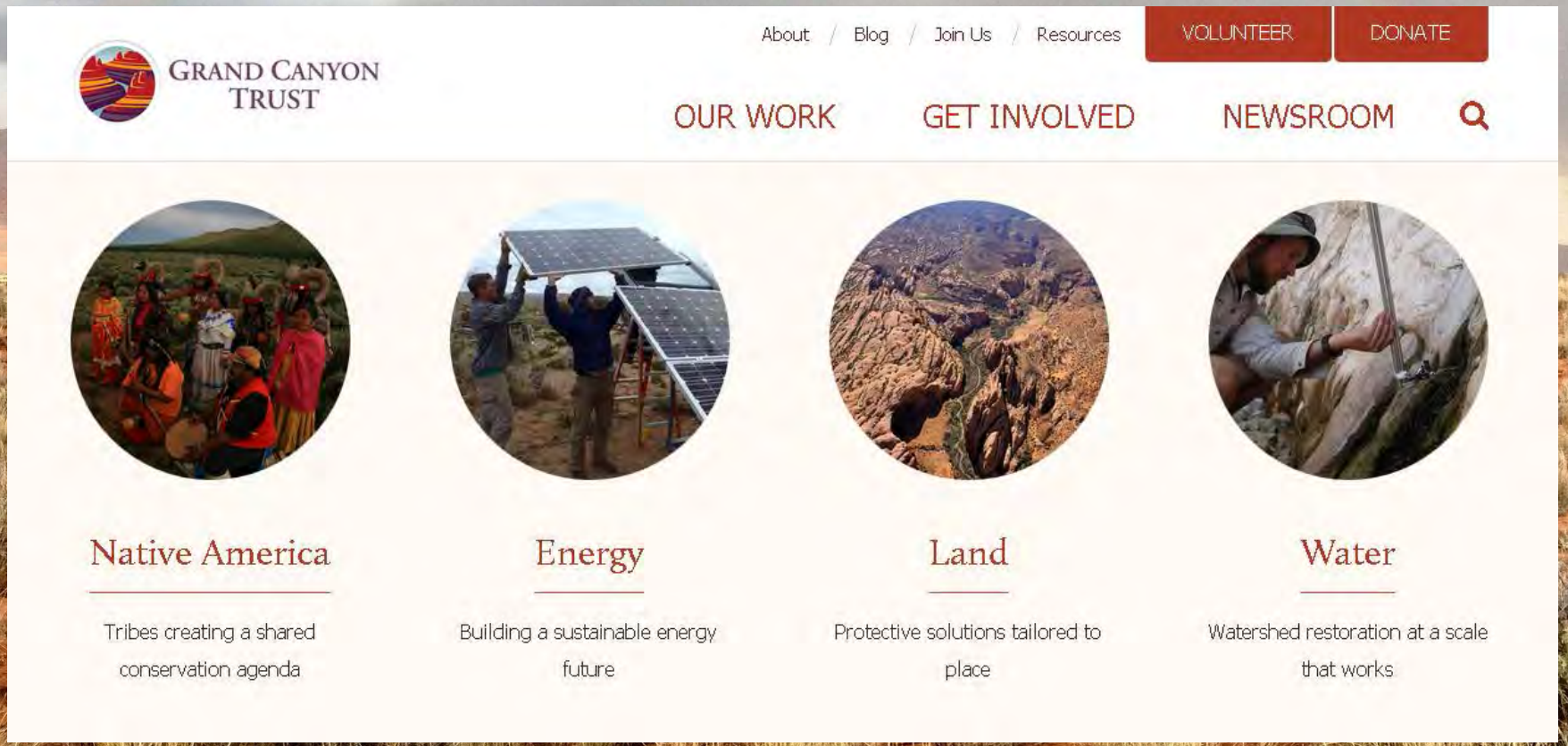
CLIMATE ADAPTATION THROUGH SPRINGS RESTORATION ON MULTIPLE-USE PUBLIC LANDS IN NORTHERN ARIZONA

