

Restoring the Healthy Water Cycle: A Summary

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Only about 4%-20% of the global heat dynamics are regulated by carbon, while 75%-95% is regulated by water.

Most of us have been taught an over simplified story of the water cycle. We tend to think of the water cycle like this: rain falls, water evaporates, condenses into clouds, and repeats. This is only part of the picture.

A lot more happens underground. Healthy soil is like a sponge that soaks up a lot of water. Some of it is taken up and stored by plants. Some of it percolates deep down into aquifers.

This ground water wells up and feeds streams, allowing more life to thrive. Then there is much more water to evaporate from the saturated ground and transpire from plants.

This abundance of water allows for more consistent rainfall.

Biology makes rain mostly via plants and via management practices of crops and forests as sources of:

- 1) Atmospheric water vapor
- 2) Aerosols that are effective cloud condensation nuclei and ice nuclei

The **full water cycle is much more complicated and interconnected than what we learned in school.**

The Full Water Cycle:

Clouds form when the sun's energy turns liquid water into vapor. **For water vapor to condense into droplets**, forming clouds and then rain, **it needs nuclei**, a particle that the water vapor can start to condense upon and form around. **Then it can** gather mass and volume in order to **form a droplet. Precipitation nuclei can be** ice crystals, salts, or **microorganisms. Hygroscopic microorganisms** (which attract water) **can account for 50%-80% of the precipitation** received. **Where do these microorganisms grow? Within the leaves of trees**, using the surplus sugars from photosynthesis as a food source.

Transpiration from plants cools the environment just like sweat cools a human body.

Plant leaves aren't just leaves; they're home to many species of bacteria that are condensation nuclei, producing clouds much more quickly. In this way, **plants seed clouds.**

If we don't have plants and don't have their condensation nuclei, water vapor isn't able to form clouds and it forms a haze instead, so we have heating instead of cooling.

So **more plants mean more clouds.**

Phase changes of water involve a tremendous amount of heat and energy. The phase change from gas (large) to vapor (small) creates a big change in volume, resulting in a drop in pressure. This acts like a vacuum, drawing in more humid air from the coast. Through this mechanism, the **biotic pump, water is delivered from the coasts through Earth's land masses.**

As **vegetation transpires water** (part of photosynthesis), the water absorbs a tremendous amount of heat energy as it is converted from liquid to gas. This heat is carried away from the surface of the Earth, into the atmosphere, by the stream of rising water vapor. **This contributes** a very significant amount of water to the atmosphere, accounting for **roughly half of the precipitation received**

With the surface of the earth sheltered and protected from the sun, the **soil stays cool and moist.** It is therefore able to quickly absorb the warmer falling rain. The **water infiltrates deep into the earth along the roots of vegetation, recharging aquifers.** This water then returns purified, mineralized, and energized as springs.

This provides for ample water for photosynthesis throughout the year, with the cooling effect of transpiration buffering against temperature extremes. The water flowing through the Earth keeps rivers and lakes cool and clean, providing for a healthy aquatic system and water abundance.

This is a feedback loop of productivity and abundance, leading to a balanced and stable climate, the natural state of Earth.

Water Cycle Death Spiral: How We're Killing Our Planet

The Watershed Death Spiral is a feedback loop--the drier landscapes become, the less life they support.

The lifeless landscapes are unable to effectively regulate temperature and humidity.

As a result the biome desertifies - making life harder for all of Earth's inhabitants.

These effects and impacts build on one another; the further down the spiral we go the harder it becomes to reverse.

What happens if we cut down the forests, plow the grasslands, and expose the soil?

Without trees or plants to buffer the rain, a heavy downpour compacts the soil.

The water can't soak down into the ground. Almost all the water runs off, making a flood, carrying loads of topsoil with it.

When the rain stops, what little water there is left evaporates quickly, leaving the ground compacted and dry.

This lack of percolation depletes the ground water over time so it can't feed the streams, which dry up.

Now there's no water in the land to feed rainclouds, and we have a drought.

If a rainstorm does come, it just creates another flood and worsens the subsequent drought.

Instead of consistent rainfall, we have a drought-flood cycle.

The Revived Water Cycle

By acting as keystone species, humans can revive the health of our land and water.

How Do We Do This?

Doing this **requires starting** with a **newfound respect for water and nature**. It means **changing our relationship from** one of **control and extraction to** one of **cooperation and symbiosis**.

This shift means **transforming the created water-sheds back into water-catchments**.

Community driven, decentralized water retention projects rehydrate landscapes and restore the health and vitality of ecosystems and communities.

