# Scripts of PamBacklund's Videos on YouTube

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Page 2 1a Why is the Concho Valley in a grassland biome? https://www.youtube.com/watch?v=hLCSxELQEM0
Slide show of the youtube video pdf

Why is the Concho Valley considered to be in a grassland biome?
Well, it all boils down to rainfall and temperature.

The Concho Valley averages about 20 inches of rain per year and has a moderate yearly temperature average.

The grassland biome in general encompasses much of the central USA.
Some people call it the "breadbasket of America" since many grains...being grasses...grow well there.

In Texas the grassland biome can be further separated into:

- Short grass prairie
- Mixed grass prairie
- Long grass prairie

A MIXED grass prairie receives about 20" of rain/year.
So the Concho Valley is regarded to be a Mixed grass prairie grassland.

The SHORT grass prairie receives less than 20" of rain per year but more than 9" of rain per year. The desert part of the state might receive 9" or less of rain/year.

The LONG grass prairie receives more than 20" of rain per year but less than 32" of rain per year. The piney woods (forest) part of the state receives 32" or more of rain/year.

Trees (that don't steal water from aquifers) generally need 32" or more of rain/year.

So for the Concho Valley, the rainfall amount governs that it should NOT be covered with trees but instead should be covered with mixed grasses.
Therefore if acres of the Concho Valley are covered with mesquite trees, cactus and/or cedars, it is the result of humans choosing poorly and/or a lack of prairie fires.

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Page 3 1b What ecosystems are within a grassland biome? https://www.youtube.com/watch?v=Q_XIfexybng
Slide show of the youtube video pdf

When the Concho Valley was pristine…(before the Western Expansion) there were three dominating ecosystems in the region.

Being a mixed grass prairie with about 20" of rain/year, the flat-lands were inhabited by a diverse list of grasses and small forbs.
Small bushes were seen intermittently, but they did not dominate. Small trees would sprout from seed, but lightning induced fires and/or grass competition kept trees on the flatlands rare and small in size.

In the lowlands (river beds and creek beds) shrubs, trees and vines existed. A dominating species of tree was and still is the pecan tree. The lowland streambeds are called "Riparian Areas".

In the highlands (small hills and plateaus) cedar, yuccas and coarse shrubs existed.
Within each of the three ecosystems, animal life were and still are specialized for eating food within their niches.
But most mobile animals would depend on the lowland pools of water in the intermittent stream beds. At least once a day they would get life-giving water.

There were "wet" years and there were "dry" years. So the communities of various populations within each ecosystem underwent cycles of "better than average survival rate" and "worse than average survival rate."
As in all ecosystems, catastrophic events temporarily stripped plants (the base of all food chains) to a scary low level.
The Concho Valley's three major ecosystems were affected by events such as:

migrating buffalo herds,
prairie fires,
hailstorms, tornadoes and
massive floods followed by
lengthy droughts.

But with 'secondary succession' all three ecosystems and their smaller "micro-climate-areas" always recovered.
And each species' population, evolved ever so slightly to be hardier than prior to the catastrophic event.
The riparian ecosystem, the grassland ecosystem and the upper hills ecosystem; all exist in the Concho Valley area.

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Page 4 1c What is a sustained ecosystem? https://www.youtube.com/watch?v=lZOys2euZuA
Slide show of the youtube video pdf

Let's compare: "sustained ecosystem" to "balanced home budget".

In a household, money is earned and is called "income".
In an ecosystem, rain occurs and is like "income".

(In deserts and prairies, water is usually a limiting factor.
Water is one of basic things that living things need.)

Money can buy necessities.
In the household, 'income' is used to buy the basic 'necessities'.

In an ecosystem, 'water' is used by plants and animals for their basic necessities.

A "balanced home budget" is where the income is adequate to care for necessities.
And maybe some income can be saved for the future.

A "sustained ecosystem" is where the rainfall is adequate to care for the plants and animals. And maybe some rainfall can be saved in aquifers for the future.

In another ecosystem, such as very shady, wet places like a tropical rain forest, the limiting factor might be sunlight, or space, or nutrients...instead of water.

In another ecosystem, such as a tundra flatland, the limiting factor could be shelter from wind, or warmth, or nutrients...instead of water.

So in the Concho Valley grassland prairie, money is compared to water because WATER is what is most limited.

The Concho Valley cannot increase the water income. The region will always have a limited rainfall existence. Therefore, to remain sustained, the amount of living things using water, must not be too excessive in the Concho Valley.

The right amount of living things in the Concho Valley, kept the "ecosystems sustained" before the Western Expansion.

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Page 5 1d Why does excessive overpopulation stop ecosystem sustainability? https://www.youtube.com/watch?v=0sn3VV_tNFA

Slide show of the youtube video pdf

Indigenous wildlife cannot change their circumstances much.
They just live day to day in a habitat that is somewhat stable.
But when hard times circle round, some individuals either migrate or die.
The cruelty of harsh living, kept ecosystems sustained
for thousands of years by limiting populations.

By contrast, humans like to be comfortable all of the time.
To have constant comfort, most humans plan for the future,
and in doing so, might use more resources than they really need.
They over-prepare for when the hard times circle round.

And some humans waste.
Some humans have been using nature,
And using other humans,
for their own advantage since the beginning of time.

As the centuries passed, humans improved their survival rate and comfort.
But in doing so, they got into a tough situation.
There were more humans than land resources.

Food for humans requires a lot of water especially if they are meat-eaters.

In the Concho Valley it became necessary
to draw water from aquifers and rivers in the late 1800's.
And it was necessary to build dams to collect water---
water on which humans downstream were probably dependent.

So as humans improved their lifespan, survival rate and comfort,
the rainfall amount could not accommodate those additional humans' needs.

Balanced before the Western Expansion...
Not Balanced after the Western Expansion.

