DROUGHT PROOF TEXAS

Flood and Drought Mitigation

DROUGHT PROOF TEXAS - MISSION

Total rehydration of the entire state of Texas, built on the foundation of regenerative and biologically rich soils.

By harvesting every drop of rainfall possible and storing in the soil we can recharge aquifers, revive springs, build high quality soils and keep our rivers flowing year round.

A HISTORY OF FLOOD AND DROUGHT

The Texas Hill Country experienced an extreme and oppressive drought in the early to mid-1950's.

In 1950, Llano received 9 inches of rainfall, and a10 inch rainfall deficit in 1951.

In August of 1952, the Llano River had virtually dried up, requiring the city of Llano to ship water into town with train cars. Lake Travis was at its all time recorded low on September 6, 1952.

A HISTORY OF FLOOD AND DROUGHT

On September 9th, 1952 precipitation finally began to move into the Hill Country. Gentle showers began to settle the dust in Llano on the 10th with 2.2 inches recorded.

By the end of the day on September 11th, heavy downpours had **dropped up to 20 inches of rainfall in a single day over 8 different counties** in the Hill Country. Including Llano which recorded 16 inches.

A HISTORY OF FLOOD AND DROUGHT

The Llano River bounded from 0 cfs to 232,000 cfs in one day and topped out at 32.6 ft high.

However, some areas missed this rain and the stream flow for the Llano River at Junction grew from 15 cfs to only 23 cfs. **This indicates the high variability of rainfall in the Hill Country.**

A HISTORY OF FLOOD AND DROUGHT

This is the same flood that reduced the cypress-lined Pedernales to a wasteland of broken and bent trees reduced to kindling.

Much like the recent flood on the Blanco River in Wimberley, trees that had withstood the ages of flood were now decimated. The banks were swept clean of soil, leaving only limestone behind. This area has yet to fully recover.

A farmer in Hye reportedly had *"a field as fine as any to be found in Gillespie County before the rain. Now the field is just gravel and clay since all the topsoil was washed away."*

A HISTORY OF FLOOD AND DROUGHT

Lake Travis gained 701,000 acre feet of water in a single day, tripling its volume and gaining 57 feet of depth in 24 hours. The flow into Lake Travis reached 800,000 cfs at 7:30 am on September 12th.

The Texas Board of Water Engineers noted that millions of acre feet of water flowed into the soil and underground reservoirs. A San Antonio aquifer observation well rose 7 feet on the morning of September 12th.

A HISTORY OF FLOOD AND DROUGHT

Despite the massive amounts of rainfall, Texas received no relief from the drought.

October 1952 went down as one of the driest months on record. Llano, Mason, Fredericksburg, Blanco, Junction, and San Saba all reported 0.0 inches of rainfall for the month.

Citation: "Flash Floods of Texas" by Jonathan Burnett pages 136-150. Published by ATM nature guides in 2008.

PATTERNS OF FLOOD AND DROUGHT

Boom and Bust cycle

- Long dry periods followed by flash flood events, followed again by increasingly severe drought.
- Drought is exacerbated by heavy soil erosion during flooding events.
- Damage from subsequent droughts and flood cycles increasingly limit the soil's ability to absorb rainfall. This leads to worsening conditions of drought and flood.
- The two issues are interconnected and the problems are the solutions for both.

PATTERNS OF FLOOD AND DROUGHT

In later studies done on the May 2015 Blanco River Memorial Day Flood, it was estimated that **70%** of the rainfall that fell in the Blanco Valley catchment area ended up as runoff and damaging flood waters.

Because most of our rainfall comes in heavy deluges, **much of the rainfall is ineffective**.

Even though our average rainfall may be around 30 inches, much of this is lost immediately as runoff. Instead of recharging the aquifers optimally, the water is lost to the Gulf of Mexico.

EFFECTS OF FLOOD AND DROUGHT

Native plants in sensitive riparian areas are hit the worst. The banks of rivers and creeks are swept clean of soil or dumped on by large layers of sediment.

This creates an open **niche** in the ecosystem that is quickly filled by opportunistic non native plants.

The toll in Texas is in the billions of dollars in agricultural loses, infrastructure loses, habitat destruction, loss of natural resources and loss of human life.

THE PROBLEM IS THE SOLUTION

To mitigate drought we must be ready to harvest as much rainfall as possible during heavy downpours and store it in the soil as high in the landscape as possible.

The energy of *overland flow* should be pacified as high in the landscape as possible before it becomes channelized in river basins and becomes a destructive force.