GRAND CANYON TRUST

Cerissa Hoglander | choglander@grandcanyontrust.org

www.grandcanyontrust.org



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Map by Stephanie Smith, GCT


The Colorado Plateau
National Parks (NP)
National Monuments (NM)
National Recreation Areas (NRA)
National Forest
Tribal Lands
Salt Lake City
Dinosaur NM
Denver
Aspen
Green River
Moab
Canyonlands NP
Arches NP
Colorado NM
Canyon of the Ancients NM
Yucca House NM
Mesa Verde NP
Durango
Natural Bridges NM
Hovenweep NM
Rainbow Bridge NM
Navajo NM
Shonto
Navajo Nation
Aztec Ruins NM
Canyon de Chelly NM
Chaco Culture National Historical Park
Hubbell Trading Post National Historic Site
Albuquerque
El Morro NM
Zuni
El Malpais NM
Petrified Forest NP
Hopi
Cedar Breaks NM
Bryce Canyon NP
Zion NP
Grand Staircase Escalante NM
St. George
Vermilion Cliffs NM
Pipe Spring NM
Kaibab Paiute
Kaibab National Forest
Grand Canyon Parashant NM
Grand Canyon NP
Havasupai
Lake Mead NRA
Wupatki NM
Sunset Crater Volcano NM
Flagstaff
Walnut Canyon NM
Tuzigoot NM
Montezuma Castle NM
Prescott National Forest
Coconino National Forest
Little Colorado River
Colorado River
Green River