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Page 6 2a How did PaleoAmericans and Jumanos affect the Concho Valley? https://www.youtube.com/watch?v=tc9SsFdDvb4
Slide show of the youtube video pdf

Paleo-Americans crossed the Bering Strait and impacted the Concho Valley
as other predators and scavengers impact the land.
Those first peoples lived in harmony with the environment.
Their life struggles are not well recorded and it is thought that they went extinct.

A second migration across the Bering Strait brought the people now referred to as "Native Americans".
Those second immigrant groups branched throughout the Americas...to become numerous recorded tribes.

When European explorers began recording life in the Americas in the 1500's they found Jumanos living in the Concho Valley.
Jumanos were friendly hunters and traders with no permanent dwellings.
They were 'crafty opportunists' who made use of everything including: bones, flints, grinding rocks, hides and baskets.
They valued everything, even using dry buffalo dung for fuel.

They migrated because of floods, droughts and being 'ousted-away' by other wandering clans. And because they were always on the move, they did not farm or make heavy burdensome belongings.
Doing like their ancestors, they hunted, scavenged, gathered... meats and plants.
They depended on clean spring and seep water.
But their bodies were conditioned to also accept water straight from some rivers.
They survived well partly because of accumulated knowledge from their elders.
The Jumanos wouldn't go extinct, but bad and good times still came in cycles.

Jumanos might have learned through trial and error that lightning fires gave them more food.
They set their own prairie fires to confuse and frighten herds of buffalo.
It made hunting easier and prevented bushes/trees from overtaking the grassed prairie.

Their "prescribed burns" as they are named today, also removed old-growth grass which made the next year's "new shoots of grass" very tasty. This attracted herds of animals; their main food source.
Both the Paleo-Americans and Jumanos had no negative impact on the prairie ecosystems of the Concho Valley. In fact, they helped the prairie with their fires.

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Page 7 2b How did the HORSE BACKED natives impact the Concho Valley? https://www.youtube.com/watch?v=Wlr_y4Yt5YM

Slide show of the youtube video pdf

When the Apaches arrived into the Concho Valley in the 1500's, some Jumanos intermingled with them in inter-tribal marriages.
But other Jumanos were exiled and/or abused by the Apaches.
Explorers (coming in search of treasure and to spread Christianity) were bringing horses and horsemanship SKILLS to the Americas.

The Apaches became horse-Indians.
Hunting while on horseback required less planning than previous Jumano hunting techniques (including fire-corralling).
FEWER prairie fires were set by Apaches because hunting with horses was easy.

Sometimes huge herd kills led to unintentional waste...causing higher scavenger populations
In the 1700's a new group (the Comanches) overtook the Apaches/Jumanos of the Concho Valley.
They had extremely good horseback and predatory skills.
European, American and Mexican immigrants were in certain danger when confronting Comanches.
Comanche impact on the environment was no different than the Apaches' but their impact on all competing societies was monumental.

They were the top predator of the land and being so good at attacks led to much "hunt-aftermath-waste'.
No doubt there were plenty of scavengers following any Comanche path.
Apaches and Comanches impacted the ecosystems by increasing "bushy rather than grassy" plants because they set fewer prairie fires.
But overall, both the Apaches and Comanches had only slight environmental impact on the Concho Valley.

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Page 8 2c How did changing Europe affect the Concho Valley? https://www.youtube.com/watch?v=bGwJEXvmsCM
Slide show of the youtube video pdf

Europe has a surprisingly nice climate considering its northern latitude.
The 'water to land' ratios as well as the jet stream, provide moderate temperatures.
It's an easy place for humans to occupy.

So Europe has had multitudes of tenants throughout recorded time.
Cycles of war, peace, migrations and disease were, and still are, common.
So when the Concho Valley was still pristine (low impact Native Americans coming and going), Europe was becoming overpopulated with people.
Those over-populations strained the ecosystems there.

And besides being overcrowded, quests for treasures, slaves, new territories and adventure led explorers to other continents.
The Spaniard explorers and missionaries affected the Concho Valley because they made the first permanent structures and they brought ideas about land management.
They also brought plants and animals from their homeland.
No doubt, some of the introduced species became invasive but others blended into the original diversity without flawing that diversity.

Of all the animals they brought, the horse in particular changed things, especially the Native American behaviors.
Horses reduced 'human induced prairie fires' because the Apaches and Comanches used horses for hunting. They didn't need to use prairie fire to secure food from herds anymore.

So the Spaniards may have inadvertently increased prairie trees, bushes and cactus (which fires had kept in check) in the Concho Valley.
Other Europeans arrived to the Valley. They, with immigrating Americans and Mexicans made monumental changes (farms, ranches, cities) to the pristine prairie ecosystems.

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Page 9 2d What happened to indigenous peoples of the Concho Valley? https://www.youtube.com/watch?v=K8rntulwfpQ
Slide show of the youtube video pdf

In the Concho Valley, Jumanos, Lipan Apaches and Comanches existed even though the area was "owned" by six sovereignties.
Spain, France, Mexico, The Republic of Texas, the Confederacy of the Civil War and the United States of America….all supposedly let the Natives "live for free" on their land until the Western Expansion.

In the 1800's, Europeans, Mexicans and Americans were eager to inhabit the land, even though it had been so primitive and harsh to the Native Americans.
Why? Homeland overcrowding, adventure, lust.
There were rumors of silver deposits. There was definitely open grazing land. There were mail routes and security to protect those routes.
The "Galveston-El Paso-California" route (a road which neighbors the Concho Valley) attracted people.

The system of US Forts including Fort Concho, employed contractors and support people. Those people became 'fort-town' tenants.
No matter the reason for coming, huge droves of non-natives immigrated into the Concho Valley and "BOUGHT" the land.
They had more technology from collaborated ideas (from centuries of sharing thinkers).
They could transform the primitive/harsh land and get rid of the natives.

