Point Blue Conservation Science

Restoration Technician Jessie Ditmore in the field. Point Blue Photo.

Inoculant-Supported Restoration (ISR)

Harnessing the power of fungi to increase climate change resilience

Climate change is increasing the need for ecological restoration across the planet. Californians are rising to the challenge by investing millions of dollars in ecosystem restoration projects thanks to voter-approved funds like Measure AA and Propositions 1 and 68. The critical nature of this work and the swell of support presents exciting opportunities for innovation. Here we share our initial findings of a restoration approach that directly addresses climate change by adding a new spin to a tried-and-true approach. We invite our conservation colleagues to test and improve on it as we collectively work towards shared conservation goals.

We built on the beneficial relationship that woody plant roots form with ectomycorrhizal fungi. With a hotter future in mind, we collected fungi locally and regionally from warmer/drier areas and added them to the soil during planting. We predicted that fungi collected from regions with higher temperatures would help restored plants survive current droughts and a hotter future, and the early results are promising.

We believe this approach should be added to the restoration practitioner's toolbox due to its potential to increase plant survival, improve project success, and enhance climate mitigation and adaptation.

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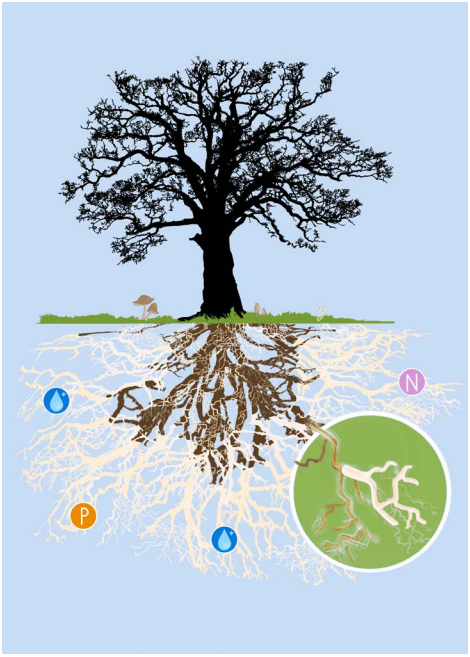
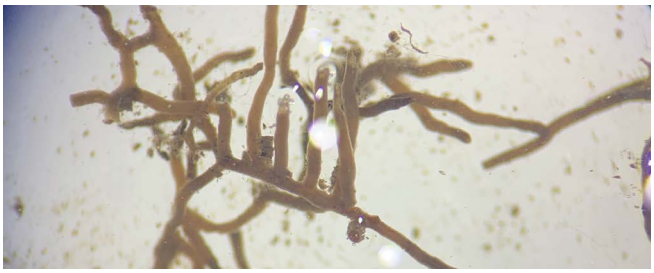


Ectomycorrhizal fungi play a key role in water and nutrient uptake from the soil for many woody plant species in habitat restoration. (Graphic by Jessie Ditmore)



Ectomycorrhizal root sheaths under a microscope. Photo by Bridget Hilbig, Weber State.

Point Blue field scientist adding inoculum to the soil during planting. Point Blue Photo.

Mycorrhizal Mitigators

Plants with robust mycorrhizae (beneficial fungi growing in association with plant roots) are more resilient to drought and climate change, and are also capable of sequestering more carbon in the soil. Trees, such as oaks and willows, associate with a particular type of mycorrhizal fungi known as ectomycorrhizal fungi. Inoculation with ectomycorrhizal fungi can increase tree survival and the success of restoration projects as well as provide more climate change mitigation and adaptation benefits.

A Spoon Full of Cost Effectiveness

As the need for riparian restoration increases with climate change, water for irrigation will become increasingly limited and costly. Ectomycorrhizae increase the plant's ability to extract nutrients and water from the soil, and therefore can decrease the amount of effort and investment needed from restoration practitioners over time. And when the inoculant is adapted to hotter and drier conditions, it can support survival as temperatures rise and droughts increase.

Work in the field at a riparian restoration site. Point Blue Photo.

Point Blue field scientist assessing plant growth at a restoration site. Point Blue Photo.