White River
Glen Canyon NRA
Capitol Reef NP
Manti-La Sal National Forest
Dixie National Forest
Fishlake National Forest
Uintah Ouray Ute
Ute Mtn Ute
Southern Ute
Apache National Forest
UTAH
COLORADO
NEVADA
ARIZONA
NEW MEXICO
CALIFORNIA
GRAND CANYON TRUST
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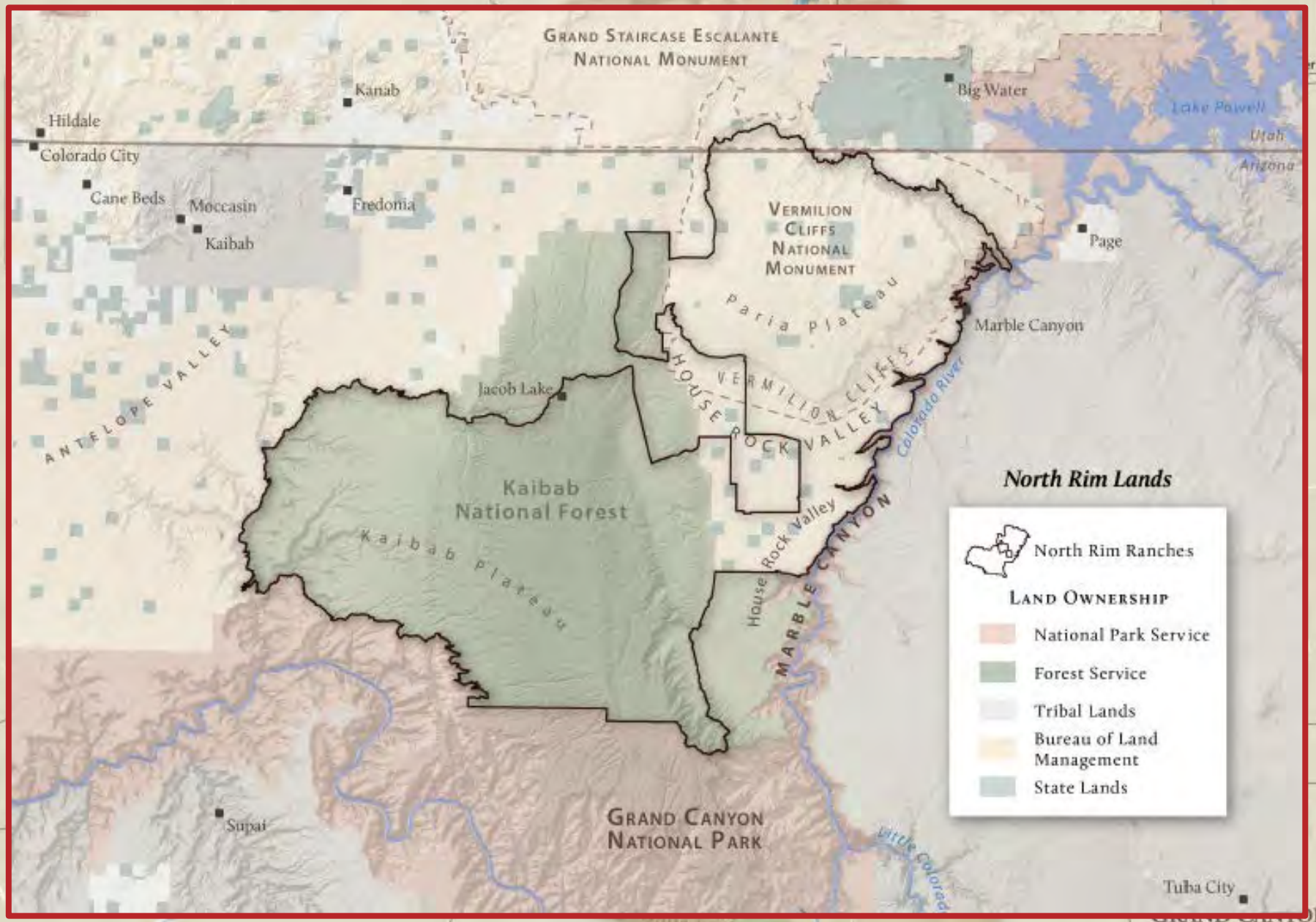
Grand Staircase Escalante National Monument
Kanab
Big Water
Lake Powell
Utah
Arizona
Hildale
Colorado City
Cane Beds
Moccasin
Kaibab
Fredonia
Vermilion Cliffs National Monument
Page
Paria plateau
Marble Canyon
Antelope Valley