But what about the Natives?
Some diseases brought by the Europeans, Americans, Mexicans; reduced populations.
However, sheer numbers and technology impacted the Natives immensely.
"Kill Jumanos, Apaches and Comanches," boasted the new immigrants.
The "Western Expansion" was a genocide.

Comanches defended their stake in the Valley the best they could.
But in the end all natives were defeated.
Natives that weren't killed, retreated to what is now, New Mexico, Old Mexico and reservations.
Thereafter, the pristine Concho Valley would forever be changed in big ways by the Europeans, Americans and Mexicans.

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Page 10 3a Contrast Concho Valley Intermittent and Perennial waterways https://www.youtube.com/watch?v=OS48hSC_51s

Slide show of the youtube video pdf

The Concho watershed is part of the Upper Colorado River watershed.
A watershed contains a valley and its waterways.
It is bordered on its sides by "hill divides".

The Concho Valley's main tributaries are the North Concho, the Middle Concho and the South Concho.
Two other main tributaries are Spring Creek and Dove Creek.

Some of the waterways are intermittent and others are perennial.
An intermittent, on a map, would be drawn with dots and dashes.
Intermittent can mean: "flash floods, then dries up mostly".
Also, intermittent can mean: flash flood, then alternates between "pools" and "marsh"
Because of erosion and deposition, waterways age.
Older waterways of somewhat flat land "meander".
So the alternating pools and marsh of meandering and intermittent waterways are evident in the Concho Valley.

Some waterways are "constant flow." This is the meaning of "perennial stream".
In the Concho Valley, constant flow waterways are the result of "dammed water release" or close proximity to "springs."

The Concho Valley does NOT have very many perennial streams.
Places with tall mountains, which receive massive amounts of snow are very likely to have mostly perennial (constant flow) steams.
You now know the difference between intermittent and perennial waterways.

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Page 11 3b What affects rain patterns of the Concho Valley? https://www.youtube.com/watch?v=Lh-RdAgR8sw
Slide show of the youtube video pdf

Location on the continent determines that the Concho Valley would be on the eastern edge of a desert and the western edge of prairies.

A latitude close to the equator determines that the Concho Valley would have a warmer climate compared to northern latitudes.

And then there's El Niño and La Niña that happen because of water and air flow fluctuations globally.
When El Niño and La Niña occur, the entire USA's climate is affected.

El Niño's jet stream causes more Concho Valley spring/summer rainfall...especially when a low pressure system is over the Four Corners region or when a low pressure system over northern Mexico.

La Niña's jet stream is much further north, therefore Concho Valley's winter is milder and drier than normal.
Droughts in Texas are much more likely during La Niña.

Tree rings might help show when the two fluctuations (to the mean) are occurring.
But not necessarily! There are other variables that affect rainfall.
Hurricanes can cause a lot of precipitation if the speed, direction and place of landfall are just right.

In September of 1980, tropical storm "Danielle" hit the Gulf Coast with all of the right stuff to dump 6.22 inches. And Danielle occurred when temps were at the mean. Neither La Niña or El Niño.

In October of 1981, "Norma" had all the right stuff to dump 8.68 inches on San Angelo.
Again Norma occurred when temperatures were at the mean.

In September of 2008, “IKE” had some of the right stuff and dumped about 3” of rain on San Angelo. And IKE occurred when temps were at the mean.

These storm events sometimes coincide with “Cooler Niño “ and other times occur during “the average or mean” times of the cycles.

Some other factors that affect global weather (which then affects Concho weather) are solar flares and “super huge” volcano eruptions.

After “super huge” volcano eruptions, there are about five years of “slightly cooler” global temps.
Krakatoa erupted in 1883.

For San Angelo, average rainfall most months, is less than 2”.
But five months of the year averages are closer to 3”.
After the Volcano Krakatoa’s ASHES dispersed globally, there were 7 months of GREAT rainfall.
1883 and 1884 had more yearly rainfall than the 20” average.

In the present, sometimes rain can be coaxed artificially.
Clouds can be “seeded.”
The clouds grow heavy with precipitation closer to the area
from which the water had evaporated.

In doing so, a watershed’s evaporation cycles back to its water-donating land.

There are several variables that influence rainfall.
In West Texas, harnessing the rain variables (and correctly combining them) improves the economy and improves urban water supply.

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3c Will rain runoff or soak in?
Water motion is the same throughout the world, including the Concho Valley.
Runoff of rainfall, falls onto the divides, and moves to lower ground, either into waterways or aquifers.
Since runoff affects rivers and aquifers, let's look at runoff first.
Runoff depends on 1. Rain properties 2. Ground properties

**Rain properties:**
First, runoff depends on the size of drops: There are small and large and others in-between.
Runoff also depends on frequency or "Drops per second" such as a few or many.
And finally, the amount of runoff is affected by impact of drops. Is the rain gentle or forceful?

There are also other rain properties, such as temperature, acidity etc. that don't really influence runoff, so we move on to the ground.
When we wonder about the ground, we ask: What is ground? It is soil with layers or strata.
The layers can be made of different types of soil.
Some strata will behave as aquifers, others will not.
So scientists examine soil strata with EM field and echo, finding recharge areas and different strata. Knowledge of this helps in decision-making.
These questions always arise:

Is rain going to soak in? OR
Is rain going to runoff?

So we need to know about the **ground's properties.**
For instance is the ground porous like sand? Or is it more like clay?

Will the rain fall on level ground or steep ground?

Will the rain fall on bare soil as in the hills, or "grass vegetated soil"
or on something impervious like a road?

Shown is a simple experiment testing soil porosity. When water was poured on clay soil, with no vegetation, it took 31 minutes for the water to soak in.

In the second part of the experiment, the location was still clay soil, but was vegetated with dormant grass. The same amount of water took only 10 seconds to soak in.

So knowing what kind of cover is on the ground is important.

