



Upper Gila Watershed Alliance

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Upper Gila Watershed Alliance

Office

PO Box 1536 Silver City, NM 88062 575-956-3301 admin@ugwa.org www.ugwa.org

Mission Statement

The Upper Gila Watershed Alliance is a non-profit watershed protection and conservation organization working to promote the long-term health of the Upper Gila Watershed and its communities of life. Through advocacy, education, research and restoration projects, we are striving to build communities of stewards in more locally based economies.

UGWA Staff

Carol Ann Fugagli Executive Director

Rebecca Martin Administrative Assistant

Board of Directors

Nora Fiedler

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Sharman Apt Russell (Chair)

Dennis Weller

Editor

Sharman Apt Russell

Graphic Design

Rebecca Martin

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Remembering Jim Furnish

The UGWA community is deeply saddened by the loss of board member Jim Furnish, who passed away peacefully on January 11, 2025, in his home in Gila, NM.

Jim joined the UGWA board in 2022. He soon became a trusted voice, especially in regards to the stewardship of the Gila National Forest, as well as larger issues of national concern and conservation. He was unfailingly kind, thoughtful, and ready to help when UGWA needed him. Importantly, he shared our love for the Gila watershed and, in turn, he shared his love and enthusiasm for life with everyone around him.



About the Cover

Students sharing the message are either employed by the New Earth Project or are fourth-grade students in classrooms where we conduct monthly soil health activities.

TOP ROW (L-R): Emma Blanco, Ella Jameson, Deru You, Sunny Stormbringer; MIDDLE ROW (L-R): Caleb Hunte, Jerek Gnader, Lila Knadler, Harper Seal; BOTTOM ROW (L-R): Harper Dunlap, Judas Smith, Dara Werber-Raiter, Ivy Stephenson.

Sign artwork by Nan Franzblau; photos by Nan Franzblau and Carol Ann Fugagli. Jim brought a wealth of experience to the UGWA board. He retired as Deputy Chief of the U.S. Forest Service following a 34-year career working primarily in the West. As Deputy Chief at national headquarters in Washington, D.C., he played a principal role in promoting the 2001 Roadless Area Conservation Regulation, which protected some 56 million acres of public lands from road building and other development. Earlier, as Supervisor of the Siuslaw National Forest in Oregon during the spotted owl controversy, he effectively led that forest from a mission of clear-cutting timber to managing the larger ecosystem for all of the natural values in the forest. He is the author of Toward a Natural Forest: The Forest Service in Transition, published by Oregon State University Press, and numerous opinion pieces, including in the Washington Post and Albuquerque Journal.

After retiring in 2002, Jim served on the boards of many environmental and faith-based conservation groups. He moved to the Gila Valley in 2022 where he continued his advocacy work and also learned to love pickle ball. He was often seen bicycling from Box Canyon Road to the courts by the Gila Community Center. He will be greatly missed.

We'd LOVE to stay in touch!

And we have a couple of great ways to do that!

Email If email is best for you, sign up for our monthly e-newsletter. We promise it's just once-a-month and an important bulletin every so often. Sign up on our website at ugwa.org and click on the Read Watch & Listen Tab.

Social Media If social media is more your flavor, we're on Facebook and Instagram. Give us a follow!

Or better yet, do both!

Message from the Executive Director

ecently, I've been reflecting on how young people perceive nature. They cannot experience the untouched, special places I knew as a child, as those areas have either been lost or have become less biologically rich. A term that describes this phenomenon is shifting baseline syndrome, or SBS, which was coined by marine biologist Daniel Pauly. SBS is a psychological phenomenon where people's understanding of the natural world is influenced by their personal memories and experiences rather than by a more comprehensive understanding of its historical state. As the environment degrades or changes, younger generations may not remember or appreciate the conditions that existed before, leading them to accept the current state as normal. This can create "generational amnesia," where the true extent of environmental change goes unrecognized. All generations experience this, but the rates of destruction are occurring much faster today than ever before. Young people today are growing up in an age of necessary ecological restoration, and UGWA's work reflects this commitment. Restoring springs will enable the meadow jumping mouse and numerous bat species to thrive. Eradicating invasive species like salt cedar and feral cows along the Gila River will restore natural habitats and ecological systems.





While we focus on regenerating nature, it can be easy to overlook our own human needs and desires for connection with the natural world. The paths of rejuvenation are unique to each individual. I find solace in the quiet beauty of immersing myself in a natural environment, while others may find it in wildlife tracking, nature photography, or writing. Some turn to meditation and yoga to gain a deeper sense of themselves. UGWA has the great privilege of sharing an office with Jeff Goin, the director of the Lotus Center. Over the past decade, I have seen people restoring their minds and souls daily through these practices, and I have found many benefits myself. Whatever method you gravitate towards, make space for taking care of





Photo by Mike Fugagli

yourself. Our physical and mental wellbeing will empower us to improve the well-being of our home, planet Earth.

"Anything else you're interested in is not going to happen if you can't breathe the air and drink the water. Don't sit this one out. Do something. You are by accident of fate alive at an absolutely critical moment in the history of our planet." – Carl Sagan

My friend the water

By Savanna "Savvy" Egge

My entire life, so far, has been a collection of miraculous monumental meaningful moments, melodies and magic. The loss of my mother has taught me to become my very own caretaker, and the grass and trees that surround me have become my friends. I was born talking, soon enough singing, and I haven't stopped since. My connection to music and its healing properties is a deep, intimate and

exceptional one. The song that the river sings to me is not just one, but seventeen years worth of heart. When she speaks to me, softly, the stream grants me with the greatest gift I believe one could ever receive. This gift, so raw and delicate, is the ability to create. In stillness I receive stories of love, loss and trial. Songs appear somewhere deep under the surface. When I can find it in myself, the courage to dive in, I find that the water is warm and welcoming.

