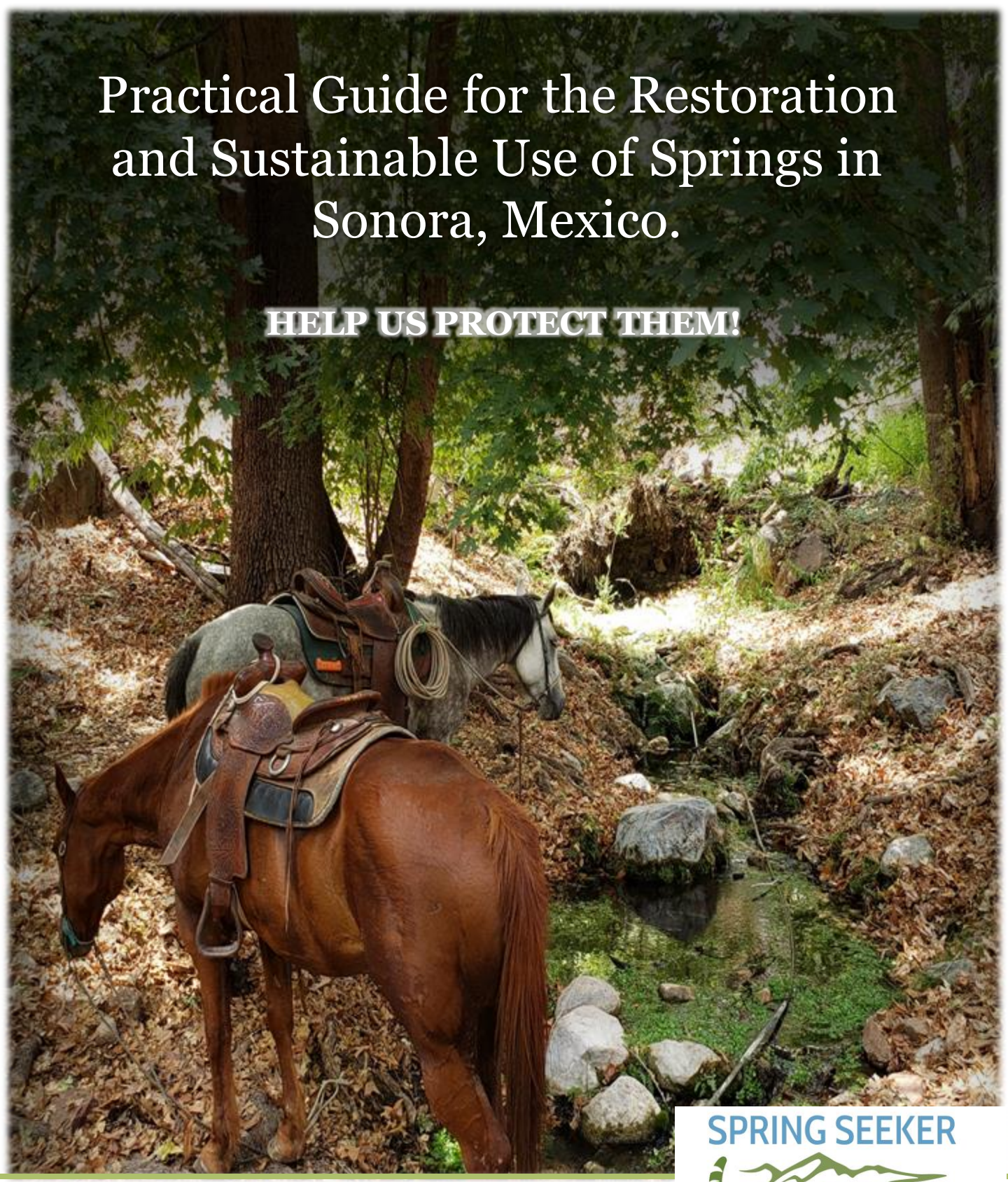
Practical Guide for the Restoration and Sustainable Use of Springs in Sonora, Mexico.

HELP US PROTECT THEM!



SPRING SEEKER

SKY ISLAND ALLIANCE

Conservation and Sustainable Use of Springs in the Sky Islands

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This guide is intended for public and private landowners and workers who are willing to make a change to improve the situation of springs in Sonora, Mexico, through the development and implementation of good practices.

