but the decision-making process provided valuable insight into the way organizations must trial ideas before the final plan is made. Also early in the process, I researched soil sampling techniques so that we could send a sample to a soil lab and get results in order to inform our soil amendment process. I also compiled a list of possible compost and plant sources to present to the team so that purchasing decisions could be made. These processes helped me practice taking a wide array of information and making it digestible for the rest of the team.

LEAD holds weekly work parties for the community to participate in on campus. We worked at several sites across campus but focused much of our energy on getting the main North Campus worksite into a manageable condition. When Heidi, the former head groundskeeper first showed us the site, it was completely covered in invasive species, with a few standing deciduous trees, and a lone Douglas Fir (Figure 1). I had done plenty of invasive species removal before, but never on a site quite so degraded. It has been difficult to find a comprehensive history of the site, but according to Heidi, it hadn't been maintained in at least 20 years. The site sits just north of the 3R parking lot, an awkward triangle shaped lot sandwiched between Billy Frank Jr. Street and Ivy Terrace (Figure 2).

Figure 1: The worksite in November 2022, covered in English Ivy *(Hedera helix),* Clematis *(Clematis terniflora),* and Himalayan Blackberry *(Rubus armeniacus).* Photo taken by Brandon McWilliams.

Figure 2: The north campus worksite in January 2023, after large scale invasive species removal but before planting. Photo taken by Sky Bressette.

These weekly work parties were a great way to meet other students interested in working in the environment. In my current environmental communication class, people keep mentioning how the best way to network is with the people coming into the field with you, since they will be your coworkers someday. I think these work parties have been a great opportunity for that. I have gotten to connect with people from a range of backgrounds, interested in studying things from environmental studies to creative writing. On and off campus work parties have also helped teach me the skills of being in a leadership position in restoration work. LEAD sometimes partners with the City of Bellingham Parks Department to help lead small groups in restoration efforts on Saturdays. These events gave me the opportunity to practice giving quick, accessible talks on topics like tool safety and plant identification (Figure 3). These experiences also prepared me for our much larger Earth Day event.

Figure 3: Tegan and I at the worksite in early October. We focused on removing English ivy from the trees on this day, and discovered that it ran under all of the dead leaves pictured here. Photo taken by Sofia Quizon.

For the curriculum portion of my internship, I focused on putting together resources that LEAD would be able to use in many circumstances, hopefully even after I graduate. In part because we hoped to eventually have a website up, we wanted to make the research we compiled accessible to others, so that they wouldn't have to do the same searching we did. I made a native/invasive plant guide which is currently being adapted to the website (Figure A1). I also wrote up a guide on bare root planting, as we had to find a lot of information before handling the bare root plants, as none of us had dealt with them before. Tegan and I reached out to and talked to experts from local organizations like the Nooksack Salmon Enhancement Association (NSEA) and Whatcom Million Trees to learn how to store the delicate plants from when we received them in mid-March, to when they would be planted in late April. It was no simple task, as we purchased about 900 bare root plants which we ended up heeling in to prevent them from breaking dormancy. Heeling plants in involves placing them at an angle in a moist material to keep them safe from weather and desiccation. For our final planting day on Earth Day, April 22nd, I also made a printable document for people to learn about the Miyawaki Method that they were helping with (Figure A2). These jobs taught me

more about how to make attractive, and easily understood handouts to share, and how to coordinate with Sofia, our social media intern on how to maintain a cohesive style. The LEAD website is still in development, but will house these resources soon.

The entire year, we were building up to the final planting day, where we got to put all of the pieces together and plant the mini-forest. After all the research, work parties, and many emails, Earth Week arrived faster than I expected. A representative from the Washington Trails Association came out the week before to help us and volunteers build a trail so that the community can walk through the forest. I finalized the plan I made to help people know where each plant would go (a process involving many hours color labeling stakes and small plants) (Figure 4a). The Western Alumni Association flew Hannah Lewis, the author of Mini Forest Revolution, out to WWU to give a talk in the Environmental Speaker Series, so we not only got to hear her speak on the method we had read about in her book back in September, but she attended and helped at the Earth Day work party. A lunch with the mayor of Bellingham was even coordinated, where I got to hear Hannah explain the method and answer questions from relevant city officials. We had the final meetings with the City Parks Department, Whatcom Million Trees, and the Whatcom Conservation Corps who would all be helping run the event on Earth Day, and it was time to recharge until the event itself.