Some days it's a rushing wave of inspiration, crashing down on everything and pleading to be heard. The river winds and wraps its way around me so tight I cannot escape it. The stream hums a sweet sound and asks me to repeat it. This curious water has a way of seeping into my mind and, stubbornly, she'll let me drown if I do not write down her stories. Sing them. Share them with people. The song I hear in a body of water is often loud.

Other days, a drop or two will trickle down into my ears, onto my neck, and playfully roll down my back and onto the ground. Into the earth, where it first came from just as I did, as we all did, and dissipate. The stream flows in all the time, reminding me that everything is connected. The wind, howling at weeping willow branches to stay still, the rain, eager to reunite with his lost liquid love, and the loving, living girl who is so grateful she gets to be surrounded by it all.

The melody that accompanies the water's whisper is a sound of great power. Bold vibrations that shake the water out of its



body, splashing it all over mine. A gentle yet stern push towards fate. The melody is a wise teacher, sharing his knowledge of awareness. His curiosity about what it means to exist amongst all of this magic. The melody wishes for the song to hear his rumble, for his shakes and rhythm to awaken her, for the earth has loved the body of water that sings as long as he has known to melodize. The words that spill out in my

songs are an unborn child of this devastating, all consuming love. Love is usually that way. Not always devastating, often not, but all consuming.

There are some things you just know. The sky is blue. What goes up must come down. Each person is of equal value. What I know is the river sings through me, and she is a friend. We spend so much time together, I have a feeling she just knows how much I love her.



Savanna "Savvy" Egge

Originally, I wrote this essay for a writing contest, and it ended up becoming my favorite piece of writing I've ever done!

I'm a Junior at Aldo Leopold Charter School, and after I graduate, I plan on seeking adventure and taking life as it comes.



Grandly 2025: One Grand Gift at a Time. Each year, the Give Grandly Coalition—powered by the Gila Community Foundation—rallies our region around one powerful movement of generosity. Since its inception, Give Grandly has raised over \$1.8 million to support the vital work of nonprofits across southwest New Mexico. These funds provide critical general operating support that local nonprofits rely on to sustain and grow their impact. From food security to youth programs, arts and culture to environmental stewardship—your gift helps ensure these organizations can continue serving our communities year-round.

This year, donations open on April 19, 2025, and continue through May 17, 2025, culminating in a special in-person Giving Day celebration on **Saturday, May 3**, **2025, from 9:00 AM to 2:00 PM at Gough Park** in Silver City, NM. Come meet the nonprofits, enjoy local food, live music, family-friendly festivities—and be part of something truly grand. The Gila Community Foundation proudly organizes and supports Give Grandly, solicits matching funds from local businesses, and takes no fees from donations raised—ensuring every dollar goes where it's needed most. Together, we can build a stronger, more vibrant community—one grand gift at a time.

If you miss the in-person event you can visit the online giving platform from April 19 - May 17: <u>www.givegrandly.org/organizations/upper-gila-watershed-alliance</u>

Underground Networking: The Amazing Connections Beneath Your Feet

By Britt Holewinski

Walking through the forest, it's easiest to pay attention to what is happening at eye level and above. Birds, sunlight, wind, branches, there's a lot to observe. Next time you're exploring a forest, consider what lies below the soil, leaves, and moss that carpet the ground. Underneath the forest floor, intertwined with the roots of the trees, is a fascinating microscopic network of fungus.

Woodwide Web

When most of us think of fungus, we imagine mushrooms sprouting out of the ground. Those mushrooms are in fact the "fruit" of the fungus, while the majority of the fungal organism lives in the soil interwoven with tree roots as a vast network of mycelium. Mycelium are incredibly tiny "threads" of the greater fungal organism that wrap around or bore into tree roots. Taken together, myecelium composes what's called a "mycorrhizal network," which connects individual plants together to transfer water, nitrogen, carbon and other minerals. German forester Peter Wohlleben dubbed this network the "woodwide web," as it is through the mycelium that trees "communicate."

In healthy forests, each tree is connected to others via this network, enabling trees to share water and nutrients. For saplings growing in particularly shady areas, there is not enough sunlight reaching their leaves to perform adequate photosynthesis. For survival, the sapling relies on nutrients and sugar from older, taller trees sent through the mycorrhizal network. A study on Douglas-fir trees at England's University of Reading, indicates that trees recognize the root tips of their relatives and favor them when sending carbon and nutrients through the fungal network.¹

Ecologist Suzanne Simard hypothesizes that the fungus linking the trees is motivated by the need to secure its own source of carbon. The mycorrhizal network plays a distribution role to keep the mycelium-connected trees alive and healthy and the fungi's supply of carbon consistent.² As a sort of payment for their services, the mycorrhizal network retains about



Mushrooms are the fruit of the mycorrhizal network fungus, and connect trees through tiny threads called mycelium. Dr. Shannon Guichon

30% of the sugar that the connected trees generate through photosynthesis. The sugar fuels the fungi, which in turn collects phosphorus and other mineral nutrients into the mycelium, which are then transferred to and used by the trees.¹



Mother Trees

A linchpin in the tree-fungi networks are hub trees. Also referred to as "mother trees," these are the older, more seasoned trees in a forest. Typically, they have the most fungal connections. Their roots are established in deeper soil, and can reach deeper sources of water to pass on to younger saplings. Through the mycorrhizal network, these hub trees detect the ill health of their neighbors from distress signals, and send them needed nutrients.¹

These findings suggest trees have developed complex symbiotic relationships for species survival. The mycorrhizal network is an integral part of this connectivity, and while the fungi are often acting in their own best interests, they facilitate health and survival of even the biggest trees.

