

Repairing the Water Cycle and Promoting Solutions

Floods and droughts are our inevitable future as our global climate unravels. **Andrew Zions, Joanna Crowson** and **Jorge Gallardo** describe how they are transforming a dry and scorched valley into a place of 'green water', sequestering carbon and improving the local climate. Incredible work!

Honouring Water at Summer Solstice

In Andalusia the shortest night of the year is traditionally celebrated as 'Noche de San Juan' by lighting bonfires and burning effigies in towns and on the beach. Out here in the already parched countryside it's not safe to light fires, so instead we hold a ceremony to honour the resilience of our landscape in the face of drought, celebrating its capacity to survive the long months ahead until the rain falls again. Standing on the ridge of Vejer, and looking toward the ridge opposite, the eyes rest on a green oasis where the aquifer rises as a spring in Santa Lucía. The rest of the landscape between here and the sea looks dry and barren, but in places on our land you can see the signs of 'green water' – spots where vegetation is flourishing thanks to our design. This dry time is also peak tourist season in the south of Spain,

when tourists come in droves, crowd the beaches, play on the artificially green golf courses, and put a huge strain on our most precious resource: water.

Scarcity of Water as an Inspiration for Action

It was the fragility of our ecosystem in the context of this competition for scarce water that first led Andrew to become interested in water retention landscapes. After reading about the work of the Austrian permaculturist Sepp Holzer at Tamera, an eco-village in the Alentejo in Portugal, in 2011 he visited to take a guided tour with Holzer and explore his work first hand. Some years before, Holzer had convinced the 200 residents of this pioneering project that they weren't actually suffering from a scarcity of water, rather that it needed to be stored and managed differently. Within a few years,

Weeks after mulching and seeding with green manure, everything will be green



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what had been a dry, scorched valley became a mosaic of ponds and swales, lined with fruit trees, and abundant gardens – the residents of Tamera were now thriving in this greened landscape, swimming in the ponds, and witnessing the return of springs which had dried up years before.¹

The Broken Water Cycle, an 'Aha' Moment

In 2014, Andrew returned to Tamera to take a two-week water retention landscape design course, led by Bernd Mueller, then head of the ecology project, and a team of inspired earth stewards. He came away understanding that the water cycle is broken, and our focus on restoring it has given clarity and focus to the implementation of the first permaculture ethic – earth care – over the years.

Many people don't realise that most of the planet's freshwater is stored in the ground. In a fully functioning ecosystem, water is held there, and springs are fed from this abundant groundwater. In urban spaces hard-paved surfaces and buildings turn that water into a 'problem', and a lot of civil engineering goes into removing rainwater, and channeling it elsewhere, rather than getting it into the ground. In deforested rural spaces, with little vegetation or organic material to receive the water, surface runoff also occurs, causing erosion and destruction and preventing the groundwater from recharging. Whether we live in urban or rural spaces, learning and teaching about the broken water cycle and promoting solutions is key to our future on this planet.

Learning from our Mistakes

Just months after the course, we bought our first piece of land, and its steep, eroded slopes were one of its attractions. With very few trees, the valley was visible from three directions, and would be a great place to experiment with water retention, while creating a visible impact in the area, and becoming a place to learn and teach about repairing the water cycle. Following permaculture's recommendation to observe for a year, we identified the most immediate threat to the land as several gullies where the rainwater from the road and land above us ran down the slope, taking valuable topsoil. The water couldn't slow, spread and sink (the 3 'S's of water retention) into the earth.

Our annual rainfall in this part of Cadiz can be as high as that of some northern European cities, but it is concentrated into as few as six months a year due to the local climate. We knew that getting the water into the ground as high up the slope as possible was the best way to protect the valley, so we started by designing and building our first two swales – ditches dug on contour to collect rainwater and allow it to infiltrate. We hired a local backhoe and got down to work, at the same time starting to reforest the upper slopes. Despite our best attempts, a few months later after heavy rains, the swales began to fill with mud as the soil collapsed down from the steep cuts we'd made, impeding their proper function. We quickly realised that though we knew the theory, we needed help with the practice.