When we act for water, it creates positive ripple effects through the web of life.

Forests attract rain. Forest cover plays a much greater role in determining rainfall than previously recognized. Forested regions generate large-scale flows in atmospheric water vapor.

Reforestation, revegetating, terracing landscapes, and creating water bodies all help the land receive the seasonal rains.

Decentralized Water Retention Landscapes help distribute and balance the availability of this vital resource.

Reconnecting waterways with their floodplains and **providing space for water to gather and infiltrate during flood events** further increases the seasonal recharge.

Treating the catchment area by reestablishing forests, diverse vegetation and consistent groundcover improves the health of the soil and the infiltration and retention of rains.

What Are the Results?

Storing the seasonal rains **within the earth-body** ensures abundant and healthy water supplies throughout the year and into the future.

Rehydrating the landscape gives ecosystems the chance to rebound to a state of health.

Fresh water from the oceans is recharged back into the earth, **replenishing groundwater and aquifers.**

Springs come back to life, and the streams and rivers become full of fish and wildlife once again.

With abundant water, **vegetation photosynthesizes for longer** throughout the year, cooling the air and regulating the temperature; the heat dissipates.

Hygroscopic microorganisms growing within the forests drift into the atmosphere, again seeding water vapor into clouds and then rain.

The forests trap heat as they convert water from a liquid to a gas, for that heat to then be released higher in the atmosphere when the gas re-condenses back into a liquid.

The low-pressure systems created by this process draw in more humidity from the coast.

This forms a feedback loop. In this way The Full Water Cycle can be restored, and with it a balanced and productive climate.

How Long Does It Take?

When working with water, people see the results of their efforts after the first rainy season.

Year after year the landscape stays green for longer and is more productive.

As the ecosystem develops interconnectedness and complexity, productivity continues to increase.

These actions make sense for a human time scale as they provide us feedback with each passing rain.

Huge transformations are possible within a decade, and people clearly see the results of their actions quickly, empowering them to gain confidence and community to expand their work.

Here are nine ways to reverse drought, flood, and fire:

1) Infiltrate water into the earth

~ Give water space: don't hold water separate from the earth; let it return to the earth to restore the hydrology in the ground.

~ Lengthen the flow path: make water path weave back and forth. It's not about how much water we receive, but how many times we use it before it leaves.

~ Decentralized: important to do this work decentralized. Hold little bits of water all throughout the landscape. It's not about draining all the water into certain areas and holding it in big reservoirs. It's about returning it to the earth all over the landscape. This is how we restore the biosystems.

- 2) Work with nature
 - ~ Let the vegetation grow
 - ~ Let the weeds grow
 - ~ Feed the soil
- 3) Forests plant rain, so plant forests
 - ~ Protect what remains
 - ~ Establish new
 - ~ Agroforestry
- 4) Prime the Pump
 - ~ The Biotic Pump
 - ~ Ecosystems
 - ~ Irrigation
- 5) Move From Old Water Paradigm to New Water Paradigm
 - ~ Why the Old
 - ~ Why the need for change
 - ~ What is the New
- 6) Awareness
 - ~ Where does your water come from
 - ~ How is it treated on its path
 - ~ Is the rain rejected or received
- 7) Transform Your Relationship with the Natural World
 - ~ From extraction and destruction to partnership and co-creation
 - ~ From degeneration to regeneration of water abundance, healthy ecosystems, and balanced climate
- 8) Achieve Water Neutrality, Strive For Beneficial
 - ~ Your water bank
 - ~ Water efficiency
 - ~ Snowpack and glaciers
- 9) Outreach
 - ~ Educate and advocate
 - ~ We're all in this together

Two examples of farmers restoring the healthy water cycle:

[**Natural sequence farming: How Peter Andrews rejuvenates drought-struck land | Australian Story**](#) (29-min. video)

Is "natural sequence farming" the secret to restoring our water-starved continent? For more than a decade, two farmers have shown that parched landscapes can be revived. And finally, Canberra's listening.

[Holding Water: Working with Nature to Drought-Proof Your Farm](#) (15-min. video)

Across the world, farmers face growing challenges as extreme weather and climate change take their toll. At the Danthonia Bruderhof farm in Australia - a land renowned for "drought and flooding rains" (and bushfires) - we're implementing Regenerative Agriculture practices, to work with nature to restore and improve our landscape. In this video, we showcase the efforts our community's farmers are making towards "drought-proofing" our farm by increasing the capacity of our land to hold water.