Underground Networking continued from page 5



This diagram shows the connections between, where older and more connected trees are shown in dark green, while young trees just establishing themselves to the network are paler green.²



Next time you're visiting a forest, as you wander through the trees, take a moment to think about the complex exchanges happening underneath your feet. The mycorrhizal network is critical to supplying the life-giving nutrients that keep our forests healthy.



A cross-section of a seedling connected to the mycorrhizal network.³

Article reprinted with permission from the National Forest Foundation (NFF).

The NFF is the official nonprofit partner of the U.S. Forest Service and works to bring people together to restore, enhance, and enjoy National Forests and Grasslands. Over the past few years, the NFF has been expanding their program of work in New Mexico. Since March of 2024 NFF's Southern NM Program Coordinator, based in Silver City, has been working with the Gila National Forest to implement restoration projects in the Black Fire Recovery Area, initiate watershed planning, and work with a diverse network of partner organizations to expand the good work happening on the Gila National Forest. Learn more about the NFF's work in the Southwest Region here: https://www.nationalforests. org/regional-programs/southwest.

References

1 Smithsonian Magazine, 2018, "Do Trees Talk to Each Other"

2 Yale Environment 360, 2016, "Exploring How and Why Trees 'Talk' to Each Other"

3 Rainforest Alliance, 2021, "7 Fascinating Facts About Soil"

T Tealthy soil is a robust **L**ecological web of mostly microscopic organisms (see the Meet the Soil Food Web www.nmhealthysoil. post org/2024/02/28/meet-the-soil-<u>food-web</u>) working in synchrony with plants to cycle nutrients and create more and more biomass and biodiversity. As human participants in this web of life, there are many ways that

we can help support a more abundant soil organism community. Simply following the six healthy soil principles (www.nmhealthysoil.org/2019/09/07/ principles) is a great start and sometimes all that is needed. With the right conditions, soil organisms will land from wind-born spores, come from animal manure, or wake up out of dormancy as soil conditions become more hospitable. However, there can be a number of reasons that we might want to jump start the soil ecosystem by inoculation, which is to say introducing more organisms from elsewhere. This series will discuss the why and how of using liquid compost amendments to inculcate soil.

Why inoculate?

1. Inoculationisawaytodramatically speed up the soil building process. Yes, dormant organisms are usually in the soil waiting to come to life when more living roots bring them the sugars they need, but sometimes a soil is so denuded from tillage, overgrazing, or chemical inputs that there are simply not very many organisms present to start cycling nutrients and feeding plants. This is exacerbated in arid climates where due to the lack of water things are moving even more slowly. If left to its own devices, soil will inevitably accumulate organic matter and cycle nutrients eventually-but



Image by Isabelle Jenniches CC BY 2.0



this can take anywhere from years to decades to centuries depending on climate and precipitation.

plant roots. there aren't fun to eat, they can very detriment If there are plen of healthy fungi the soil, then the nematodes are boon because they munch o the fungi, they

Why Inoculate?

By Navona Gallegos

By inoculating, we can speed this process up so that the soil building that would have taken years might be accomplished in as little as a season if we also provide the conditions in which these organisms can thrive. I want to emphasize that simply inoculating won't do much if those organisms don't at the very least have mulch to provide food, habitat, and moisture retention. Ideally, there are some living roots in the ground as well as mulch or plant litter. If so, these newly introduced organisms can get to work building soil structure and cycling nutrients right away and the results can be dramatic.

2. Inoculation can treat plant **disease.** A healthy soil ecosystem is full of predators that cruise around and eat disease causing organisms like parasitic fungi and root feeding nematodes. Indeed, in a thriving ecosystem, every inch of a plant's surface is covered by its microbial allies. So if a parasitic organism lands on a plant, it will quickly be eaten before it ever gets to attack the plant itself. What is more, creating a healthier soil can have repercussions that even change disease-causing organism's behavior. For example, there are some nematodes that can switch between eating fungi and eating are cycling nitrogen that plants can then use. I've successfully used inoculation to treat some aggressive fungal disease on tomatoes. After just one inoculation with compost extract in the springtime, the late blight that had been recurring for years disappeared and still has not been an issue two years later. It only took about half an hour to make and apply the extract.

3. Inoculation can also be a way to shift the soil ecology to favor different sorts of plants. Bacteria and fungi cycle different forms of nitrogen (nitrate and ammonium). Because of this, every plant has an ideal soil fungal to bacteria ratio it thrives in. "Early successional" plants-those that show up in degraded soil, like dandelion, goat heads, bindweed, etc.-can thrive with little to no fungi and just some bacteria in the soil. "Later successional" plants like redwood trees that grow in the abundant soil of old growth ecosystems require lots of fungi and very little bacteria (a ratio of around 1,000:1). How does this relate to inoculation? If we want to grow strawberries, a plant that naturally occurs on the forest floor, but we are starting with a compacted dirt lot in a city, then mulching and inoculating with lots of fungi can create the conditions for strawberries to thrive. Conversely, if we are making a veggie patch in an area that was recently forest, then we may inoculate with lots of bacteria to give our broccoli and kale a leg up.

What is a good inoculant?