Content

What is a spring? 2

Importance of the springs 3

For wildlife 3

For people 7

Environmental services of the springs..... 9

What affects the springs?..... 10

Cattle 10

How to reduce the impacts of cattle? 11

Diversion and extraction of water 15

Sustainable methods to divert and extract water 16

Poorly designed containers 19

Sustainable container designs 21

Restoration activities 23

Reforestation 23

Extraction of invasive species 24

Placement of gabion and rock dams..... 25

What are our goals?

After evaluating dozens of springs in the region, the Sky Island Alliance realized the great threat they face from human activities, mainly cattle ranching.

In response to this problem, the aim is to improve the situation through this guide, which shows new and existing methods for the rehabilitation, restoration and sustainable use of springs, which will help improve the state in which they are found and protect their biodiversity. without neglecting the use of this resource for livestock.

In addition, the importance and the current situation faced by springs (aguajes) in the region are highlighted, in order to understand the short and long-term consequences that the misuse of these important resources will bring.

With careful design, water for livestock and wildlife can be provided while maintaining the ecological functions and values of the springs.

What is a spring?

A spring is "every place where water is born", in Sonora they are commonly known as aguajes, ojos de agua, veneros or cienegas and these are frequently found in nature. They originate when rainwater infiltrates mainly in the upper parts of the mountains and runs underground until it finds a place where it can come to the surface.

Spring in good condition, Nacozari, Sonora.

Some springs are permanent and have water throughout the year, but there are also springs that have water seasonally or for a few days after it rains. We can find cold water springs and hot water springs that can sometimes have high salt and mineral contents.

Importance of Springs

- **For wildlife:**

When groundwater reaches the earth's surface, a group of plants and animals that depend on this resource to survive begins to establish themselves, forming an ecosystem dependent on groundwater. Sometimes the plants and animals that live and take refuge in these places do not exist in other parts of the region or the world and are known as endemic species.

➢ Plants that live in springs

Willow Tree

Ash Tree

Poplar Tree

➢ Animals that live in springs

Dragonflies

Salamander

Beetles

Damselfly

Larva

Turtles

Fishes

Water boatman

Snails

Life cycle:

Egg

Tadpole

Leopard frog

Examples of animals that drink water in springs

Deer

Coati

Quail

Skunks and Foxes

Puma

Coyote

- **For people**

Since its origin, human beings have settled around springs to take advantage of the resources provided by these water sources.

Currently the springs are used for:

Cattle raising

Recreation

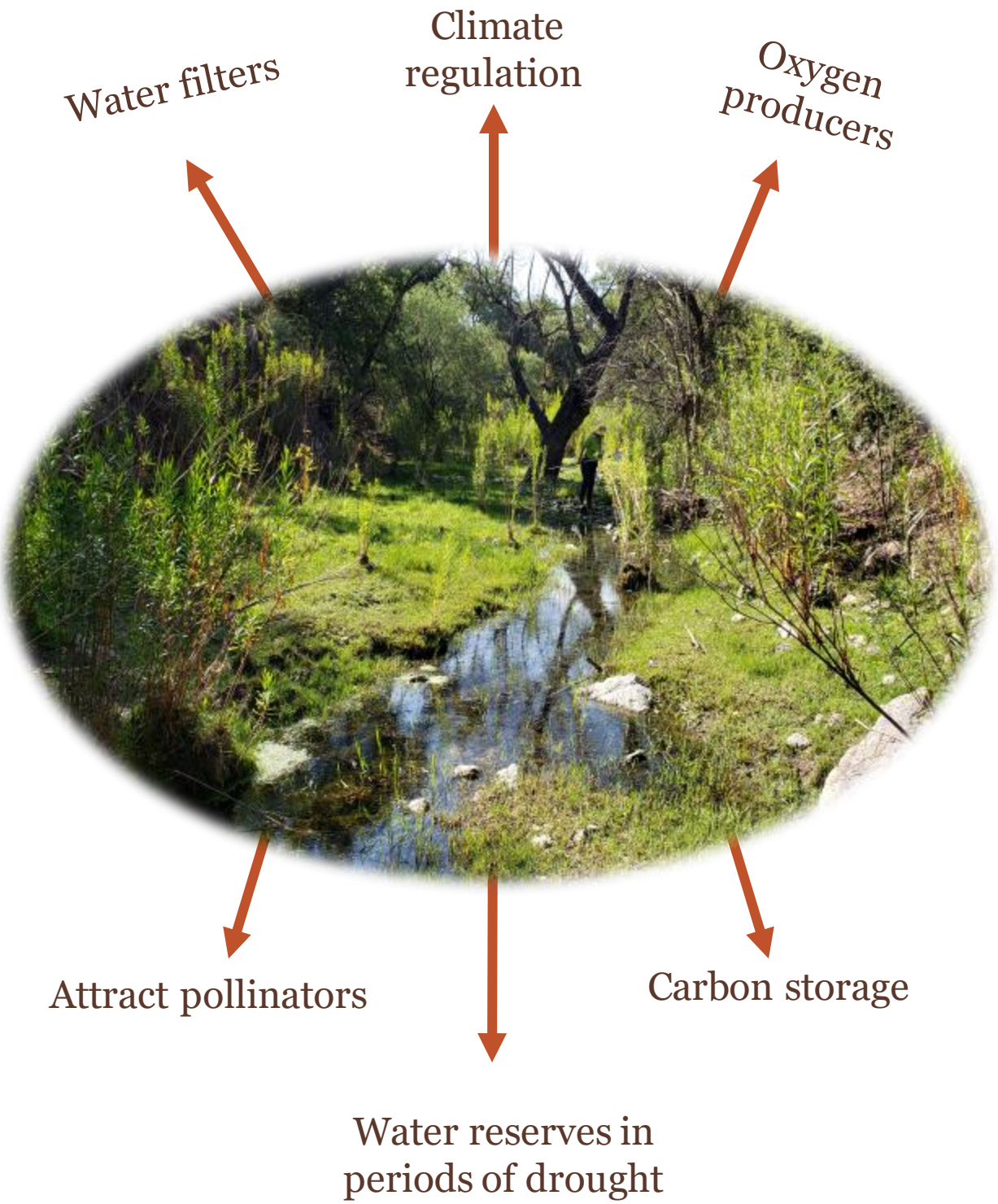
Crop production

Road construction

Domestic activities

Mining

Environmental services of the springs



What affects the springs?

Cattle:

Overgrazing :

When cattle consume plants from one place for a long period of time.

Consequences:

It causes the loss of vegetation, compacts the soil and increases the risk of erosion.

Trampling and wallowing:

When cattle visit a spring frequently and stay in the area doing activities such as wallowing or drinking water.

Causes soil compaction, removes sediments, increases the presence of infectious pathogens, and kills wetland plants and animals.

Excrement and urine:

Consequences:

It causes contamination, alters the pH, increases the presence of pathogens that cause the death of plants and animals, and spreads diseases in cattle that drink from this water.

How to reduce the impact of cattle?

Building a fence around the spring

Isolating the cattle from the water hole and the surrounding vegetation by means of a fence will help to maintain the spring in good condition and its ecological function, increasing its life span and its natural services.

"Cattle will be able to drink water outside the fence if possible, if not, water can be diverted from the source into basins and drinkers"

Considerations for putting up a fence

Common methods may be used at your discretion to place a chain link fence, however, the following considerations must be taken into account:

- Within the fenced area, the water hole and the surrounding vegetation must remain.
- Leave a smooth wire at the top and bottom with a minimum height of 50 cm, this will allow the passage of wildlife.

Example of a method to fence

Tools and necessary material

2.5 meter natural poles

staples, nails and hammer

Smooth and barbed galvanized wire

Agricultural digger or steel bar

Shovel

Wire wrench and wire tensioning key

Steps...

1. Determine the area to be fenced and the position of the posts.

2. Dig where the posts will be placed, it is recommended every 2 meters with a depth of 1 meter, leaving 1.5 meters of the post outside.

3. Bury the posts by adding wood or rocks for support.

4. The main post should be reinforced with a support post placed diagonally and nailed.

5. Mark on the post the distance in which the wires will be placed.

6. Place the smooth wire at the first mark of the main post, turn it twice and tighten with fencing pliers and staple it without scoring the wire.