Another property of the ground that affects runoff is saturation level. During a drought, the ground is definitely UN-saturated. There's a good chance that at least some of the rain will "soak-in" on the drought-stricken ground.

Whereas, when the ground is already wet, (especially if drenched deeply) we say the ground is saturated. Runoff occurs very readily when the ground is already saturated.

And there are other ground properties, such as chemical make-up, amount of organic material-etc. which won't be discussed in this video.
So moving on... if you want to predict runoff quantity and quality, you have to know
the rain event's properties and the properties of the ground (on which the rain will fall.)

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Runoff of rainfall, falls onto the divides
and moves to lower ground, either into waterways or aquifers.

Now let's suppose that a rain event occurs on some ground and doesn't run off.
If rain soaks into the ground and is not absorbed by plant roots, it could join an aquifer.
Once in the aquifer, it could remain there until removed by humans with wells or with deep tree roots.
Or the aquifer water could flow downward (underground) and enter a river.
Seeps and springs are aquifer water, re-surfacing, possibly near a river.

BUT, the reverse can also happen.
Rivers can GIVE water to aquifers, just as rivers can RECEIVE water from aquifers.
It all depends on which excess water is above the other.
Gravity takes care of the direction as shown with this seep.

**Spring basins:**
When people had no way of sanitizing drinking water (except boiling for 15 minutes,) they constructed seep and spring basins.
A spring basin is similar to a kitchen sink but with an overflow drain instead of a bottom drain.
The clean aquifer water collects in the basin (therefore not mixing with the river water,) until overflow.
One could come to the spring basin with a bucket and remove the spring basin water for immediate refreshment.
But once the spring water overflowed into the river below, the mixture would probably be unfit to drink.
So, clean aquifer water was priceless in the times when sanitizing with chlorine wasn't available yet.

**Wells:**
Another way to get clean aquifer water is with a "well".
Both a hand-dug well and a drilled well usually provide safe drinking water.
But you have to keep things and animals from falling in, to keep it safe.
We now understand much about aquifers, but there's one more topic worth looking at.

And that topic is **recharge of aquifers**.

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How do aquifers get recharged?
The most common way is: Rain must soak-in on a recharge 'zone' in order to join an aquifer.
It's very important that the rains fall on recharge zones.

Rivers can also contribute to aquifers.

But occasionally, people have used "existing-drilled-wells" as a way to force water back into the aquifer to prevent evaporation from a surface reservoir.
In some regions, a sinkhole (in a similar "fast event") gathers runoff
which goes directly into an aquifer.

But usually, aquifers are recharged with "soaking in rain" that falls on recharge zones.
Recharge zones are extremely important to aquifers.

In fact, communities whose only urban water source is an aquifer,
label the zone so the public is extra careful there….
because impervious cover and poisons on recharge zones are enemies of aquifers.
Impervious cover no matter the location is only great if you want runoff.
But the problem with runoff, of course, is chemicals
and debris being dragged downhill with the rainwater.

Additionally, runoff could eventually join the ocean.
Runoff lost to oceans is a crisis to inland communities such as the Concho Valley.
We want our rainfall to stay with us.
So, protection of recharge zones has become a common practice.
Many places, such as San Marcos TX, have done studies of
'where recharge zones are' above their aquifer.
Then, careful planning goes into reducing impervious cover there.
This increases quality and quantity of aquifer water.

Protection of runoff contaminating the rivers has become a common practice.
Many places, such as San Angelo TX, screen debris from runoff before it enters the Concho River.
Careful planning also goes into "buffer zones" near waterways.
This improves water quality.
So, in the Concho Valley hydrology studies are ongoing,
because river water and aquifer water are very related.
Improving one, improves the other as well.

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 4a When Fort Concho was active, how was the local environment affected? https://www.youtube.com/watch?v=oJKATu3Yyuo
Slide show of the youtube video pdf

In the 1800's, western expansion required military help.
So, the US government set-up a system of forts.
And when the Civil War ended, the Concho Valley area was chosen to receive a fort.
The mission of that fort was to provide traveling emigrants, mail carriers, cattle drivers, land surveyors, etc…..safety from Native Americans and all kinds of bandits.

But before building could begin, non-military contractors made bids to provide services for the fort.
Contractors won bids. Enlisted men and officers were chosen. People moved to the site.
And the fort was to begin in 1867.

The military personnel (~400) and contractors (~100) were a large group living on a relatively small piece of land. There were even children living in the area.
Some overcrowding issues arose.

For instance: for a while, there was no organized way of getting rid of their wastes.
At the same time, buffalo hunters camped near the fort.
They stored buffalo hides, bones and fermenting tongues out in the open, until they could be freighted to the east.
Rain there certainly must have had a negative effect on river runoff for a while.

Also, for about a year, saw mills were set up to harvest large river trees for the fort's buildings.
After removing the best, oldest trees, they ran out of adequate trees for lumber.
(The fort still progressed though as freighters brought lumber with other necessities, from Fredericksburg.)
But, losing ancient pecan trees was damaging to the river ecosystems.
It's doubtful that anyone remediated the river beds by planting young trees to replace the ones cut down.
Because back in the 1800's this concept was unheard of.

We'll never know how big some of the pecan trees were before they became part of fort structures. Photography was very difficult back then. We can only imagine.

Did small trees escape the ax?
No. Smaller trees would inevitably become firewood for cooking, heating and steam engines.
For the next 20 years wood was used until coal became available in about 1888.

So imagine that fort structures are being built.
Soldiers are supplying safety.
And contractors are helping the fort.
Continue to imagine that those ~500 people need to eat three meals a day.
There was plenty of meat to go around.
And non-perishable foods came up from Fredericksburg.
So the Bismarck Farms was set-up. It grew irrigated fields of fresh foods to supplement freighted food.
The river was dammed causing water to flow to the food crops.
Though the dam was helping the fort, all dams horde water away, from downstream neighbors.
In this case, it didn't really matter, because the fort itself was the downstream neighbor.

