Western Washington University

Outback Farm - Bellingham, WA

Western Water Resilience Case Study

The Outback Farm is five acres on the Western Washington University (WWU) campus composed of garden space, food forest, wetland, mature forest, and native plants. Started by Fairhaven College 52 years ago as a place for education, experimentation, wellbeing, and agriculture, the Outback Farm is a place where students grow food for other students.

Based on a model of mutual aid, 100% of what is produced on the farm – from veggies and fruit to honey and eggs – is distributed to WWU students facing food insecurity."
In 2024, the Outback Farm—led by Terri Kempton and John Tuxill—began testing mulching techniques, using soil moisture sensors to guide irrigation decisions across, and experimenting with crop varieties known to perform well under dry-farmed conditions in Oregon's Willamette Valley.

Exploring Water Resilience: What was tried and learned

Expecting a hot, dry summer, the farm team trialed summer crops that usually struggle in their cool, coastal climate. But an unexpectedly wet season—later linked to La Niña—led to poor germination and low yields.

Other water resilience strategies proved more effective. Weed cloth best suppressed weeds, and soil moisture sensors signaled the need to irrigate only three times all season—down from the usual 60. This freed up students for other tasks and reinforced data-driven decision-making.

Farm at-a-glance

TYPE
Student Farm

AVERAGE ANNUAL PRECIPITATION
36.5 inches

SOIL TYPE
Fill dirt amended with organic matter on heavy clay

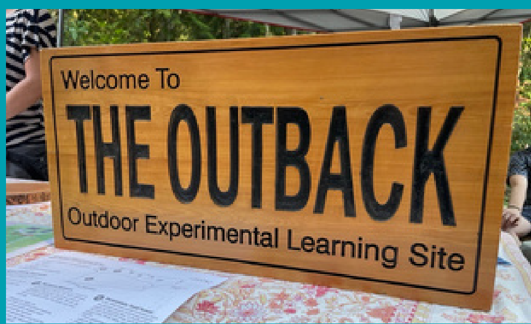
Available water holding capacity: 9 inches

CROPS
Vegetables, herbs, fruit

FARM SIZE
Five acres

LAND TENURE
Protected wetland and designated greenspace in the university's 2000 master plan

2024 WATER RESILIENCE PRACTICES
Mulching
Soil Moisture Sensors
Crop Trial



Understanding Context: Water, Climate, and Soil

Bellingham gets about 36 inches of precipitation per year. In the climograph below, you can see that less than six inches of precipitation on average fall June through September, the dry season, which coincides with the highest annual temperatures averaging from 66 to 72 degrees Fahrenheit.

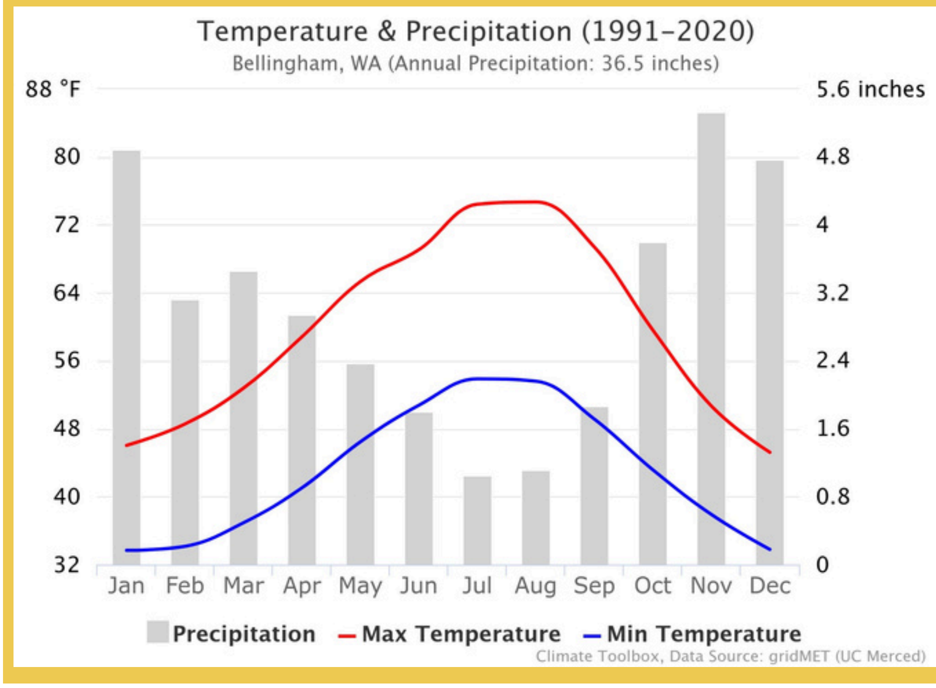
A unique feature of the Outback Farm is a restored and protected wetland running the length of the farm. The wetland and creek topography has evolved over the decades, and is fed by a natural seep on the hillside. The wetland also receives stormwater runoff from the hardscaping at the dorms, which can cause the creek to rise substantially in a major rain event but has never been large enough for the stream to flood the fields and garden area.

For irrigation, there is a water spigot on the highest corner of the farm which is tied to the university water that feeds a system of hoses and drip lines throughout the garden beds. While the water supply is generally reliable, the main challenges at the Outback Farm have been the learning curve of maintaining the farm, including irrigation with student power.

Before becoming a farm, Outback Farm was a flat site with graded dirt used as a parking lot for construction vehicles. The original ground was a combination of fill dirt and local clay-heavy soils. Over the years, it has been amended with compost to improve soil texture and nutrient availability. Soil test results indicated that pH was 6.8, so no lime was needed; there was an excess of phosphorus (P) and potassium (K); soil organic matter in the surface layer is almost 5%.