Ok, so where do we get these bacteria or fungi or soil predators to inoculate with? It is possible to use a small amount of really good soil from, say, a forest floor. An area in the wild where there is an abundance of the plants we

Organism	Minimum Biological Requirements for BioComplete® Compost
Bacterial Biomass	135 µg/g compost
Fungal biomass	135 µg/g compost
F:B ratio	Equal to or greater than 0.3:1
Protozoa	10,000/g compost
Beneficial Nematodes	100/g compost
Ciliates must be less than	5/drop at 1:5 dilution

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are trying to grow or a spot with lots of fruiting mushrooms can be good places to grab a handful of soil. However, for the best results, it is wise to use a compost that we know for sure contains a high density of all the necessary soil organisms. Think of this compost as the sourdough starter that gets the rest of the dough going once it's mixed in.

Of course, what people call "compost" ranges from backyard piles to municipal sewage slurry to bagged compost at the nursery. Making a compost that's a good inoculant is both an art and a science. Much of what is available on the market may be more accurately called "decomposed organic matter" or "mulch" rather than "compost" because it usually lacks living organisms by the time it gets through the composting process, is bagged, and sits on the shelf in a garden store.

Dr. Elaine Ingham (of the Soil Food Web www.soilfoodweb.com) has created a standard called BioComplete™ that is a useful guideline for identifying a good inoculant. The table below shows the levels of organisms per gram of compost necessary to ensure that a compost has enough biology to be an effective inoculant. Notice at the bottom of the chart is a maximum level for ciliates; these are potentially disease causing organisms.

These levels are ascertained by looking at compost with a microscope. It's actually not too difficult to do if you are interested in getting some training and learning to do it yourself. And if that's appealing to you, I highly suggest taking an online course with the Soil Food Web School. If you are just wanting to get the benefits of inoculating your soil without taking up a new hobby, then the easiest way is to find someone in your area selling compost that meets the biocomplete standard. If you ask your compost provider for a biological assessment of their product and they don't know what you are talking about, then it is likely their material is not inoculant grade.

Many different composting styles (whether done commercially or at home) can achieve a product that meets these standards, so long as it's an aerobic composting method. Vermicompost and thermophilic composts are a couple common approaches. Another

composting method that I'd like to give an extra shout-out to is the Johnson-Su bioreactor (affectionately referred to as the JSB). This is a static, aerobic compost that takes one year to mature and, if done correctly, usually far exceeds the BioComplete[™] levels, especially in those all-important fungi. That means even less of it goes a long way. In order for JSB to be successful it has to be built with the correct surface area to volume ratio to allow it to stay aerobic. Also make sure that it stays watered and doesn't freeze over the winter. Because it isn't turned, it gives fungal



Compost extract application at Quay Ranch. Image by Isabelle Jenniches CC BY 2.0

mycelium lots of space to proliferate in the compost and nematodes lots of habitat (when compost gets turned, nematodes literally run away from the disturbance). There are many compost providers using the JSB these days. It is also absolutely possible to make one for yourself as one of the easier ways to go about making inoculant-quality compost because you don't have to turn it or do much but water it after the initial build. If you're interested in learning about the Johnson-Su method, keep an eye out for upcoming field (www.nmhealthysoil.org/fielddays days) and/or check out this blog post on the Johnson-Su Bioreactor (www. nmhealthysoil.org/2021/04/18/johnson-<u>su-bioreactor-2</u>).

Usually a compost that has high levels of beneficial soil organisms may cost more than the bulk compost one might

buy by the yard. Luckily, we only need a few pounds of inoculant-grade compost per acre. But wait–you might ask–how do we spread five pounds of compost over a whole acre? That's where liquid inoculation comes in.

Liquid compost amendments are simply techniques to spread a small

amount of compost over a larger area by mixing it into water. There are several ways to do this. They all take into account the fact that soil organisms make glues to help them stick to the organic matter in compost. In order to get the organisms evenly distributed over an area, we have to get them unstuck from the organic matter and suspended in water and then spread this mix over the desired area in such a way that the organisms survive the journey. Before we get into the specific techniques, there are a few considerations that apply no matter what method you choose.

Key Considerations

Keep it aerobic – While there are some approaches to inoculation that use anaerobic organisms or go through an anaerobic phase, for the purpose of this post we're considering aerobic compost and aerobic organisms. The maximum level of ciliates in the the BioComplete™ standard (see previous blog post) is a way of ensuring that compost has not reached low oxygen levels that then create conditions for anaerobic (no oxygen) or facultative (low oxygen) organisms. This is important because plant and animal pathogens all occur in these low or no oxygen conditions. Obviously, we do not want to be inoculating with disease-causing organisms. Furthermore, when a liquid amendment that's full of beneficial aerobic organisms goes anaerobic, many of the beneficial organisms die or go into dormancy. It only takes twenty minutes of anaerobic conditions for anaerobic organisms to start eating the

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Preparing compost extract in the field. Images by Isabelle Jenniches CC BY 2.0



Hello, my name is Bodhi Baker, and I am a student at WNMU studying business. I am originally from Silver City and have been working with the New Earth project since it started. During that time, I have done almost every job there is, although the main ones I do now are bioreactor building, bioreactor filling,

watering the bioreactors at the old site in Santa Clara, and chipping the brush whenever needed. I enjoy working on the New Earth project because it removes loads of waste from the landfill and turns it into a highly valuable resource that can be used to revive dead soils anywhere!



Ti! My name is Dara Werber, and I've been a proud crew member of the New Earth Project $\mathbf \Pi$ for almost two years now. I've spent my sophomore and junior years of high school homeschooled, taking dual enrollment classes at WNMU. One of the main reasons I chose homeschooling was to have more time to dedicate to my work with NEP.