Every hill is full of fractured rock and, like a sponge, can be filled with **water that will be slowly released over time.**

THE PROBLEM IS THE SOLUTION

This process of slowing, spreading, and sinking storm waters into the hills can mitigate damages from floods downstream.

The filling of the hills with water will also raise the local water table and provide a slow release of water from *seep springs* that will feed rivers for an extended period of time.

It will take longer for the hills to drain and springs to dry **if they are saturated with more effective rainfall.**

LANDSCAPE REHYDRATION

There is no recipe, only a recipe for disaster.

Every land and landowner is different and solutions are site-specific.

The context of every situation must be observed to find the most cost effective solution that can be managed within the means of whoever is managing.

We have plenty of rainfall, it is just not being utilized effectively.

SOIL FERTILITY

- Healthy topsoil has a high level of organic carbon, or organic material of various stages of stability.

- 1% organic matter in the soil holds around 27,000 gallons of water per acre. 1 inch of rain per acre is about 27,000 gallons.

- Each percentage increase of organic matter increases the amount of inches of rain absorbed by the land.

SOIL FERTILITY

- 1% organic matter = 27,000 gallons water storage per acre. Only 1 inch of rain is harvested in a deluge.

- 3% organic matter = 81,000 gallons water storage potential per acre, or 3 inches of rain harvested in a deluge.

- Most of the land in the Hill Country has soil organic matters levels at 1%-2%.

- Healthy topsoil has a minimum of 5% organic matter.

SOIL FERTILITY

Topsoil is created when soil is in contact with plant roots.

Plants with green leaves take in sunlight, water, and carbon dioxide during the process of photosynthesis.

During photosynthesis, plants split the water molecule and exhale oxygen, which we breathe. The remaining hydrogen is used to create sugars that the plant uses as food to maintain and grow its own body.

SOIL FERTILITY

SOIL FERTILITY

SOIL FERTILITY

During good conditions plants will produce more food (sugars) than they need to. This excess is known as liquid carbon which drips from tips of the plant roots as root exudates.

Billions of micro-organisms including bacteria, fungi, protozoa, and various nematodes feed off these root exudates in a complex system of symbiosis. In exchange for sugars from the plant, these creatures provide incredibly vital minerals and nutrients that the plant cannot obtain on its own.

SOIL FERTILITY

The lifecycles, cycling of these micro-organisms, and final digestion by **fungi** creates *humus* in the soil.

Humus is a very stabile and complex mineral and organic carbon molecule that functions as long lasting feed for plants.

Humus for the soil is analogous to honey. Bees create and use honey as energy storage over the winter for use as needed. Plants are doing this same thing during photosynthesis.

SOIL FERTILITY

We can increase our soil's capacity to hold water simply by having as many green plants photosynthesizing for as long as possible during the year.

Our number one priority is to achieve 100% ground cover, 100% of the time. Bare soil is public enemy number one!

It was estimated by professor Del Weniger that the entire state of Texas had lost 6 feet of topsoil by the year 1860! It is vitally important to our ecosystem to start the healing process and use our mighty human strength and organizational skill to reverse this downward slide.

SOIL FERTILITY

Soil Fertility is destroyed or extracted from:

- Pesticides, herbicides, fungicides
  (including worming agents like ivermectin)
- Chemical fertilizers
- Tillage
- Overgrazing/Continuous Grazing
- Clear-cutting Forests
- Erosion