And then there were the animals.
All of the horses, mules and livestock needed hay.
So at least 3 "hay camps" were set-up. One of them was as far as 22 miles from the fort.
Fortunately when they cut the native prairie grass for the fort's hay,
the impact to the environment was as minimal as a prairie fire or migrating buffalo herds.

But could people and animals live without water?
Of course not.

That's one of the reasons why the site chosen for the fort was between and near two rivers.
Getting river water and animals together wasn't easy, but far easier than getting water for the humans.
Getting spring water (drinkable for humans) required effort.
First they had to scout around for the closest, good producing spring.
(They found one about 2 miles south of the post.)
Then they had to build a spring basin under the spring but above the river.
(That project may have been the first constructed spring basin in the area.)
Then they had to send wagons, barrels and buckets daily to get the water.
But all in all, the spring basin was no environmental hazard.

Next to the spring basin was one of the places that rocks were cut and shaped...a quarry.
Stones were loaded, sent to the fort where masons and soldiers created the buildings.
The stones were removed from places that had been homes to native plants and animals.
But because the Concho Valley has so many rocks, no one would claim that the quarries had any impact on the environment.

A lesson has been learned.
In the present, if you remove resources….you must remediate.
This means you restore the place to its natural state.
The fort was built with sweat, perseverance and good intentions...but no remediation..
There's hope today, that progress doesn't have to take advantage of resources.

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For how long have cities existed?
Well, in the Eastern Hemisphere...for thousands of years.
Nonetheless, in the Western Hemisphere,
and in West Texas especially,
cities like San Angelo are relatively new.
San Angelo started off as a community next to Fort Concho in the late 1860's.
In its early days, San Angelo was unorganized and pretty filthy
by today's standards
because it was for Fort Concho's contractors.
But in the 1880's things turned around.
It became the county seat of Tom Green County.
It became the terminus for the Santa Fe railroad.

Nearby ranchers and farmers went there
to get supplies,
sell goods,
take care of business and legal matters;
take in some services,
and be entertained.
Churches, schools and businesses of all kinds
were erected to provide services for the city-dwellers
and the visiting rural folks.

So as in any growing city…
food, energy, water and land were being consumed by the people at a quick rate.
In turn, the polluted urban environment affected the health and quality of life of the people.

Therefore, as in all cities of the time,
infrastructure was needed.
This prompted leaders into planning.
Water needed to be moved from the river to other locations.
So, pipes were put in "blasted" ditches under streets to provide fire protection.
Shown is one intersection's infrastructure starting in ~1889 and forward. Why this intersection?
The Nimitz Hotel's location is an example of what was happening throughout the town.
That hotel was lucky to have a well. It may have had a hand pump.
Unfortunately, that hotel burned.
It was replaced with another hotel, with a windmill over the existing well. Add electricity and phone and they were doing fine.
That hotel burned. It was replaced...and other replacements were built.
In the final picture of that intersection...one can see the infrastructure of traffic control.

Even though the city was still small, plans were being acted upon.
A dam was set-up at the Lone Wolf Bridge area
to double as a water reservoir for city faucets
and a reservoir for cooling the machinery of the power plant.
Folks also used their "Concho Lake" as a place for entertainment.

In the 1890's and early 1900's large homes beautified some of the places in San Angelo,
though on average, homes were generally small and basic.
People also beautified the stark West Texas landscape with shade trees.
And since cars didn't exist until the 1910's,
there was effort in keeping the animal manure
from being a problem in the city.

Now, imagine coming into town from your ranch.
The tall county courthouse could be seen from miles around.
But, eventually, in the 1920's the antiquated courthouse was replaced with a new one (not quite the skyline beacon of the old one.)

By coincidence a unique skyline landmark was built at about the same time...the Cactus Hotel.
In the city, buildings were torn down. Buildings were erected.
The city doubled in size between 1940 and 1950.
In the late 1950's a new place for rodeos, stock shows, circuses and large events was constructed...the coliseum.

As the city grew, infrastructure was expanded and improved upon.
Even at the present, city and county officials continually
evaluate present infrastructure
and make predictions for future infrastructure.
Someone playing "SIMCITY BUILDIT" can understand the complexity.

Water, energy, transportation, communication, sanitation, safety; and even economic boosts are always on the minds of city and county leaders of the San Angelo area.
All cities and towns
stress the natural environment
but are great havens for humans.

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This video is a remake of a powerpoint which I presented to the Tom Green County (TGC) Historical Society in October of 2010.

I used for reference, the two books shown on the screen.
The green one "Tom Green County, Chronicles of our Heritage, Vol. I" was put together by the TGC Preservation League.
The other book "Concho Country" was written by Gus Clemons.

I also went to what is now the Stephen's Central TGC Library.
There, I read "Tom Green County Courthouse and Town Clock" by Rose Austin.
There I also skimmed the
"**Index to San Angelo Standard Times: May 1884- Dec 1889"**
Captions from that newspaper will be within a red box in this video.
So, the title of this video is
The Second (Stone) TGC Courthouse.
If the topic is about the 2nd courthouse, then what happened to the 1st courthouse?
Well, in the 1870's Ben Ficklin began as the county seat with a wooden courthouse.
Then a nice "stone building" was erected.
That stone one was only operative for about a year. Why only a year?
This is because a massive flood in 1882 destroyed much of the little town.
So the building was dismantled and rebuilt as school property in San Angelo.
So destructed was Ben Ficklin, that the town of San Angelo became the new county seat.
Notice on this calendar of 1882 that it took about 2 months to move all of the soggy county records to San Angelo.
Where in San Angelo?
Well, a wooden courtroom served the county until a permanent courthouse could be built.
According to Rose Austin, (a notable historian) in a presentation (in 1951) an adobe building was also used as a courtroom.
Both were near this present day intersection.