Jacob Lake
House Rock Valley
Vermilion Cliffs
Colorado River
Kaibab National Forest
Kaibab plateau
House Rock Valley
Marble Canyon
North Rim Lands
North Rim Ranches
Land Ownership
National Park Service
Forest Service
Tribal Lands
Bureau of Land Management
State Lands
Supai
Grand Canyon National Park
Little Colorado
Tuba City
Apache National Forest
ARIZONA
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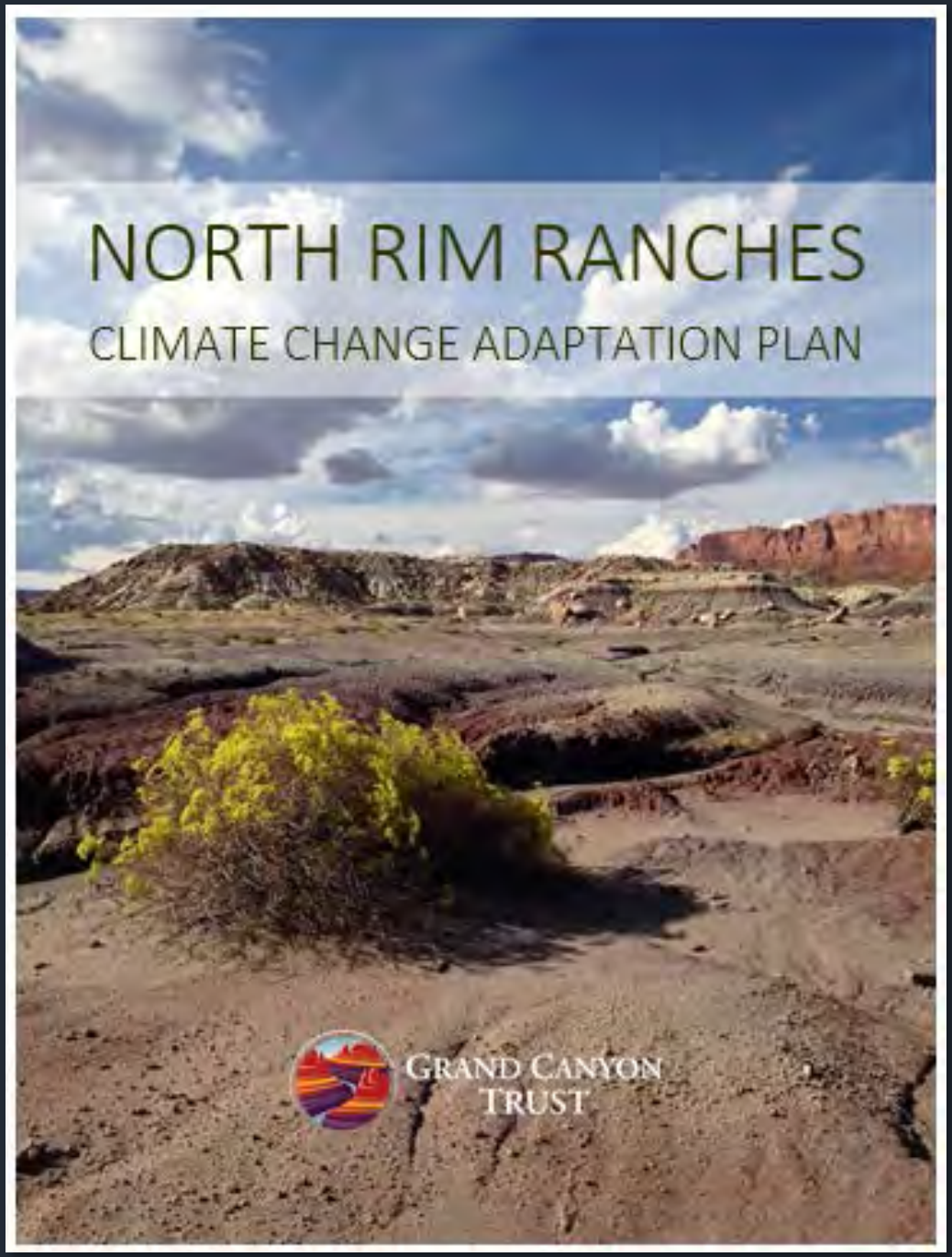
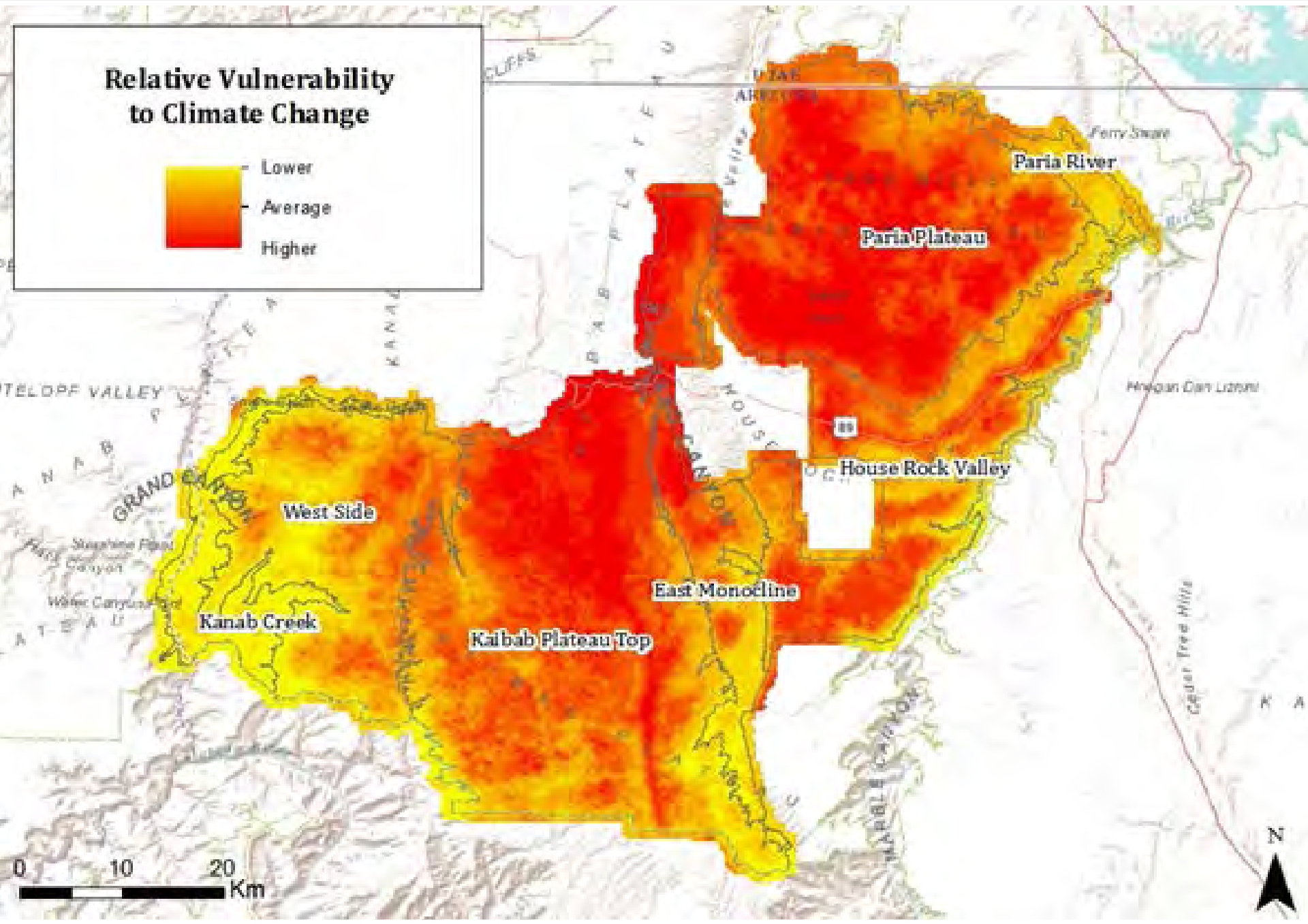
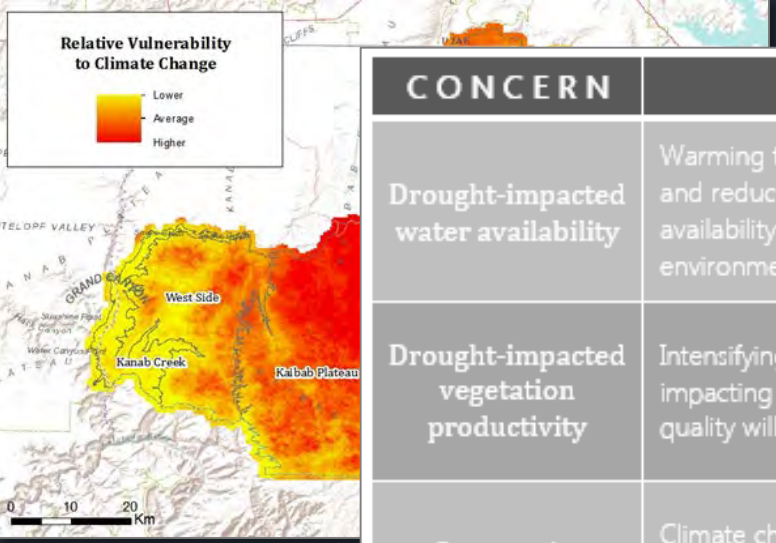
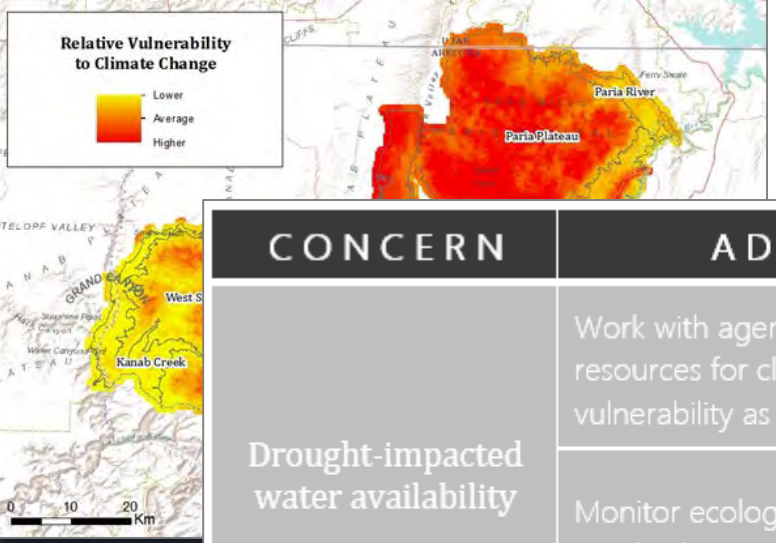