LANDSCAPE REHYDRATION - HILLTOPS AND HILLSIDES

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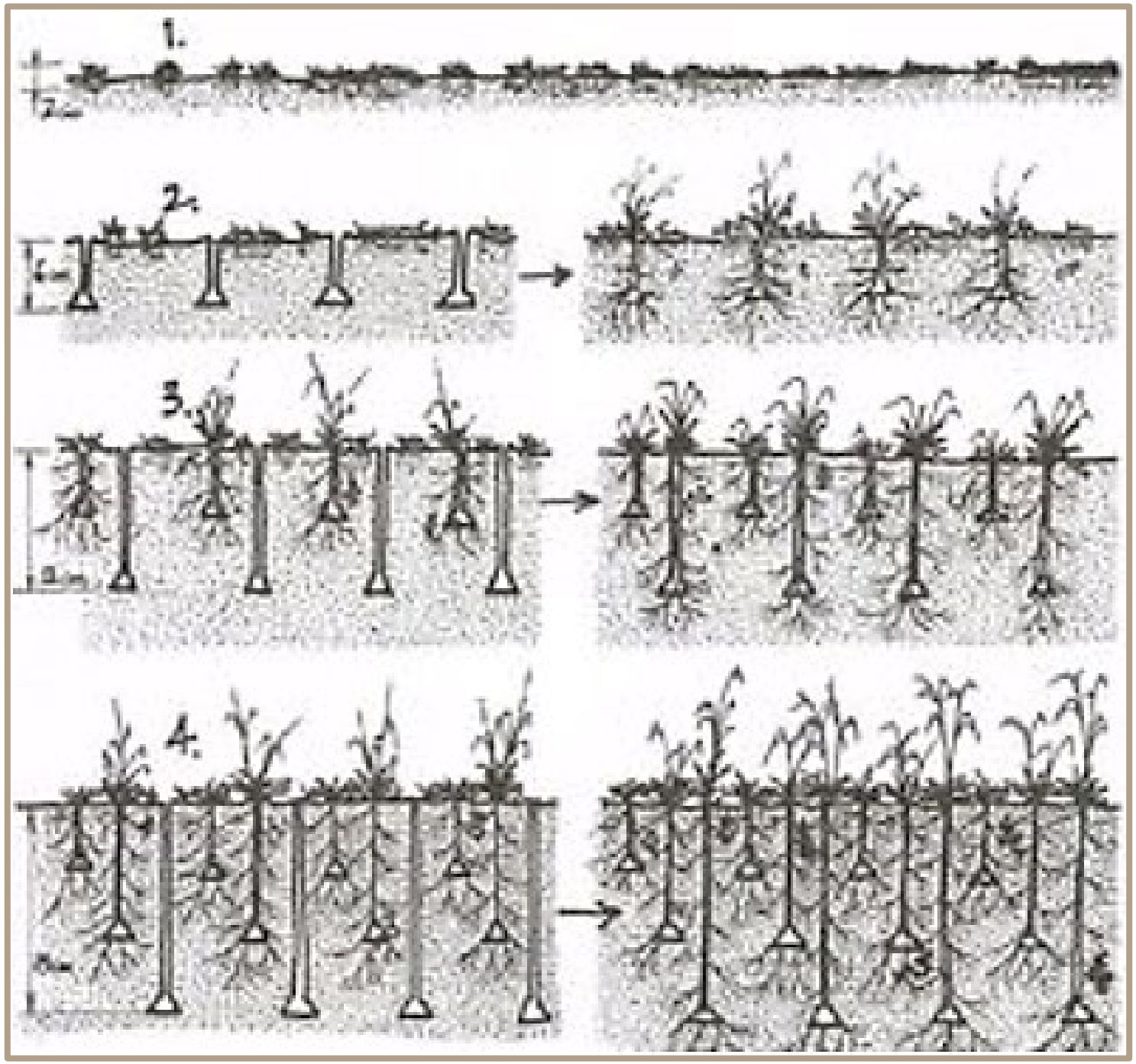
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COVER CROPS

COVER CROPS

NATIVE SEED


NATIVE AMERICAN SEED
BLACKLAND PRAIRIE MIX
Net Wt. 5 lb.
...helping people restore the earth
NATIVE AMERICAN SEED
SUSTAINABLE QUAIL AND DOVE MIX
Net Wt: 1 lb.
...helping people restore the earth
NATIVE AMERICAN SEED
BEE HAPPY MIX
Net Wt. 1 lb.
...helping people restore the earth
NATIVE AMERICAN SEED
PRAIRIE STARTER MIX
Net Wt: 2 lb.
...helping people restore the earth
NATIVE AMERICAN SEED
HUMMERS & SINGERS MIX
Net Wt: 1 lb.
...helping people restore the earth

GRAZING MANAGEMENT

- Adapted Genetics
- Non-selective grazing
- Managing for soil Fertility
- Proper Protein Supplementation
- Ultra high density with frequent moves
- High level of management
- Jaime Elizondo Braun
  - droughtprooftx.com/business/regenerative-grazing-jaime-braun/