Earth Day arrived with a sprinkling of rain and otherwise beautiful weather. I got to the worksite just before seven that morning and set to work doing the final preparations with the rest of the team. We had a large meeting led by the city in which I got more insight into how they run such large-scale events, and volunteers started arriving. I lead the “nursery,” the spot where our plants had been heeled in for the past month. In the tight space me and two other

volunteers made buckets full of plants to send out to the rest of the volunteers, where they could then match the color of the survey tape on the plant to the color coded stakes we had placed the day before (Figure 4a). I planned this system hoping that the responsibility would be on us to give out diverse groups of plants, instead of the volunteers needing to worry about it. This was important because a major part of the Miyawaki Method is planting a richly diverse group of species, and not planting the same species in close proximity when possible. I believe that the system worked well, and the planting went faster than expected. Between those planting with LEAD, and doing invasive species removal with the other organizations, at least 200 volunteers came for the morning event, and another 60 in the afternoon for the second LEAD work party (Figure 4b). Altogether, we planted almost 1000 trees. I was amazed to see such a turnout, with so many people excited to help. It was the first time I got to participate in an event of such scale.

(a)  **(b)** 

Figure 4: (a) The worksite before planting began, with potted plants staged and the stake-

system in place. Photo taken by Amelia Lee. **(b)** Volunteers planting at the Earth Day work party, the view from the nursery. Photo taken by Eva Araujo

Reflection:

I am very grateful that I got the opportunity to participate in this internship. It has been an amazing experience to see a project of this scale come together over the course of the year. In addition to the skills mentioned previously, I got to learn about grant processes, coordinating with other organizations, and volunteer engagement. I had experience volunteering with restoration projects before LEAD, but this internship has helped deepen my understanding of the processes that must happen before the work party. This view into the behind-the-scenes world has helped give me an idea of if I would like to work in a similar job in the future, and I can conclude that I would. I really enjoyed working with a small, close-knit team and how tangible the final product was. It was good practice in learning how my skills can be combined with others to further a common goal. Even though I had never imagined myself in a public facing job, I realized through the course of this internship that I really enjoy talking to people about the environment and helping lead restoration efforts. Coming from a major in Environmental Science, I'm glad I got the opportunity to participate in a less science-based project as well as all the STEM-centered classes I've taken here at WWU. This internship has helped broaden my view of the possible jobs available to me, especially because I got to interact with several other organizations beyond LEAD such as by meeting people from non-profits and within city government. Getting insight into how different groups can bring different resources and work together was also valuable.

Having past experiences in leading groups and with restoration helped me succeed in this internship. Much of this knowledge came from past jobs, such as those leading groups in summer camps, or volunteer experience with organizations like the Washington Trails Association. I think if I had taken a class related to restoration it could have helped me be more prepared, such as with native plant ecology, but I still felt equipped enough to handle my duties and ready to learn along the way.

Appendix A:

Resources created for LEAD

Native/Nonnative Plant Identification

What are invasive/nonnative plants?

- Invasive species are non native species which threaten the economy, environment, or human health.
- "Noxious Weed" (examples are Himalayan blackberry and English ivy) is a legal term for invasive plants which harm local ecosystems and agriculture. There are specific control measures in place for many of these plants.
- Not all nonnative plants are noxious/invasive!

Nonnative/Invasive Plants

Plant, Origin, Info	Identification, Photos
Himalayan Blackberry (*Rubus discolor, Rubus procerus, Rubus bifrons*) *The Himalayan blackberry is a plant native to Asia, which quickly overgrows large areas, reducing habitat for native species*	• **Five/three rounded alternately arranged leaves** • Flower clusters of 5-20 flowers, with small (1 in diameter) white-light pink flowers with five petals • The thorny stems/canes are angular, not round and can be up to 40 feet long, and then re-root when they reach the ground • NOT trailing blackberry, a native species. Trailing blackberries usually have only three leaflets, and usually grow along the ground with smaller fruits and narrower canes. 