I absolutely love this job because it's been so much more than just a job. I've done everything from simply watering bio-reactors to teaching elementary students about the importance of biodiversity and soil health. These experiences have been incredibly rewarding and have shaped the way I see the world.

of NEP.

Victory for the Gila River!

ALBUQUERQUE— A federal judge today upheld efforts by the U.S. Forest Service to remove feral cattle from the Gila Wilderness, America's first designated wilderness and one Southwest's largest ecologically intact tracts of public land.

The U.S. District Court order dismissed livestock industry arguments against the removals. The Center for Biological Diversity intervened in the industry's lawsuit, which aimed to block the Gila National Forest's cow removal plan, to support the U.S. Forest Service.

"This sensible ruling validates the Forest Service's efforts to protect the Gila Wilderness and its remarkable biological diversity," said Taylor McKinnon, Southwest director at the Center. "It's a victory for America's first wilderness that will lead to a cleaner, healthier Gila River and restored wildlife habitat."

Gila National Forest officials received

more than 5,000 public comments that supported removing feral cattle from the wilderness, including using lethal means.

Feral, unbranded cattle have been destroying fish and wildlife habitat, overgrazing native vegetation, trampling stream banks and polluting critical water sources within the Gila Wilderness for decades. Recent Forest Service surveys have found little or no sign of feral cattle in the Gila Wilderness.

The area is critical habitat for several endangered and threatened species, including Mexican spotted owls, yellow-billed cuckoos, loach minnows, Chiricahua leopard frogs and narrowheaded garter snakes.

Years of roundup efforts and ecological monitoring have confirmed that the feral cows in the Gila Wilderness are unowned, unbranded, unauthorized animals that have been reproducing independently



In the future, I hope to attend college out of state and explore the world's natural wonders. I've learned so much over the past two years and owe it to the amazing people who are part

January 29, 2025

of any ranching operation. There are no ranches or active grazing allotments near areas where feral cattle have been found.

The Gila National Forest has full legal authority to remove unauthorized livestock from federal lands under its management.

Read the decision: www.biologicaldiversity.org/programs/ public lands/pdfs/Dkt-70-Decision.pdf



Feral cattle crossing the Wilderness reach of the Gila River. Photo by Mike Fugagli

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precious aerobic fungi that are usually the main focus of our inoculation!

Therefore, it's absolutely crucial that our liquid amendment stays aerated. One way to do this is to use an aquarium bubbler and keep the liquid at a "rolling boil" level of aeration. This can be helpful if you are leaving a batch overnight or for a few hours before applying. Don't leave a liquid amendment sitting for more than two days, even if you keep it aerated.

If you are making a liquid amendment on the spot in order to apply it right away, you can simply stir the liquid well and create a vortex that draws in some air. This can be done by hand and should happen about every ten to fifteen minutes.

Water – Most municipal water contains antibiotic compounds like chlorine and fluoride. In addition to killing waterborn diseases, these compounds can also kill the beneficial soil organisms. Luckily, humic acid, which can be bought at most grow stores or ordered online, can be used to neutralize these antibiotic compounds. All that's needed is a couple drops per gallon of water. Simply use a dropper to add one drop at a time of humic acid until you start to see the water turn a slightly brown color. Once a color can be seen, it means that the humic acid has bonded with all of the chlorine and/or fluoride and it's safe to add the compost.

Temperature-Thebesttemperaturefor water intended for a liquid amendment is around room temperature. This is convenient because some techniques involve getting your hands wet. If it's comfortable for you, it's probably good for the organism too. Water that's approaching steaming is too hot. Cold water may not kill organisms, but it shocks them and many will go straight into dormancy. This can slow the results of your inoculation as it will then take a while—perhaps days or weeks—for the organism to wake up again. It's best for our organisms to be active when they land on the soil or plant so they can be motile (mobile) and find the right niche for themselves.

Don't smash the organisms – When we make a liquid amendment, we may want to use equipment like a backpack sprayer to apply it. In this case, we have



Farms. Image by Isabelle Jenniches CC BY 2.0

to filter out the organic matter from the liquid so we won't clog equipment. If we are filtering an amendment, the filter pore size must be 400 microns or larger, or else some of the organisms won't get through. It's easy to find 400+ micron bags for sale online.

It's also important that we don't spray so hard that the pressure kills the organisms when they collide with plants or soil. A simple way to determine this is to spray a piece of paper from about arms length away. If we damage that paper at all, then the pressure is too high. One way to reduce pressure is to simply get farther away from the target we're spraying. If you spray in a big ark, even if the organisms come rocketing out of the sprayer, they will have time to slow down before they hit ground and have a softer landing.

Keep out of the sun – Soil organisms mostly live underground and out of the sun's UV rays. It's advisable to keep compost and liquid amendments out of direct sunlight. Unless you are making a compost tea, where the organisms grow and make UV resistant glues in the process, it's best to apply liquid amendments early in the morning, on a cloudy day, or in the evening. My favorite is the latter because I have a hunch that it's helpful for the organism to have all night long to migrate to their ideal soil depth before the sun comes up. It can also help to water right after inoculating, especially in a dry area, so that the organisms can literally swim down into the soil to get to the depth they prefer.

Keep equipment clean – It's easiest to clean equipment when it's wet, just after use. When equipment like sprayers get slimy build up of biofilms on them, those films can house disease causing organisms. It's also important to make sure any spraying equipment that has been used for fertilization or pesticides has been cleaned very thoroughly with soap to make sure there are no harmful residues.

How much water and compost to use

- This is a common question and as with most things ecology the answer is: it depends. Generally, we can say that it takes about five pounds of biocomplete level compost to inoculate one acre. However, if you find a really great compost that has, say, 1,000 micrograms of fungal biomass as opposed to the 135 microgram minimum, you could only use two pounds per acre for a good inoculation.