Soil and Water Conservation at TerraPurezza Farm

TerraPurezza Regenerative Agriculture Farm

TerraPurezza is privately owned farm in Spicewood, Texas. In one year we have transformed a barren caliche hilltop into a profitable farm that virtually eliminates erosion, increases storm water infiltration, improves soil fertility, boosts diversity, and enhances pollinator habitat. Bio-swales were designed and built to harvest rainwater and passively soak it into the ground. We dug out 8-foot wide basins 6-8 inches deep on contour across the landscape that totaled 1,760 linear feet. The spoils were shaped into garden bed-like berms downhill of the basins. The berms and alleyways were seeded with a diverse mixture of native grasses, wildflowers, and cover crops. A layer of native wood mulch was then spread over the system to protect the seeds and soil. The berms were also planted with native trees, fruit trees and shrubs. The farmers are now intensively managing a rotational grazing pattern of chickens throughout the system. The animals have a high impact on the land for a very short period of time, which has been proven to increase soil fertility. The results in just one year have been astounding and the family is making a sustainable living on the farm.

Before

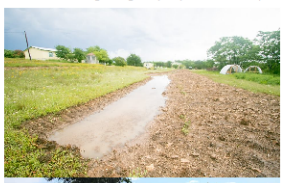
After

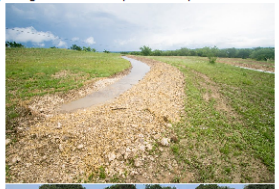
Runoff Management

The 3 acres of catchment can receive 80,000 gallons in one inch of rain with no runoff. This system has absorbed all runoff and not overflowed since installation in early 2016, for a cost of $5000.00. Soaking water into the hills can help mitigate flooding lower in the watershed. The following photos show the system as its being built and the freshly excavated bio-swales.

Water Conservation

These bio-swale structures were built to last for 100 years or more. Over a 25-year period, using an average rainfall of 35 inches, this 3-acre system has the potential to harvest 70,000,000 gallons (212 acre feet). This extra water has been put to use serving the farm ecosystem. The berms are being managed as a poly-cultural orchard, with a ground cover of native grasses and pollinator forage. The system will pay for itself with a bounty of fruits and cut flowers. The alleyways are being managed by chickens and the farm is already having great success selling their meat and eggs to local restaurants. The following photos show how the bio-swales catch runoff, water soaking into the berms, the mulch covering and the first seedlings coming up. As the project matures native trees and fruit trees will grow to shade the terraces and grazing alleyways, this will help keep the ground cool and prevent evaporation.





Pollinator Forage & Habitat

The berms of these bio-swales were built to be strong but able to grow things easily, like a long garden bed. The extra moisture from the basin and the garden bed tilth gives the native grasses, wildflowers, cover crops, and trees the perfect growing conditions to thrive, in this context. The structures were seeded with over 60 different native plants. The results in one year were incredible. The berms were covered 100% with thick vegetation, both native grasses and wildflowers grew to sizes that we had not anticipated in this soil type. The alleyways also have also shown great improvement in plant diversity. Where there was no diversity now is a thriving ecosystem that is profitably managed by farm animals.

Farm Enterprises

The farmers and managers of this land, Orion Weldon and Tina Lubomira Weldon, are putting this system to work. The berms have been planted with 150 trees and shrubs. There is a diversity of fruit trees, fruiting shrubs, native legume trees, and pollinator forage trees. In the alleyways between the bio-swales they are now grazing and frequently moving chickens and pigs for sale to local restaurants. The pasture raised chicken is amazing! Rotating the animals around the property has begun to have a positive effect on the soil health. The once barren caliche in the alleyways is now growing grass and native flowering plants! The farm has acquired two honey bee hives to take advantage of the prolific pollinator forage and to supplement pollination for the fruit trees. They have also been using the berms as raised bed crop gardens growing squash, beans, and corn.

Community Outreach

This project has been functioning on the farm since April 2016. In February 2017, in partnership with Earth Repair Corps , we held an event open to the community where 45 volunteers came and planted 150 trees, spread seeds, install fencing, install irrigation for the trees, and cover the grazing alleyways with mulch at the farm. Earth Repair Corps has held over 45 educational events similar to this helping local farms, schools, and homesteads. In some cases there have been over 100 volunteers attending these events to learn about sustainable design and regenerative agriculture. During the event we had a quick tree planting demonstration, and educational talks from the farmers and President of Earth Repair Corps, Kirby Fry. Pictured below is our group photo for the TerraPurezza Farm Permablitz event. For more information about this volunteer group and educational events please visit www.earthrepaircorps.org. TerraPurezza has been tirelessly working with local restaurants and proving to them that regenerative agriculture can produce high quality products with ecological integrity. Please visit their website http://terrapurezza.com.

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WHICH HAS MORE WATER?

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THANK YOU!

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