The landfill cap itself is an extremely compacted layer of clay combined with loam, over three feet deep.

Temperature & Precipitation



Soil test results indicated that liming could be discontinued, boron and phosphorus had accumulated excessively, and a magnesium amendment should be considered. Potassium levels were also found to be high.

The soil at this site has an available water holding capacity (AWHC) of nine inches, meaning it can hold nine inches of water in the top five feet, which is fairly good for crop growth. Because the lower soil layers have a lot of clay, water moves through them slowly, which can lead to water pooling during the rainy winter and spring months—making the soil somewhat poorly drained. A soil test also showed high levels of phosphorus and potassium. This was helpful information for the students managing the farm, as it helped them avoid using too much fertilizer and risking runoff into the nearby stream and wetland.

Soil Health Practices & Preparation

In the fall, soil was weeded and planted with a cover crop of winter rye, daikon radish, and hairy vetch. In May, the cover crop was mowed; some was removed and used for compost and the remaining plant materials were gently incorporated into the soil using a broadfork.

Additional fertilizer was not added due to high nutrient levels observed in the soil analysis from the previous fall. In areas without cover crops, tarps were used to suppress weeds and prepare the soil (a process called occultation) for 2–3 weeks before broad forking and planting.

Water Resilient Strategies Explored in 2024

The Outback Farm demo featured soil moisture sensors, mulching techniques, and crop trials.

Soil Moisture Sensors

Watermark granular matrix sensors, two installed at a depth of 1-foot and two installed at a depth of 3-feet, were used for:

Site comparison: The same crops were planted in two distinct areas with different soil types:

- *Main upper garden* with fill soil versus
- *Lower south field* (previously in grass) near creek, to help understand soil moisture and crop performance differences in those locations.

Corn, beans, amaranth, winter squash, and kale were planted in both beds.

Irrigation decisions: Soil moisture sensor data (at one-foot and three-feet) was used to inform and communicate about when to irrigate in a reduced irrigation plot. When sensors read 50 or higher (Zero is saturated and 199 is wilting point), irrigation was turned on. There was a dry farmed plot (not irrigated and slightly uphill from the irrigated sections to limit accidental runoff irrigation) and a full irrigation plot (irrigated four times per week) adjacent for observation.

Key findings

The soil moisture sensors placed at one foot deep showed that the lower south filed dried out faster than the main upper garden. Even so, the sensors only signaled the need to irrigate three times all season. In contrast, in a typical year—without the benefit of these sensors—students would have watered about 60 times, usually four times a week throughout the season.

Meanwhile, the sensors placed three feet deep stayed near full saturation the entire time. Interestingly, the south field still had better corn and bean yields, possibly because it got more sun and had faster-draining soil in the top foot. Meanwhile, the upper garden's cooler, shadier conditions were tough on heat-loving crops, especially with the extra rain this year.

Mulching

Outback Farm faces high weed pressure, so the team explored different ground cover and mulching techniques to help conserve moisture and suppress weeds, including:

- 'Dust mulch' - kept the top 2-3 inches of soil loose and weed free with a wheel or stirrup hoe to conserve moisture below
- Trough and straw - furrow row for planting then apply straw mulch 6-8 inches deep (applied at 8+inches that compressed down to 6 inches after two weeks)
- Weed cloth - rolled out three weeks before planting. Holes were made for tomatoes, broccoli, zucchini, cucumbers, and onions.

Key findings

Weed cloth was the most effective in managing weeds. Straw mulch applied to the depth of 6-8 inches was not very effective in suppressing weeds and got moldy in the unusually cool, wet weather. The 'dust mulch' was successful in eliminating weeds and conserving soil moisture.

Crop Trials

The farm team trialed summer crops that usually struggle in their cool, coastal climate, including corn, beans, squash, melons, tomatoes, and potatoes. They grew varieties from the Dry Farming Seed Directory and Dry Farming Adaptive Collection, that were included in the water resilience demo in the dry farmed, irrigated and reduced irrigation plot, alongside crops and varieties adapted conditions in Bellingham (brassicas, carrots, beets, onions, greens, radish, peas).

Key findings

In this extremely cool, wet, La Niña year, the summer crops trialed did not do well. Daytime temperatures never got above 90 degrees and night-time temperatures didn't stay above the 40s until July. It was a prolific year for cooler-season vegetables like kale, mustard greens, brassicas, alliums, and, surprisingly, summer squash and amaranth. It was also a remarkable year for perennials such as herbs, berries, hazelnuts, and tree fruits.

Looking Forward

As summers grow longer, hotter, and drier, Outback Farm is increasingly focused on finding ways to conserve water in food production—and weaving those strategies into their educational programs.

Looking ahead, the farm plans to keep experimenting with crops and varieties that perform well under low-water conditions. After a particularly wet 2024, they're also interested in testing row cover as a way to shield plants from excessive moisture.

Soil moisture sensors will remain a key tool, helping guide irrigation decisions and reduce unnecessary watering, saving both water and student labor.

The team will continue using weed cloth for both occultation (weed suppression) and moisture retention, and they plan to try straw mulching again, expecting better results during a more typical dry summer.

The farm's 1.5-acre perennial food forest also supports their water conservation goals and serves as a living example for students. Made up of trees and shrubs, this system requires only occasional irrigation and mimics the structure of a mature forest—naturally absorbing rainfall and reducing erosion. It offers a complementary model for growing food and fiber with minimal water inputs, expanding what students see as possible.

For More Information:

Outback Farm (Bellingham, WA)

Dry Farming Institute Case Studies

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