7. Unroll the wire and stretch it, in order to tie it to the main post at the other end, turn it twice, adjust it to the post and place a staple.

8. Staple the wire to each of the posts along the fence, without tightening it.

9. Repeat Step 7 depending on the number of lines you want to have.

10. Place the last line of smooth wire so that it does not cause harm to any wildlife that crosses.

11. Repeat the steps with each side that you want to fence.

Methodology retrieved from: https://bit.ly/3IvWI2s

"The impact caused by wildlife is minimal compared to livestock" .

• Diversion and extraction of water

By gravity

By Pumping

Consequences

When the diversion and pumping of water is excessive, it causes desiccation, increasing the level of depth of the water, which makes it no longer available for the plants and animals that lived in that spring or drank from that spring and can cause their death.

"As water diversion increases; the depth, temperature and conditions of the spring change, causing the extinction of species such as fish and snails" .

Genus Pyrgulopsis

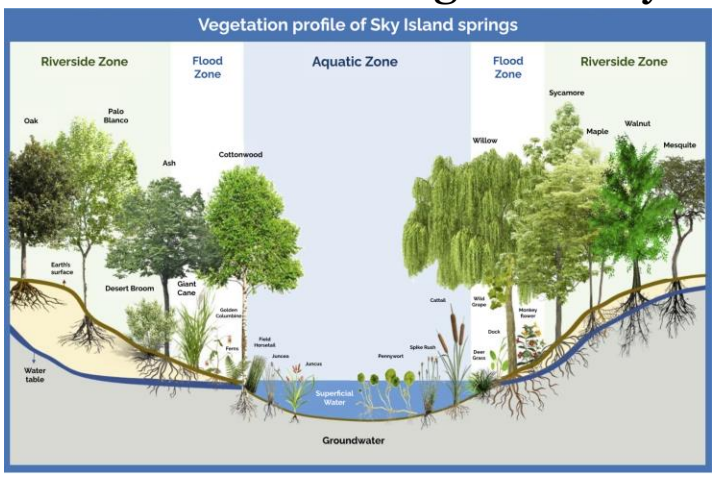
Genus Poecilipsis

By drying the spring, it will become more difficult and expensive to extract water from the underground layers, given the need to create wells and use extraction pumps, so it is better to help keep the water on the surface of the earth.

Considerations for diverting water

- Remember that the construction of water basins, wells, troughs, etc. directly in the waterhole of a spring causes the disappearance of the most important habitat of this ecosystem, so water diversion is preferable.

- Before diverting water, it is important to know the optimal water requirements needed by the vegetation present in the area, in order to determine the amount to be diverted without affecting the ecosystem.



- The seasonal variation of water discharge must be considered, since it is better to divert and store water when there is a greater discharge and have a reserve for periods of drought.

In most cases, only a small percentage of water can be diverted without significant ecological impacts. However, small diversions are usually adequate to supply water to livestock.

Diversion using gravity

Gravity diversion is an economical method that allows water to be transported from the source to the storage tank, trough or water basin, without expensive mechanized pumping.

Only condition:

There must be a difference in height between the water source and the location of the container, trough or water basin, the pressure with which the water descends will depend on that.

Example of one method:

Essential material

½ inch black hose

Filter or piece of mesh

Valve with float

Steps...

1. Unwrap the hose from the spring to the location where the container or water basin will be placed.

2. Fill the hose with water and let it flow until the air is released, then cap the bottom end until the hose is full and cover it with a finger.

3. Without releasing your finger, submerge the upper end of the hose into the spring, proceed to uncover and put on the filter. It must be secured with rocks or wire so that it remains submerged.

4. Release your finger from the lower end and let the water run, if it does not come out, suck a little with your mouth. Finally, connect with the valve of the container or water basin. The hose can be buried if necessary.

Solar powered pumping

Submerged water pump

Solar panel

Trough with float

The pumping systems that use solar energy through solar panels is one of the most sustainable methods of pumping water, since a renewable source is being used instead of fossils fuels or energy from the electrical network.

This is a very common method to use when the water source is at a lower altitude than the location where the troughs, water basins, or containers will be located.