Now what about the permanent building?
In August 1884, a contract was awarded.
Oscar Ruffini (architect and superintendent) had 13 months to complete the building.
John and Antone Willeke (stone masons from West Virginia), had the contract for the stone work.
The quarry may have in the Ben Ficklin area... is presently near South Bryant and the Loop.

By the way, the Standard Times Newspaper was printed only for Saturdays.
The excerpts from the paper for 3 weeks in May show how things started off slowly.
But at the end of July rocks began to be hauled to the site...which is at the 100 block of West Beauregard.

In August the newspaper reported progress on foundations and floor joists.
Apparently in November of 1884 a church service was held in a partial building.
In 1885 supplies were coming in and the tower was being worked on.
By the end of March of '85 the cupola (tower) was finished.

Shown are the floor plans (downstairs and upstairs) made by an insurance company.
This map is coded to tell the company about combustible building materials and location of water for fire drenching.
You can see how buildings were situated on the corner of Beauregard and Irving Streets.
It's done! In May, county records could be moved from the adobe courtroom to the new building.
Next item of notice...the town was becoming interested in the town clock for the cupola!

As 1885 came to a close, the courthouse was given its finishing touches.
The weekly newspaper gave details of the progress.
Newsflash:

County records described how well water was pumped up to tanks in the attic, so that the building would have gravity fed water pressure.
What was the water needed for?
Faucets of course, and the building eventually had Water Closets.
And though there were no sewer pipes at the time, there was something comparable to today's septic tank....only it was called a cesspool.
In 1886, it was time to landscape the outside.
In 1887, apparently the clock was still non-existent.
The cupola was empty due to lack of funds.
But in May of 1887 a tornado took down the empty cupola. (Maybe it was good that they didn't have the clock yet.)
Here you can see the comparison of the courthouse, before the tornado and after the tornado.
But repairs due to the tornado happened fast.
In later 1887, a clock was put into the new cupola.

In 1888, this well-known photo was taken as a parade welcomed the completion of San Angelo's railroad terminus.
The next few slides are about that clock that was installed in the cupola.
We refer back to Rose Austin's presentation where she had interviewed old-timers.

- The clock was bought after much fundraising.
- You had to wind that kind of clock to make it run.
- Two men, Flanagan and Leffel apparently had the job through the years.
- Mr. Leffel's sons (Maynard and Carl) helped.
- The person(s) doing the winding would have to climb stairs and ladders to get the inner room of the cupola.
- Then there were two cranks to turn.....One for the bell.....One for the clock mechanism.

Rose Austin found out that one time the boys (Maynard and Carl) realized late at night that they had forgotten to wind the clock (which the entire town depended on.)
So they went there late at night (with a lantern) to wind it.
Somewhere amongst the stairs or ladder the lantern got juggled and almost dropped.
How horrible it would have been if they had set fire to the courthouse.
Maynard and Carl (as grown men) must have been very nervous reminiscing of that night.

As years passed, it was decided that the courthouse was not modern enough.
So the building was dismantled in 1927.
And it is hard to believe, but during the dismantling someone stole the clock.
The mystery of that stolen clock was never solved.

But the stones and bell were re-used for a nearby church.
So in 1927 the courthouse was dismantled.
Then in 1928 the third TGC courthouse was built.
It was basically built directly over the older one.
So in conclusion, the three courthouses of TGC are shown.
I hope you enjoyed this tidbit of history.

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The Concho Valley became inhabited with farmers and ranchers at about 1870.
They came during the western expansion, hoping to sell for profit, a crop of plants or animals.
They probably didn't know about land stewardship in the beginning.
They just wanted to make an honest living off the land.
They knew farming and ranching would be hard, risky work.
Some of the immigrants to the Concho Valley (Americans, Europeans, Mexicans) had no idea that they would be embarking on drought-prone land.
Having rainfall at the right time of the crop cycle is critical for good output.
Let's say that the rain fell in their favor and they harvested a lot.
Terrific harvest didn't necessarily mean extra money in the bank.
Because they'd taken out loans for land, machinery and structures.
And their interest on those loans was higher than average because they had frontier risks.
Then there was price competition from producers elsewhere.
Also farmers/ranchers were victims of monopolies for years.
So let's be clear: when the environment began to degrade...erosion, mesquite/cactus spreading and diminished water supplies...it wasn't intentional or even foreseen.
For instance:
Who can blame the struggling farmer for erosion?
Steam-powered machinery had made farming on a larger scale easier than the horse-driven method.
That luxury gave farmers the time to plow more, leading to more exposed soil.
Wind erosion on "no-coverage land" resulted.
Who can blame a struggling ranch family for miscalculating the number of stock to put on their ranch?
The railroad terminus in San Angelo had removed the need for difficult "cattle drives" to slaughterhouses up north.
With easier freighting, why shouldn't the rancher put as much livestock as possible on the fenced land?
But as a result, mesquite and cactus engulfed the overstocked pastures.
Both of these problems can occur even at the present.
But back then landowners were unaware that their actions would lead to poor ecological results.
And then there's the water to consider….or the lack of water…that is.
There are currently laws protecting water supplies. Not so in the past.
The steam powered drilling rig made getting to aquifer water much easier.
Both ranchers and farmers were tempted to overdraw aquifer water.
Additionally, surface water was hoarded with dams in creek and river beds.
Downstream neighbors of the dams were just "out of luck" because
both the animal crops and plant crops upstream depended on the dammed water.
And eventually, ranchers went further...creating ponds or tanks...for their livestock.
Some thought that the runoff water belonged to the Concho River system instead of the landowners.
There was conflict.
Fortunately the courts intervened in the midst of water quarrels.
Then laws were passed safeguarding citizens.
Problems...Problems...
But were the problems just mentioned unique to the Concho Valley?
No, everywhere in the United States these problems were occurring.
Fast forward to the chemical revolution beginning in the 1940's.
Hazards such as pesticides and excessive fertilization began to exist. No one could guess the long term effects of the chemicals.
Both increased production for the farmers and ranchers, but were later found to have negative effects on the environment and human health.
So presently, federal and state governments have researched the problems.
With the help of individuals, universities, counties and cities...rules, regulations and guidelines have been developed. Research is ongoing. Agricultural business requires finesse in balancing the "keep ecosystem healthy" goal and the "make a reasonable profit" goal. So farmers and ranchers of the Concho Valley have a huge responsibility resting on their shoulders.