Nonnative/Invasive Plants

Plant, Origin, Info	Identification, Photos
English Ivy (*Hedera helix* 'Baltica', *Hedera helix* 'Pittsburgh', *Hedera helix* 'Star', *Hedera hibernica* 'Hibernica') *Refers to a group of ivy species, most of which came from Europe. It both outcompetes native species, and kills trees by shading them out or acting as a wind sail* *The sap and stems can also cause skin irritation, and if consumed in large amounts is toxic to people and cattle* *Since it has shallow roots but outcompetes native plants, it can increase slope failure problems*	• **English ivy is an evergreen plant, with lobed, alternative leaves** • **Vines grow rootlets to cling onto surfaces as they climb** • Mature plants grow small yellow-green flowers in the fall, and dark purple berries in late winter/early spring   

Nonnative/Invasive Plants

Plant, Origin, Info	Identification, Photos
Scotch Broom *(Cytisus scoparius)* *In the pea family, and outcompetes native plants and can cause fire hazards* *Can slow restoration of forests and wetlands* *Can cause mild poisoning to animals like horses* *Seedpods can survive for up to 60 years*	• **Bright yellow pea like flowers on evergreen branches with simple pointed leaves up to an inch long** • Gets hard black seedpods with hairy edges in the spring • Can grow 6 to 10 feet tall   *Washington State Noxious Weed Control Board*
Poison Hemlock (*Conium Maculatum)* ***Can kill humans and animals in a few hours if ingested, wear gloves to handle*** *A member of the carrot family*	• **Leaves are carrot or fern like, and small white flowers are arranged in clusters on the end of stems** • **Stems have reddish purple streaks, are hollow** • Can get 6-10 feet high • NOT Queen Anne's Lace (Daucus carota) which has hairy stems and only one flower cluster per stem, and is also generally 3ft tall or shorter   *Washington State Noxious Weed Control Board*

Nonnative/Invasive Plants

Plant, Origin, Info	Identification, Photos
English Holly (*Ilex aquifolium*) ***Berries are poisonous to humans and pets*** *Was introduced from Europe for ornamental purposes.* *Birds easily spread the seeds, and it outcompetes native species.*	• **Alternate leaves are 1-3 inches long, waxy, and have sharp spines along the edges.** • **Distinctive red berries late fall-winter** • This evergreen shrub can grow 15-30 ft tall, with a smooth, silver/gray trunk. • NOT oregon grape, a native plant which has blue/purple berries, and less waxy, opposite leaves with much smaller spines  *Whatcom Country Noxious Weed Board*
Clematis (*Clematis terniflora)* ***Very poisonous if eaten*** *Not as common as the other plants mentioned here, but present at our site* *Native to Japan* *Similar to english ivy, clematis quickly grows up over trees and shades out native species. It poses similar risks* *Considered an invasive species in many eastern states*	• Climbing, vine with opposite leaves and 4-5 petals on white flowers • Typically brown stems  *Alpsdake CC BY-SA 4.0*  *Katrina Wiese CC BY-SA 2.0*

Native Plants

Plant, Info	Identification, Photos
Douglas Fir (*Pseudotsuga menziesii)* *300+ feet tall! (only California redwoods get taller on the west coast)* *Not technically a true fir (or pine or spruce), the genus name means "false hemlock," and is most closely related to larches*	• **Distinct Papery brown buds** • **Cones have three pointed bracts poking out between scales** • Thin needles with soft tips stick out in all directions (but may lay flat in the shade) • On mature trees, bark is deeply furrowed   *Ken Denniston, NWConifers.com* 
Western Red Cedar (*Thuja plicata)* *Not a true cedar (which is genus Cedrus)* *This is the provincial tree of British Colombia*	• **Scale like leaves** • **Small brown cones which sit on top of branches** • Red-gray fibery bark   *Ken Denniston, NWConifers.com*

Native Plants

Plant, Info	Identification, Photos
Western Hemlock (*Tsuga heterophylla)* *Bark can be used to tan leather, and you can extract a red dye from it* *This is Washington's state tree*	• **Short, flat needles** • **Cones are usually under an inch long, with thin rounded scales** • The top "leader" (top bit of tree) tends to droop • On mature trees, gray bark is slightly furrowed  *Ken Denniston, NWConifers.com* 
Common Snowberry (*Symphoricarpos albus*) *The fruits of the snowberry contain saponin, a soapy substance with antioxidant and antimicrobial effects. Fresh berries can be crushed and rubbed on skin to clean, soothe rashes and burns* *Deep roots - good for erosion control*	• **Waxy, snow white berries on thin wiry branches** • **Opposite leaves, which may be lobed or smooth** • Get small pink flower clusters in the spring   *Greb Rabourn, www.kingcounty.gov/gonative*