I prefer to go as heavy as possible when inoculating. When I successfully treated late blight in tomatoes, I used about five pounds of compost for an area that was only about one hundred square feet. As long as the compost is good quality and doesn't contain harmful organisms, more is generally better.

The amount of water is simply dictated by how much water is necessary to cover the area you are inoculating. Whether you use a lot of water or a little, it is still the same amount of compost being added. Generally, it is best to err on the side of more water because you can always come back and add more liquid amendment to an area you have already covered, but if you run out of liquid and you've used all your compost, then there's an area that did not get treated. For reference, I have used 300 gallons on one acre and about 40 gallons on a 500 square foot backyard. However, it all depends on what kind of equipment you are using and how fast it sprays. When in doubt, try a test patch with just water and see how much water it takes to spray that area, or how much your watering can cover, then scale up to calculate the water it takes for your whole treatment area.

Liquid inoculation techniques

Compost slurry – This is probably the easiest liquid amendment to make. It's just what it sounds like: a slurry of compost in water. One way is to use a paint stirring paddle on the end of a drill and use the slowest drill setting to spin the compost into the water. Do this for ten minutes. Again, it's important to keep the drill on the lowest possible setting so the organisms don't go hurtling into the walls of your bucket or container and smash on impact.

Is Living Earth Compost? If Not, What Is It?

Compost is generally known as decayed organic matter used as a plant fertilizer. It is well-established that composting offers many benefits to the soil and the planet. There are countless methods for making compost, each with their own specific benefits, distinctions, and best practices. We receive numerous questions about the Living Earth we are creating in UGWA's New Earth Project, and I hope this article will clarify what our mysteriously-named product actually is.

Composting is a natural process in which microorganisms decompose organic matter in an aerobic environment (where oxygen is present) with adequate moisture. (I'm not including the anaerobic Bokashi method, as that is a different process.) Composting keeps organic material out of landfills, sequesters carbon in the soil, provides a soil inoculant teeming with microbial life, adds organic matter to the land, and kills potential pathogens.

Our Living Earth is a special form of compost with an unusually high ratio of fungi to bacteria, created in a Johnson-Su bioreactor developed by Dr. David Johnson and Hui Chun Su, who live in Las Cruces. Fungi are crucial in the plant-microbe relationship because they significantly enhance nutrient and water uptake for plants, particularly in nutrient-poor soils. This symbiotic relationship, known as mycorrhizae, involves plants providing fungi with sugars from photosynthesis, while fungi, in turn, provide the plant with water and essential minerals like phosphorus and nitrogen. This exchange benefits both organisms and is vital for plant growth and survival, especially in harsh environments. Backyard compost is frequently turned, breaking up the valuable fungal hyphae. Most composts are viewed primarily as sources of nutrients, particularly nitrogen and phosphorus. However, ample scientific evidence indicates that healthy soil and plants rely on soil microbial communities. The work of these microbes increases soil organic carbon, builds soil structure, enhances moisture retention, helps plants resist pests and diseases, boosts crop and pasture productivity, mitigates drought and flooding risks, creates nutrient-dense food, and ultimately improves food security.

Johnson-Su bioreactors are ideal for those who prefer a "set it and forget it" approach. Once the material is loaded into the cylinder, all you need to do is add worms once the thermophilic temperatures cool to about 80 degrees F to prevent the worms from baking and maintain the moisture level at 70%.

This is a batch system, meaning all of the materials are added at the same time. Our composting bioreactors contain 600 pounds of leftover food, 1,200 pounds of recycled wood, and about 100 pounds of biochar. The system is passive or sometimes referred to as "static." Again, there is no turning involved. Since the process is aerobic, there are no odors, and there is no dripping water or leachate that comes out of the bottom of the cylinder.

adding organic matter or nutrients. It isn't just about feeding the life in your soil. Effective composting is about cultivating soil biology and adding the microorganisms that do all the work.

Composting isn't just about

MICHAEL KENNARD



by Carol Ann Fugagli

With all its virtues, this process also requires a lot of patience. It can take up to two years for the compost to mature. The microorganisms must undergo an ecological succession, and like a fine wine or cheese, it can't be rushed. Over time, the microbes increase in both diversity and abundance, resulting in a fungal-dominant product. Once the material in the bioreactor has decomposed to half its original mass, we can open the biore-



A sample of Living Earth Photo by Mike Fugagli

actor cylinder and harvest the black gold. The results are well worth the wait.

Given all this compelling data, the obvious question is, "Why don't we add more microbes to the soil?"

This is precisely what we are doing with the Johnson-Su bioreactors! I like to think of the bioreactors as a crockpot of life. Every day, microorganisms in our bioreactors multiply and divide—trillions upon trillions of them. We call our compost Living Earth because it is so richly teeming with the microbial life that revitalizes depleted soil. Whenever we till the ground, apply fertilizers, or leave the soil bare without living roots, the microbes die, and the plants we attempt to grow afterward lack the necessary microbes to deliver essential nutrients to their roots.

There are several ways to apply Living Earth. The first is direct application into native soil or as a soil substitute. It can be applied in liquid form, similar to compost tea, or as a soil drench. It can also be mixed with milk and molasses as binding agents and used to coat seeds. Each method has the highest success rate when in direct contact with the seed, allowing microbes to be available upon germination. We recommend using as little as 10 pounds per acre because Living Earth is more of a soil inoculant than a soil amendment.