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When immigrants came to the area, wood and coal were the normal fuels.
Oil products were mostly used for seeing in the dark.
Whereas, wood/coal was used for warmth and steam engines.
Local coal was found (in small amounts) in Coleman and McCulloch counties.
In fact, the courthouse used coal from Brady for its heat.
Oil in the 1880's was predominantly extracted in Pennsylvania.
In 1901 oil was found in Beaumont Texas.

And eventually the Concho Valley was "oil explored".
When the "Santa Rita" well near Big Lake found oil, the Concho Valley's economy and environment were drastically changed.
But how did the oil get underground?
Forget the "dinosaur becomes oil" idea.
Microscopic algae (in massive amounts) died and were subjected to evaporated sea beds, sedimentation and pressure. That's how oil formed underground.

Let's now focus on environmental changes...when fossil fuels became popular.
In the Concho Valley, coal was only burned briefly (1880's to ~1920's).
Its combustion products caused some air pollution.
Burning oil and gas also produces air pollution, but with less particulates.
But when we think of pollution from oil in West Texas….we generally are talking about saltwater getting into freshwater and/or onto surface soils.
Water (usually bought fresh from landowners) has always been needed to make drilling happen.
The bit needs cooling and lubrication from water.
The rocks & soil down in the hole, need to be "floated up" to the surface with water.
Also, there are layers of "brine water" above and with oil deposits.
The salty brine water comes up with the oil and is separated out.
During the really early years of oil production, much brine water ended up on topsoil making it barren.
Eventually "brine evaporation tanks" and "deep injection wells" got rid of the brine water.
(The injection wells did not become regulated until the 1950's)
Salt Water Disposal (SWD) wells have been a sore spot with the general public.
Currently some companies are trying to "desalinate" the water so it can be re-used.
But, recycling brine water is presently more expensive than deep-well injection.

Back to brine pollution:
Some places in the Concho Valley have "plugged and abandoned (P&A) wells. "
Some of these wells were plugged wrong or not at all.
Brine surfaces either into freshwater aquifers, topsoil near the well or spring fed waterways.
The State of Texas has had agencies to regulate oil production.
However sometimes the 'regulation and record-keeping' wasn't adequate for the growing oil industry.
Some oil workers even knowingly broke environmental laws…. causing pollution.
In order to find oilfield mistakes, some researchers use "Airborne EM" and Soil/Water sampling.
Backtracking to find who is responsible and who should remediate the problems occurs next.

Actual petroleum pollution to aquifer water and topsoil is a minor problem compared to brine.
There have been pipeline ruptures, tanker truck wrecks, overflowing storage tanks.
There are also the gas flares and escaped sulfured methane problems with air pollution.
There are several things that people are worried about.

Advanced oil recovery including “Hydraulic Fracturing (**HF**)” removes freshwater from preferred use by cities, ranchers and farmers.
During droughts, this is especially frustrating.
Could the fracturing of layers (HF) cause injected pollution below to seep upward?
Could hydraulic fracturing cause land to subside?
Could the seismic blasts of hydraulic fracturing loosen plugs of nearby plugged wells?
Are injected pollutants going to show up in drinking water aquifers?

No one really knows with certainty, how the environment will be affected by current advanced oil recovery methods.
Correcting pollution can take decades (possibly centuries).
The oil industry provides so many jobs in the Concho Valley.
When oil production goes down, the economy of the entire area recedes.
Not to mention, state funds and education depend heavily on oil royalties and leases.
Even at the national level, the US Government prefers to be “oil-independent” when making international policies.

So local oil production with secondary recovery helps with US Global Independent Strength.
And hopefully when the Texas Railroad Commission regulates the oil industry ‘now and in the future,’ it balances “environmental safety” with “grand oil production”

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If you don't get sick from drinking the water, it is potable.
Potable water shouldn't give you intestinal problems (no bacteria, viruses, protists).
Potable water shouldn't cause illnesses long-term (no heavy metals, carcinogens, etc.)
If you live in a city, a treatment plant makes potable water from raw water.
The raw water was gathered from either surface water or aquifer water.
Some cities are also gathering raw water from treated sewage water.
San Angelo doesn't do that presently.
So how does raw water become potable?
First it's treated with chemicals that make small (usually invisible) solids clump together.
Those "clumped together solids" get heavy and tend to sink to the bottom of settling tanks and get separated away from the raw water.
Then the raw water is moved to a filtering process.
The water is getting cleaner and cleaner with each process.
Eventually all that is left to do is the sanitizing.
Some cities use chlorine while others use ozone.
There's also the UV light option.
However it is done, any remaining germ must be dead before the water can be labeled "potable".
What about people who don't live in a city? Where do they get potable water?
Usually, they have a well sunk into a good aquifer, though some people must have their water trucked in.
How did people in the past get potable water?
Native Americans basically found spring water for their needs.
However, their intestines and immune systems were conditioned to drink river water in some areas with limited natural contamination.
Early immigrant settlers dug "bucket wells" and drilled other wells.
Then they either used hand pumps or windmills to get the potable aquifer water up.
Early settlers also used water straight from the river, but would have to let it settle out and then boil it for about 20 minutes to make it somewhat potable.
A lot of people died though, of water-borne illnesses in those early years of settlement.
Fort Concho (in its 22 years of existence) always struggled to have potable water.
Soldier's Spring, various wells, collected rainwater and river water drawn with a steam pump were ways in which they got water for both the humans and work animals.
Later, to retain water for the city of San Angelo, Lone Wolf Dam was built in the late 1800s.
Water treatment in the early days just involved filtering the water through sand.
Eventually water treatment advanced to today's methods.
But guess what! The city also used rivers to discard sewage.
Everyone knows that an outhouse doesn't require a sewer.
Sewers became necessary when people wanted 'drains.'
The first sewers, built in the late1800s let domestic sewage go directly to the N. Concho River at Magdalene Street.
Later sewage was processed at Bell Street. Sewage is treated by settling out solids and removing impurities from the wastewater. The treated water of sewage for many years was put in the Main Concho River.
However, eventually water of sewage (treated wastewater) was and still is used for farm irrigation.
So how can a city use a river for potable water and use the same river to discard wastewater?
You gather potable water upstream, and you discard wastewater downstream.
But, presently, the downstream wastewater disposal area is very close to the next community's 'potable gathering area'.
So, technology has come up with ways to recycle wastewater back into potable water.
Some people think this is just too icky to consider for their community.
But some think it can be done successfully.
There are many dilemmas that city leaders are confronted with regarding potable water.
#1 Is there enough potable water (surface water or aquifer water) now and for the future?
#2 How can the city protect its aquifer from other landowner exploitation?
#3 If the city's water comes from multiple sources, how do leaders agree on "which source to use at the present time"?
Please watch: 5b Sources of Surface water for the Concho Valley, which shows historical dams and water acquisitions.