NORTH RIM RANCHES
CLIMATE CHANGE ADAPTATION PLAN
GRAND CANYON
TRUST


Relative Vulnerability to Climate Change
Lower
Average
Higher
Paria River
Paria Plateau
House Rock Valley
West Side
East Monocline
Kaibab Plateau Top
Kanab Creek
GRAND CANYON
0
10
20
Km
N



CONCERN	IMPACT SCENARIO
Drought-impacted water availability	Warming temperatures and increasingly variable precipitation will intensify drought and reduce groundwater recharge and surface water resources. Reduced water availability will heighten vulnerability of species and ecosystems to other environmental and land-use stresses and contribute to resource competition.
Drought-impacted vegetation productivity	Intensifying drought will reduce surface and soil moisture, increasing plant stress and impacting vegetation productivity. Reduced forage resources and altered habitat quality will amplify stresses on wildlife and livestock.
Community composition shifts	Climate change will increase the risk of stress and mortality to species and ecosystems. Community composition will be altered as species are lost or shift in distribution. Such changes will also alter habitat quality and connectivity.
Invasive species spread	Invasive species threaten native biodiversity and increase ecosystem vulnerability to disturbance. Areas currently affected by invasive cheatgrass (*Bromus tectorum*) will likely see further invasion as part of a positive invasive species-wildfire feedback cycle that will be amplified by warming temperatures and precipitation shifts.
Increased risk of unnaturally severe wildfire	Wildfire frequency and severity are projected to increase due to intensifying drought and greater accumulation of fuels. This will impact forest health, alter habitat quality and connectivity, reduce understory vegetation, and encourage non-native species invasions post-disturbance.
Reduced landscape connectivity	Climate-driven community composition shifts, invasive species spread, and increasing risk of unnaturally severe wildfire will contribute to ecosystem and landscape-scale alteration and threaten connectivity among habitats. Roadways and other infrastructure can contribute to fragmentation.
Increased livestock management challenges	Declines in water and forage availability will impact livestock production and increase the risk of adverse grazing impacts. Balancing conservation objectives with livestock management will become increasingly challenging as climate change progresses.