Unlike the diversion of gravity, this is a more expensive method since it requires an investment in pumping equipment, however, in the long run it is much cheaper than being connected to electrical networks or using fuel pumps; also, the pump can be automized and facilitate some activities.

The characteristics of the pumping equipment and the installation methodology depend on each case: the functions we wish to have, the amount of water to be pumped, the pumping distance, etc.

Poorly designed containers

Containers

Example of a container that allows Access to animals such as frogs, todas, turtles, and snakes, but does not allow for their exit, resulting in a trap that causes their death.

Consequences

Water tank without a float valve to maintain a water Flow, which results in more water being used tan necessary.

Containers with crossed wires affects bats and birds that drink water while flying.

Hoarding all the water from a spring by creating a well directly in the water hole affects the entire ecosystem of the land.

Water troughs for cattle

1. The floating valve stops the inflow of water when the trough is full, preventing overflow and overuse.

2. The free space above the trough helps some species, such as swallows, bats, etc. To drink water while they fly.

3. The mesh ramp helps insects that accidentally fell in the water escape.

4. The trough is used so that other species besides cattle can drink water and do not have to go directly to the spring.

Trough/Drinker

Function

They function to retain water and keep it available for all types of fauna, from amphibians such as: frogs and toads, to reptiles such as: snakes, turtles, lizards and from small to large mammals.

Disadvantages

- Being at a very low altitude, cattle can cause great damage and contamination by urinating, excreting, introducing mud and trampling into the water.

- Could be used to retain water near the spring where there is no access for livestock.

Stock Tank

- The stored water becomes dirty due to the presence and reproduction of algae, which becomes a habitat for bacteria and mosquito larvae.
- The water evaporates faster when exposed to the sun and works as a trap if there is no escape ramp.

The stored water remains clean since it does not have contact with the outside; algae and larvae are unable to develop due to the lack of oxygen and very little of the water evaporates.

Restoration Activities

Restoration is the process of assisting the recovery of an ecosystem that has been degraded (Coles-Ritchie 2014).

Some actions for spring restoration include:

Reforestation

A spring affected by overgrazing and deforestation requires the planting of native trees and grasses, such as Alamos, Sauces, Fresnos, Nogales, Batamote, Chicura, Pastos, etc. This helps the recovery process for the vegetation and its ecological function.

It is important to know which species originally inahabitated the area, in order to not introduce invasive species that can cause severe damage.

Reforestation activity at Los Fresnos ranch.

Extraction of invasive species

There are springs that are severely affected by invasive species, mainly non-native species that have been introduced by humans.

Invasive species are plants and animals that manage to adapt, establish themselves, reproduce, and have an uncontrollable population growth.

Examples:

Swordtail Fish

Bull Frog

Mosquito Fish

Buffelgrass

Salty Pine

Asian Reed

These species affect native plants and animals, by competing for space, food, and preying on them, thus resulting in the loss of biodiversity in the area; some can even increase erosion and the drying of bodies of water.

One of the most efficient actions to remove invasive plants is by uprooting them by hand or with a tool before the seeds can mature.

Removing Vinca major

Gabion or Rock dam placement

A spring affected by overgrazing, with bare soil and the presence of invasive species, is prone to erosion, which causes soil and moisture loss, especially those that arise on a steep slope.

Gabion or rock dams are an economical solution for soil and water retention, boosting the filtration and recharge of soil water layers.

Rock Dams

It works mainly for small water currents with low velocity, gabion dams are usually more resistant.

Gabion Dams

The procedure for the creation and placement of these types of structures can be found in the gabion dams manual, SAGARPA: https://smal.lu/tSAuu

It’s time to make a change!

Don’t allow this

To become this

WOULD YOU LIKE TO MAKE A DIFFERENCE AND START GOOD PRACTICES?

“WE CAN HELP YOU”

Contact us to join our group of ranchers and landowners in Sonora who want to develop conservation projects.

We offer different types of help to make your project a reality!

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SKY ISLAND ALLIANCE

About Sky Island Alliance

Our mission is to protect and restore the diversity of life and lands in the Sky Island region. We're working to ensure the Sky Islands are a place where nature thrives, open space and clean water are available to all, and people are connected to the region and its innate ability to enrich our lives.

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