So, where can you purchase this magical living soil? We have staff or volunteers at the Farmers Market almost every Saturday, or you can visit our New Earth Garden off Mobil Drive on Mondays from 9:00 AM to 12:00 PM. We sell Living Earth for \$15/gallon (about 2 ½ pounds), which is an incredible bargain! Johnson-Su compost typically sells anywhere from \$20-\$75/ pound online or at retailers in northern New Mexico.

We also offer free site tours on the first Monday of the month from 10:00-11:30 am. Come on down and see for yourself!

Why Inoculate continued from page 10

It's even possible to make a slurry by simply using a stick or your hand to mix the compost and water. It's just important that it is mixed for at least ten minutes and stirred hard enough so that a vortex is created. This slurry can then be sloshed around the area you are inoculating using buckets or any equipment that won't get clogged by the organic matter.

Compost extract – The only difference between an extract and a slurry is that we filter the extract so that it can be applied using equipment that would get clogged by a slurry. The idea is the same: separate the organisms from the organic matter so that they float in water. Even if you are going to use hundreds of gallons of water, it is fine to extract all of your compost into a five gallon bucket and then add that highly concentrated extract to whatever larger water vessel you will use. You can also make the extract straight into a big tank if that's easier. The main benefit of doing it in a bucket first is ease of handling, and also, if you would like to look at your extract under a microscope, it will be concentrated enough that you can see many organisms easily in a sample.

My favorite way to make compost extract is by hand using a 400 micron filter bag. Simply fill the bag with about two pounds of compost at a time, put it under water, and squeeze the bag over and over for five minutes (see video). Once you're finished, dump out the used compost (in an area you want to inoculate-there will still be organisms that didn't get extracted), and add the next chunk of compost to extract into the bag and repeat. It's kind of like making tea except it's more active; you will see the water get darker as the humates from the compost ooze into the water. There's some technique involved as well; it's important not to grind the compost against itself as if you are scrubbing it. The correct technique is to simply squeeze over and over as if you are squeezing–but not wringing out-a wet sponge. Move your hand around the bag so you get all parts of it.

You can also use a paint paddle on a drill on a low setting and spin for ten minutes in the same way you would for a slurry. Then simply pour that slurry through a 400 micron bag to filter out the organic matter.



Image courtesy of Navona Gallegos.

It is also possible to use an aquarium bubbler to make an extract. Fill a 400 micron bag with compost (use multiple bags if you are using more than five pounds of compost), put the bag in water, and leave the water bubbling at a "rolling boil" level for at least four hours. I like to leave the bubbler going for five or six hours. This can be a nice technique if you are using a compost tea brewing device and making a big batch of compost extract. You can set it up in the morning, leave it brewing in the shade during the day, then apply late afternoon or evening.

Compost Tea - Compost extract and compost tea often get confused with one another. The difference is simply that in an extract the organisms are being extracted from the organic matter and floating in water while a tea is brewed for a period of time with foods that help the organisms grow while they are brewing. The benefit of making a tea instead of an extract is that a tea is good for foliar applications while an extract is better to apply straight to the soil surface. If treating a nasty foliar disease, tea might be very helpful. The process for making a tea is the same as an extract with some additional steps: after preparing the extract as explained above, microbe foods are added to the mix and the tea is brewed with an aerator for one or two days (not more than three). When brewed in aerated water with foods such as humic acid, plant oils, fish oils, etc., the organisms receive an abundance of all the things they need for growth. After a day or two of brewing, the organisms will have hatched from cysts, grown in size, and/ or produced more of those glues that make them sticky. So when they are applied straight to plant surfaces, they really do stick! We can also promote the growth of certain desired organisms in the brew based on the foods added. If we want more fungi, we add humates and oils, if we want more bacteria (unlikely) we may add sugars.

However, making a compost tea can be tricky because adding foods means that the organisms may grow so fast that they run out of oxygen. Then, we run into all the issues already discussed about anaerobic conditions and organisms. The brew can go from being beneficial to being dangerous for plants. Therefore, I only suggest making a compost tea if you are also able to use a microscope to monitor its progress.

Generally, organisms from a healthy soil will make their way onto plant surfaces eventually, especially if plants germinate in that soil. Furthermore, a healthy soil microbiome means that the plant will have the nutrients it needs to make its aboveground parts resilient to pests. So, a compost extract applied to soil can still be beneficial to above ground issues and is much easier to successfully use than a compost tea.

Along with mulching, inoculating with a compost extract is my favorite way to guickly boost soil and plant health. It's something that can be done any time of year and can have profound results. If you have any questions about inoculation, please feel free to get in touch. And check out New Mexico Healthy Soil Working Group's field day schedule for hands-on learning about making inoculant quality compost that can be used for these techniques.



Navona Gallegos

Navona Gallegos is a soil ecologist and lover of life. Her passion for the wholeness of nature led her to study terrestrial ecology and specialize in soil biology. Navona's educational background includes a BA in Environmental Science from the University of Virginia, Starhawk's Earth Activist Training Permaculture Design Course, and Dr. Elaine Ingham's Soil Food Web School as well as lived experience as a farmer and informal learning from a wide variety of land stewards from across the United Śtates, Caribbean, and Central Africa.

n prings are jewels of our forest, teeming $oldsymbol{O}$ with biodiversity and life when they are in their natural condition, allowing natural processes to unfold. Snowpack and associated runoff are projected to decline significantly over the next 50 years, reducing headwater streamflow. With year-round water, springs in the Gila National Forest create vital islands of refugia for biodiversity, and their protection is essential.