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Because the Concho Valley is located in a semi-arid place, there has been a constant concern about adequate water sources.
Native Americans migrated, keeping their normal paths across Texas in line with dependable springs and pools of water.
When immigrants from Europe, America and Mexico arrived, migrating wasn't in the plan. Permanent settlements required yearlong water supply.
The reliable spring properties were scooped up by people who would invariably become successful in their agricultural dreams.
But the other immigrants were more hesitant to believe that water would always be at their homestead after a few years of seemingly 'surprise' droughts.
So the first earthen dams (rocks, logs, mud) were built along the creeks and rivers of the Concho Valley.
They were followed by more permanent concrete dams.
Some of the original dams of the early 1900's still exist, though sediment accumulated over the years makes the dammed pool of water rather small compared to when it was new.
All towns formed near a river and most erected some kind of dam to keep water for them.
In the town of San Angelo, a fairly large dam (called Lone Wolf) has been collecting water for some time.
For a while, the electric power plant there would intake water and cool its machinery.
At the same time, water was and still is being collected and consumed by San Angelo there.
Then because of the growing city, it became necessary to provide more electricity and water for the growing city.
So Lake Nasworthy Dam and a new power plant were completed in 1930. Lake Nasworthy got water from the Middle Concho and several major creeks.
Until its closing the power plant would cool its machinery with the lake water.
Of course the city benefitted...more water to consume and more recreation.
In 1936 a flood on the North Concho branch made city leaders realize that a dam on that branch would prevent floods and secure more 'consumable water'.
World War II put the project on hold for a while, but between 1947 and 1952 it got done.
In 1957 a large rain event filled the lake and did no damage to the city. The dam was a success.
Then because the city was constantly concerned about growth and adequate water, Twin Buttes Reservoir was initiated. Before Twin Buttes Lake, rainfall on its watershed could either flood buildings at Lake Nasworthy or be released from the floodgates to downstream neighbors.
For those who don't know it, Twin Buttes is a feeder lake to Lake Nasworthy.
If water is consumed from Lake Nasworthy, then Twin Buttes Reservoir replaces that consumed water.
So if you see in the media that Lake Nasworthy is 84% full, don't be fooled into water confidence.
Always check the levels of the other lakes listed to understand the seriousness of a drought.
Rain fills lakes if it falls on the lake's watershed.
From the lake: farms, cities and even evaporation consume it. More people, less rain means further planning for sources of water.
This happened to the Concho Valley, as well. So eventually, cities cooperated with each other to build two more lakes and share the stored water.
These two lakes on the Colorado River were subject to debate because at that time, downstream neighbors wanted the water to flow down to them, instead of being captured upstream.
Also, at that time, there was more emphasis in saving historic sites that would be undulated...as well as more emphasis on endangered species that could become extinct with a dam in place.
Some say that the era of large dam building in West Texas is over because of these complexities.
That is yet to be seen.
What if it doesn't rain enough to make surface water? Then we resort to aquifers.
The Hickory Sand Aquifer (though its need for treatment for radium and iron was controversial) is an important acquisition for the city of San Angelo. Some other cities are probably envious of that aquifer.
Another strategy for having more water is recycling it. In other words, treated wastewater is used as the raw water to be treated into potable water.
Yet another strategy is preventing surface water from evaporating.
Some places like San Antonio, Kerrville and El Paso are storing surface water underground to prevent evaporation.
But, it doesn't seem to be a viable choice in this area because of the lack of "cave-like" aquifer strata.

More strategies for obtaining water will surely arise. We suspect this because, in the past, no one could have dreamed of our current methods of securing water.

And so it goes...in conclusion, even if there is enough water, there will still be problems regarding upkeep. For instance lakes need to be dredged occasionally. Another problem with a lake could be that the dam has a flaw. Fixing dam leaks was necessary with Twin Buttes Dam.

And then, maintenance of all moving parts (so they don't freeze-up) must exist. Dam flood gates must move on command. Pumps in wells, pumps in pipelines, and pumps in treatment plants... it's a constant struggle keeping all of the machinery working. In fact, you never really want to shut down machinery for one source of water to take advantage of another source of water, because the machinery might not 'start up' again properly due to inactivity.

And so we elect leaders to research water problems, solutions and balancing acts. If it seems hopeless, don't lose heart. Because so far, for every problem, there have been at least a few solutions for planned and protected water sources. And most likely we'll have water for the future.

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