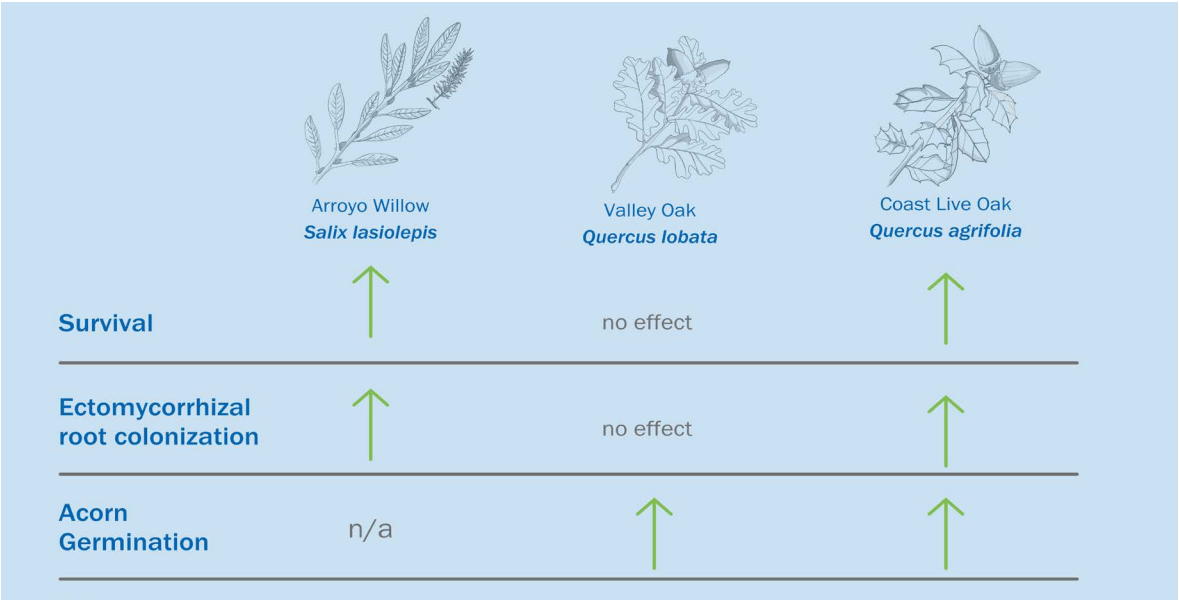
Naturally Sourced & Heat-Adapted

Inoculant-Supported Restoration is successful in part because of the use of whole-soil mycorrhizal inocula sourced from mature riparian forests. Naturally sourced whole-soil inocula are generally more effective than commercial inocula at aiding plant growth and survival. The near-term benefits of collecting inocula from regionally warmer and drier locations--a novel technique--are shown in the graphic below. We believe that these findings warrant inclusion of ISR in the restoration practitioner's toolbox.

A Promising Approach for the Future

Given our initial results (below) we are excited to not only incorporate the technique into the restoration work we do at Point Blue, but also scale it up by inviting our conservation community to join us in testing and refining the approach. The conservation community is at a critical time in history where if we don't work together to make progress more rapidly now, the future will only hold harsher challenges. Inoculant-supported restoration is one way to make positive change faster and co-create a healthier future for all.

Inital Results: How did each species respond to heat-adapted inoculum?



Tree species sketches by Jessie Ditmore.

Over a 2 year study, we compared trees planted with whole-soil inocula sourced from a nearby region with warm and dry conditions to trees planted without any inoculum. We found strong evidence that ISR more than tripled the odds of survival in Arroyo Willow and Coast Live Oak, and that these trees also had higher rates of root colonization by ectomycorrhizae. We also found that the odds of acorn germination doubled for both oak species. There was no evidence of any negative effects of ISR.

Get Involved

Try ISR

Check out our ISR technical report and companion video at pointblue.org/ISR for more details on what we found and how to replicate this approach at your site(s).

Explore Careers

Point Blue offers seasonal and ongoing technician positions as well as early career training opportunities in rangeland conservation. Keep an eye on pointblue.org/careers.

Partner

Achieving climate change mitigation and adaptation can only be achieved successfully together.
Contact Chelsea Carey to discuss ideas: ccarey@pointblue.org.