Learning from Others in Partnership

We contacted Bernd and arranged for him to come and consult with several apprentices from Tamera later that year. During one long day of their long-awaited visit, we laid out a design to help us achieve a goal of zero-runoff on our land. Because of the scale of our project, our soil type, and the hot, dry climate, there wouldn't be ponds like in Tamera, but less visible earthworks which would help recharge the aquifer, re-green the land, and eventually – finger's crossed – help dried-up springs in our valley to be reborn. We used P.A. Yeoman's scale of permanence² as a starting point. This design system, developed in Australia, the driest continent, identifies the first and second elements to consider when designing a landscape as climate and topography. These are extremely hard to change, so we focused on the third and fourth aspects: water and access. Identifying ridges, valleys, and water courses helped us to design the optimum places to slow, spread and sink water into the landscape. Access comes after water, since it is vital to honour the flow of water when designing roads and pathways. A perfect example of the potential impact of access was the road above our property which was channelling water along its hard packed surface, causing the gullies below it.

Thus, the shape of the land guided us in designing a series of swales and terraces to manage the rainwater, as well as a series of paths which would allow us to access the different areas of the slope on foot and with a small tractor, without causing runoff and erosion. At the end of the consultation Silvano, one of the apprentices, was excited about the idea of implementing the design, and we immediately started a conversation about how to make that happen.

Initial Implementation

One month later, in September 2016, we organised our first Permablitz with Silvano Rizzi and Marcus Dittlich from Tamera. The Permablitz movement usually involves an informal gathering over a day during which a group of people come together to share skills related to permaculture and sustainable living while building community and having fun. More usually associated with an urban garden makeover, this format of teaching while implementing a design in community proved to be an incredible way to support the project and our networks. We organised materials and equipment and implemented about half of the design in a week with the help of many interested people from our area.

This time instead of the inappropriate backhoe, we used a small excavator with rubber tracks which allowed us to work on steeper slopes, creating smaller swales with shallower cuts. In contrast to our initial design of two large swales to infiltrate all of the water high up on the property, this design focused on creating a series of smaller swales and terraces to cover the same function, aligning with the permaculture principles 'each important function is supported by many elements',³ and 'use slow and small solutions'.⁴ And in order to create access to the lower parts of the valley we designed a zig-zag path with a shallower slope to avoid surface runoff and allow access between the water retention earthworks. Reworking our previous mistakes and incorporating them into the design, we made earthworks with smoother, softer shapes that were



TOP Aerial photo of upper part of land, mulching and seeding with green manure during second permablitz, 2017.

better integrated into the land. By creating clear overflows for each swale we would now be able to monitor and control the system, especially in moments of heavy rainfall. After mulching and seeding green manure on all of the earthworks, we started planting trees immediately on and below the berms. The lines we'd drawn on the contour map while designing were on their way to becoming tree-lined corridors beginning a mycelial-like pattern of reforestation. What an empowering way to learn and work together while transforming our landscape!

Expanding our Impact, Achieving Zero Runoff

The following year we repeated the event, with even more participation, and more work achieved. When we finished the second Permablitz we went to the other side of our valley where we could observe the whole landscape and the impact we were beginning to have – either Silvano or Marcus observed: “If you really want to have a major impact



ABOVE LEFT Sketch of water retention and access structures after consultation with Tamera in 2016.

ABOVE Using 3.5 tonne digger on rubber tracks to build top swale in Catalina, 2021.

LEFT Silvano doing some handwork finishing a swale in 2020.

on the valley beyond your land, you should buy the land above yours, so you can manage rainwater from the top of the watershed down.” The seed sown in that innocent remark led us to jump at the opportunity to buy the upper part of the watershed when it became available. This land, which we call Catalina, is nine hectares of very steep slope, with the advantage that the upper two thirds of it is covered in scrubby native forest that already retains most of the rainwater that falls on it.