Native Plants

Plant, Info	Identification, Photos
Oregon Grape (*Mahonia aquifolium*) *Berries eaten by many birds, and are also edible to humans. They are very tart and edible raw* *The inner bark can be used to make a yellow dye*	• **Opposite Leaves (directly across from one another), blue-gray berries** • Shiny, dark green evergreen leaves, less spined than holly, new leaves are bronze colored  *Dana Kelley Bressette, nativeplantspnw.com*  *Dana Kelley Bressette, nativeplantspnw.com*
Trailing Blackberry *(Rubus Ursinus)* *Has sweet edible berries* *Important to native pollinators, such as bees and butterflies*	• **Usually has three leaflets at the end of round stems which do not form self supported brambles, but is found as trailing ground cover** • White flowers with five narrow petals • Berries up to 2 cm in length • Smaller, thin thorns than Himalayan Blackberry  *Leslie Seaton*  *Peter Pearsall/U.S. Fish and Wildlife Service*

What can we do to prevent the spread of invasive species?

- Avoid planting invasive ornamental plants
  - Other examples for Western Washington: Butterfly bush (Buddleja davidii), Kudzu (Pueraria montana var. lobata), Japanese knotweed (Polygonum cuspidatum)
- Don't dump aquariums or houseplants into the environment
- Buy firewood from the same place that you are burning it to prevent spread of invasive insects
- Clean, drain, and dry boats when transporting between bodies of water
- When traveling, clean clothes, boots, animals, and boats to prevent spread
  - Have you ever seen boot brushes/hoof picks at trail heads? Use them on the way in and out!

Other Resources

- King County Noxious Weeks
  - https://kingcounty.gov/services/environment/animals-and-plants/noxious-weeds.aspx
- Washington Invasive Species Counsel
  - https://invasivespecies.wa.gov/
- Washington State Noxious Weed Control Board
  - https://www.nwcb.wa.gov/

Figure A1: Native and Invasive plant identification Handout

The Miyawaki Method: LEAD mini-forest

How did we get here?

LEAD and the WWU outdoor maintenance crew identified the worksite as a spot needing restoration in September 2022. At that time, it had sat for 20+ years, and become covered in nonnative and invasive species. LEAD co-directors started coming up with a plan to implement the Miyawaki Method, culminating in the 2023 Earth Day work party!

What is the Miyawaki Method?

The Miyawaki method is an afforestation method that was developed by Japanese botanist Dr. Akira Miyawaki. It emphasizes planting native climax species very densely together to encourage healthy competition, resulting in diverse and healthy forests that differ from conventional monoculture plantations in several ways:

- Miyawaki forests grow 10x faster, becoming self-sufficient after only 2-3 years of maintenance.
- They have high biodiversity and are therefore more resilient and provide better habitat for a wide variety of animals.
- They are 30x denser, and can capture more carbon from the air, filter more water, and increase protection from erosion, heat, and weather events
- Miyawaki mini-forests are well suited to urban environments because they can be planted on sites as small as 3x2 meters. They have been successfully planted all around the world, in a variety of climates.

The Miyawaki Method: LEAD mini-forest

How are we using the method?

1

MAKE A SPECIES LIST

At our site, we are trying to emulate a forest characteristic of the Coastal Western Hemlock Zone (CWH), which are rich in western hemlock, Douglas fir, and western red cedar. In total, we are planting 20 different species today.

2

PREPARE THE SITE AND AMMEND THE SOIL

LEAD and it's volunteers have worked all school year to remove invasive species and get the site into a plantable condition. We have also amended the soil with compost to give the young plants the best possible start

3

PLANT!

This is where our Earth Day work party comes in! We are planting over 1000 plants, and need many hands to do it.

4

MAINTAIN

Over the next two to three years, the mini forest will be maintained by LEAD members, volunteers, and seminar students. After that, it should maintain enough moisture to be self sufficient and the canopy will be filled in enough to prevent weeds and invasive species from returning

Figure A2: Miyawaki Method Handout

References:

Fitzgerald, S. A. (2008). Successful Reforestation: An Overview. *Oregon State University Extension Service*, *The Woodland Workbook*(1498), 1–8.

Lewis, H. (2022). *Mini-forest revolution: Using the Miyawaki method to rapidly rewild the world*. Chelsea Green Publishing.