Recently, UGWA has focused on two springs that require protection: Bloodgood Spring near Kingston and Bar 6 in



Carol Martin carrying wooden posts at Bar 6 during a volunteer work day. Photo by Carol Ann Fugagl



Crew from contractor Noland Tough welding the fence at Bloodgood Spring while a crew with a water backpack sprayer looks on to douse stray sparks. Photo by Crystal Noland





Jewels in the Forest

by Carol Ann Fugagli



Bloodgood Spring Photo by Dylan Duvergé



Gap fence made of polypipe at Bloodgood Spring to allow water to flow while keeping the fence's integrity. Photo by Carol Ann Fugagli

the Burro Mountains. We are thrilled that our fencing contractor, Noland Tough, was able to quickly erect the pipe-cable fence to protect 3.5 acres of grazing animals near Bloodgood Spring. This area is a popular hiking destination for local community members.

Bar 6 Spring in the Burros presents a more challenging situation. The total protected area spans 18 acres and was established as an UGWA project in 2011. This area serves as a refuge for Bullock's Orioles, Coues Deer, and various other animals within an otherwise dry landscape. Time has diminished the fence's integrity, and the permittee is now allowed to drive his cattle through the area. We organized a volunteer workday and are grateful to the Forest Service for providing fencing materials for the repairs. We are currently collaborating with the FS staff to help them recognize the value of this unique spring, and hopefully, it will be exclusively protected from cattle.



Abel Duffy, Mike Fugagli, and Carol Martin repairing a fence at Bar 6. Photo by Carol Ann Fugagli

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UGWA Membership Application Your membership and additional financial support sustain UGWA and are critical to the organization's ongoing health. Share in the protection and conservation of our watershed and become an UGWA member today. Name(s) Address City Zip State Telephone E-Mail Membership Categories—Annual Dues: Chiricahua Leopard Frog \$ 20 Gila Trout 30 Mexican Gray Wolf 50 Beaver 100 **River** Otter 250 Other Amount Upper Gila Watershed Alliance Make your check payable to UGWA and send to PO Box 1536, Silver City NM 88062 I don't wish to join at this time but please notify me of upcoming

events. Name E-Mail

UGWA's Statement of Philosophy

The members of the UGWA recognize a vital and necessary connection between our individual and collective rights and responsibilities as landowners and community members and the long-term stewardship of the Upper Gila River Valley and Watershed.

The members of the UGWA share a love and concern for our community which is an integral part of our lives and, therefore, seek to harmonize our presence and activities within the watershed for the health and integrity of the entire "community," which includes the soil, the air, the water, the people, the plants, and animals.

The members of the UGWA share the conviction that men and women work best together in a spirit of cooperation, conflict resolution, and consensual agreement that builds upon a common ground that benefits from the views and concerns of each individual acting as uncoerced free agents.

To realize our vision for the common benefit of the entire community served by the Upper Gila Watershed, and for the sake of future generations, the UGWA seeks ways and means to bring people and organizations together in constructive dialogue and activities aimed at clear communication, education, land restoration, research, and local economic health.

So Many Ways to Donate

ONLINE: Do you prefer online payment instead of paper checks? We've got you covered! Simply go to our website at ugwa.org and click the Donate Button.

RECURRING: We'd love to see you again. And again. To become a Recurring Member, go to our website at ugwa.org, click the Donate Button and choose "Make this a monthly donation."

PROGRAM SPECIFIC: Do you have a favorite program you want to support? Include a note with your donation and we'll apply your donation to that program! Donating online? Let us know by an email to admin@ugwa.org.

Still I Rise Maya Angelou

1928 - 2014

You may write me down in history With your bitter, twisted lies, You may trod me in the very dirt But still, like dust, I'll rise.

Does my sassiness upset you? Why are you beset with gloom? 'Cause I walk like I've got oil wells Pumping in my living room. Just like moons and like suns, With the certainty of tides, Just like hopes springing high, Still I'll rise.

Did you want to see me broken? Bowed head and lowered eyes? Shoulders falling down like teardrops, Weakened by my soulful cries?

Does my haughtiness offend you? Don't you take it awful hard 'Cause I laugh like I've got gold mines Diggin' in my own backyard.

You may shoot me with your words, You may cut me with your eyes, You may kill me with your hatefulness, But still, like air, I'll rise.

Does my sexiness upset you? Does it come as a surprise That I dance like I've got diamonds At the meeting of my thighs?

Out of the huts of history's shame **I**rise

Up from a past that's rooted in pain Irise

I'm a black ocean, leaping and wide, Welling and swelling I bear in the tide.

Leaving behind nights of terror and fear **I**rise

Into a daybreak that's wondrously clear Irise

Bringing the gifts that my ancestors gave, I am the dream and the hope of the slave. **I**rise

Irise

I rise.

mb Mars

Catherine Dixon • Jeff Smith • Marie & Alain Duvergé • Susan Lehnhardt Paul Pomeroy • Lawrence McDaniel • Louise Hof • Susan Schiowitz Michael Scherer • Charlotte Spinner • Elizabeth Kaido • Pat Cochran

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Special Thanks To Richard and Carol Martin for the continued use of their truck aka, the 'Desert Rat' for the New Earth Project.



(November 5, 2024 – April 9, 2025)

New Members

Recurring Members

Jene Moseley • Marc Nevas

NEW EARTH KIDS RADIO SHOW

As part of the Kindred Continuum series, UGWA hosts a monthly radio show on Gila Mimbres Community Radio KURU 89.1FM called *New Earth Kids. New Earth Kids*, features students of all ages who talk about the challenges facing our planet today and how they are creating and implementing solutions.

Listen to archived shows on our website at ugwa.org

Upper Gila Watershed Alliance PO Box 1536 Silver City NM 88062

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