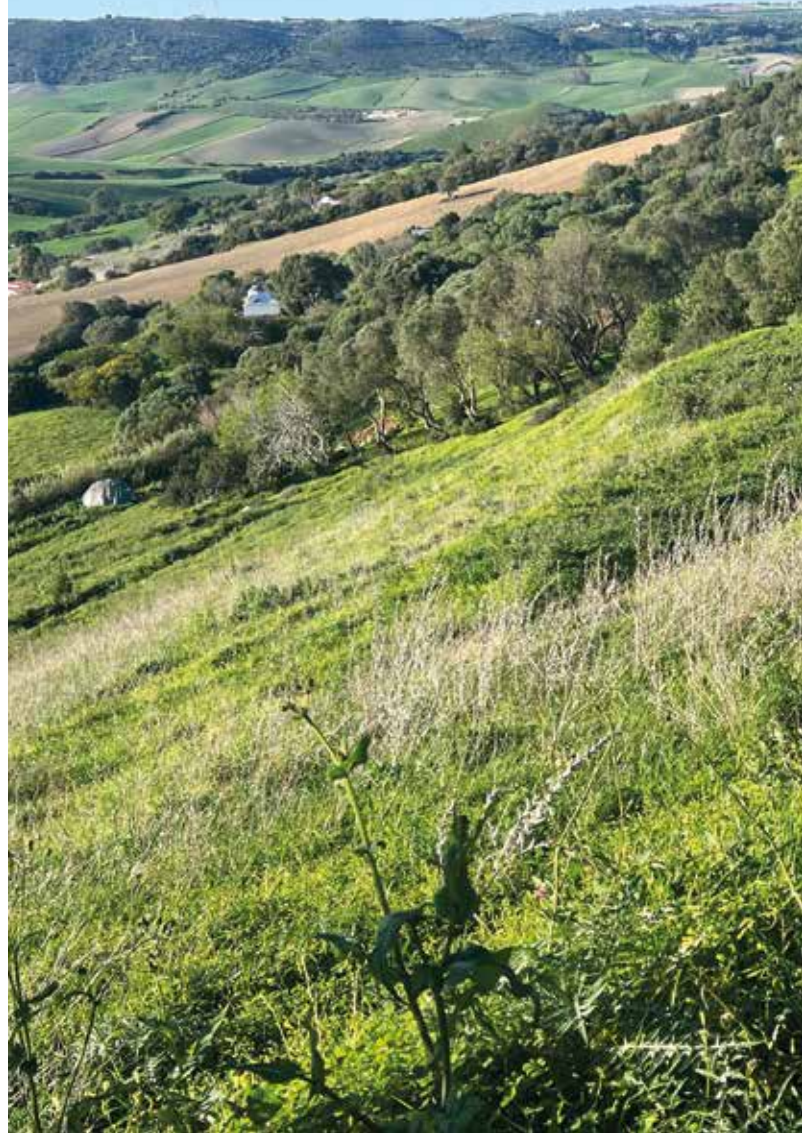
Since then we have been designing and implementing a zero-runoff landscape in Catalina, as a continuation of the work we had already done. In total we have built dozens of earth structures – terraces, swales, overflow ponds – and planted many thousands of trees. November 2021 brought torrential rains of over 200mm in a day, causing widespread flood damage in the area, mostly caused by runoff. On our land, the swales filled, but didn’t overflow, and there was no obvious runoff anywhere on the 13 hectares.

After six years of working towards this single goal, it had been achieved, and we suddenly didn’t know what was next. In the summer of 2022, Andrew returned to Tamera after many years, and observed what was happening there. The lakes and ponds were at record lows. The trees, while much larger than before, weren’t really protecting the ground from the scorching sun. In Tamera a new line of thought was emerging: Rather than open ponds and lakes prone to evaporation, perhaps seasonal ponds and floodable forested areas could be a better solution for this type of dry Mediterranean climate. Developing planting strategies to create more densely vegetated areas which would protect the ground from the sun, thereby retaining moisture and increasing soil life, would complement this new approach, and would also have a positive impact on the microclimate.

Moving Forward Towards Closed Canopy

Back at Catalina we surveyed all the trees we’d planted since the beginning. We were disappointed to see that as few as 15-20 percent of the trees had survived. Unsurprisingly, drought resistant species were the most successful, but in some areas even they weren’t making it. We also noticed that trees we’d grown in our own nursery or grown in situ from seeds were the real champions. We had found a new vision – accelerating succession to achieve closed-canopy cover with the rest of the landscape covered in dense vegetation in the next 10-15 years if possible – but we weren’t actually able to keep the trees we’d planted alive with our available resources. We decided we needed to build on what we could see was working...and to go back to the basics: to zones. By focusing on densifying the vegetation in zones 1 and 2, where most human activity takes place on the land, we could concentrate our work and resources, provide better care, and achieve a higher success rate in those areas. We also decided to experiment with dense planting strategies, specifically Miyawaki tiny forests⁵ and syntropic agroforestry,⁶ to learn more about accelerating a closed canopy in our climate, albeit only in small experimental sites at first.

In this new phase, where trees are thriving we use them as nurseries for other tree seedlings, protecting the youngsters from the strong wind and the hot sun. Gradually the corridors of vegetation along the earthworks and pathways



The top swale having grown in and integrated in the landscape

will densify, connecting to the hedges on the borders of the property. Again, like a mycelial network, these thickening lines of green water will start to fill in, gradually moving towards our next goal of closed canopy, and at the same time creating green corridors that will allow wildlife to move about the land, promoting biodiversity.

Repairing the Broken Water Cycle, the Gateway to a Regenerative Future

Working with water retention may be the most important design work of our time, whatever the scale of your project. The thinking around water must change, and rather than treating rainwater as a problem and trying to ‘get rid of it’, we need to find solutions which get it back into the ground. In cities, green roofs and innovative approaches to green spaces are on the rise. Parking lots and paved surfaces feeding their runoff into vegetated spaces are just one of many ways to turn the problem into the solution. And for rural projects, taking courses like those which continue to be offered by Marcus and Silvano at Tamera are a great way to gain the skills to begin your own learning pathway, before honing them to your particular climate and conditions.

By building on the work of others, using the scale of permanence, zoning and other permaculture tools and



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principles, permaculturists can develop projects with strong foundations, which will serve to teach and inspire others, and spread this vital work. When the green water becomes visible on a project, others take an interest, and as we learn and develop our capacity to support others, their projects will help to spread the mycelial network of green water across the land, infiltrating water, sequestering carbon and adapting the microclimate. Creating a water retention landscape can recharge the aquifer, and lead to springs coming back, providing life and sustenance far into the future for the community of life. What better example can be found of the inextricable connectivity in permaculture's triple ethic: earth care feeding into people care and future care?

For more information about the Catalina project, visit www.almenara.online.

¹ See 'The Rebel Farmer' in *PM53*

² <https://open.oregonstate.edu/permaculture/chapter/scales-of-permanence>

³ www.permaculture.co.uk/articles/3-each-important-function-is-supported-by-many-elements-an-original-permaculture-design-principle

⁴ www.permaculture.co.uk/articles/7-small-scale-intensive-systems-an-original-permaculture-principle

⁵ www.creatingtomorrowforests.co.uk/blog/the-miyawaki-method-for-creating-forests

⁶ <https://agendagotsch.com/en/what-is-syntropic-farming>



'Catalina' is a land-based project located on 13 hectares of land on a hillside in the region of La Janda in southern Spain. The project is named in homage to a local 15th century woman landowner, and the focus is on exploring different forms of community life and collaboration with nature, based on the principles of permaculture, and developing specific practices in relation to the location and condition of the land. A number of groups, volunteers and specialists have been working on the project since 2014, led by Andrew Zions Abrams. The work has involved restoring the functionality of the ecosystem by creating a zero-runoff water retention landscape, reforestation, and experimenting with regenerative agriculture and care for the soil, as well as connecting to the community of life using tools from deep ecology and sociocracy. The shared aspiration is to move beyond the idea of sustainability as sustaining a given situation over time (including what may be an impoverished and degraded landscape and/or community), instead aspiring to create a local version of a regenerative culture, as defined by Daniel Wahl in his book *Designing Regenerative Cultures* (2016):

"A regenerative human culture is healthy, resilient and adaptable; it cares for the planet and it cares for life in the awareness that this is the most effective way to create a thriving future for all."

For more from Catalina:

'Creating Regenerative Communities' (*PM120*)

'Building a Life Cairn' (*PM119*)



Andrew Zions has a background in fine arts, industrial design, permaculture and yoga. He has been implementing a rainwater retention and reforestation design on his farm since 2014, sharing the work and his passion and knowledge with volunteers and friends.

Joanna Crowson discovered her passion for permaculture in 1993 when she and her family bought land and started creating Casa Gaia in Cádiz. She currently works as a translator, educator and writer, focusing on creating regenerative cultures through reconnecting to the earth.

Jorge Gallardo, co-founder and coordinator of the cooperative Be.Time SCA, created in April 2017, works as a cultural mediator in a small town south of Cádiz, developing projects for the regeneration of species and landscapes and mobilising civil commitment in the protection of the commons.