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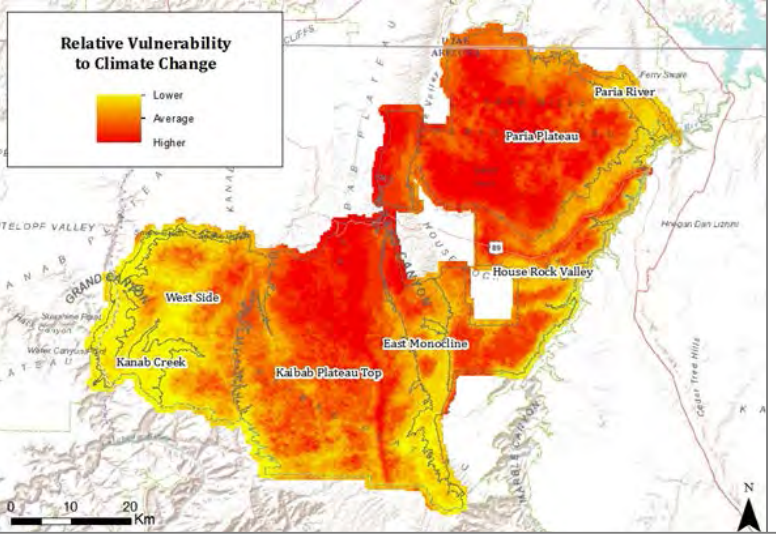
CONCERN	ADAPTATION RECOMMENDATIONS
Drought-impacted water availability	Work with agency and ranching partners, and other stakeholders to prioritize water resources for climate adaptation action based on condition and climate vulnerability as well as conservation, ranching, and public importance.
	Monitor ecological condition and water availability of priority water resources. Link monitoring to water management decisions and triggers for restoration work.
	Restore degraded aquatic and riparian ecosystems.
Drought-impacted vegetation productivity	Support agency and ranching partners in ongoing monitoring of vegetation productivity and forage utilization indicators. Use forage and vegetation monitoring to guide livestock management decisions to protect against overgrazing.
	Collaborate with agency partners to monitor changing vegetation productivity impacts on native wildlife species. Link monitoring information with livestock management decisions and triggers for restoration action.
	Explore grassbanks as a method of alleviating grazing stresses during times of extreme drought.



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Drought-impacted vegetation productivity	
Community composition	

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Kane Ranch Allotments
Allotment Management Plan (AMP)

North Kaibab Ranger District
Kaibab National Forest
Coconino County - Arizona

Prepared by: _____ Date 14 DEC 2015
Geoffory Anderson / Range Conservationist

Reviewed by & Agreed to: _____ Date 12/16/15
North Rim Ranch LLC. / Permittee

Reviewed by: _____ Date 12-16-15
Justun Jones / Ranch Manager

Approved by: _____ Date 12-16-15
Randall Walker / NKRD District Ranger

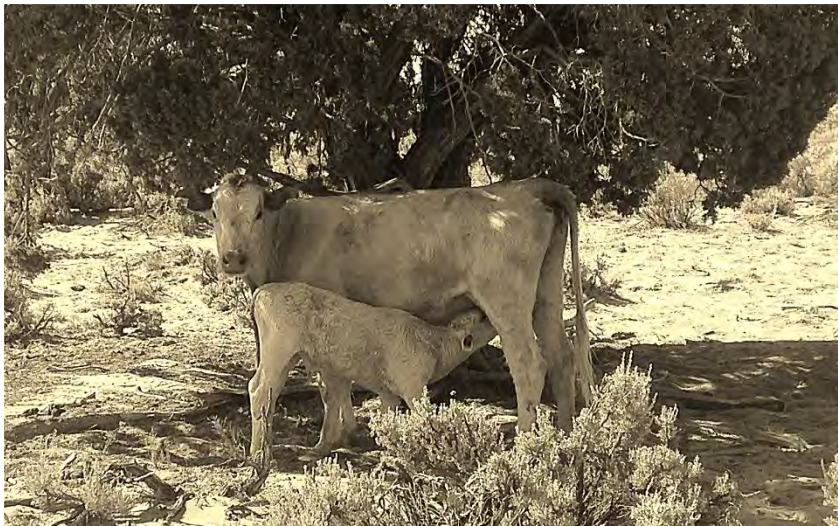
PRIORITY ADAPTATION ACTIONS

PROTECT WATER RESOURCES.
ADAPT DEVELOPED SPRINGS.
RESTORE DEGRADED SPRINGS.

120+ SPRINGS
40%? DEVELOPED
???? DEGRADED

SPRINGS ARE KEYSTONE ECO-SYSTEMS.

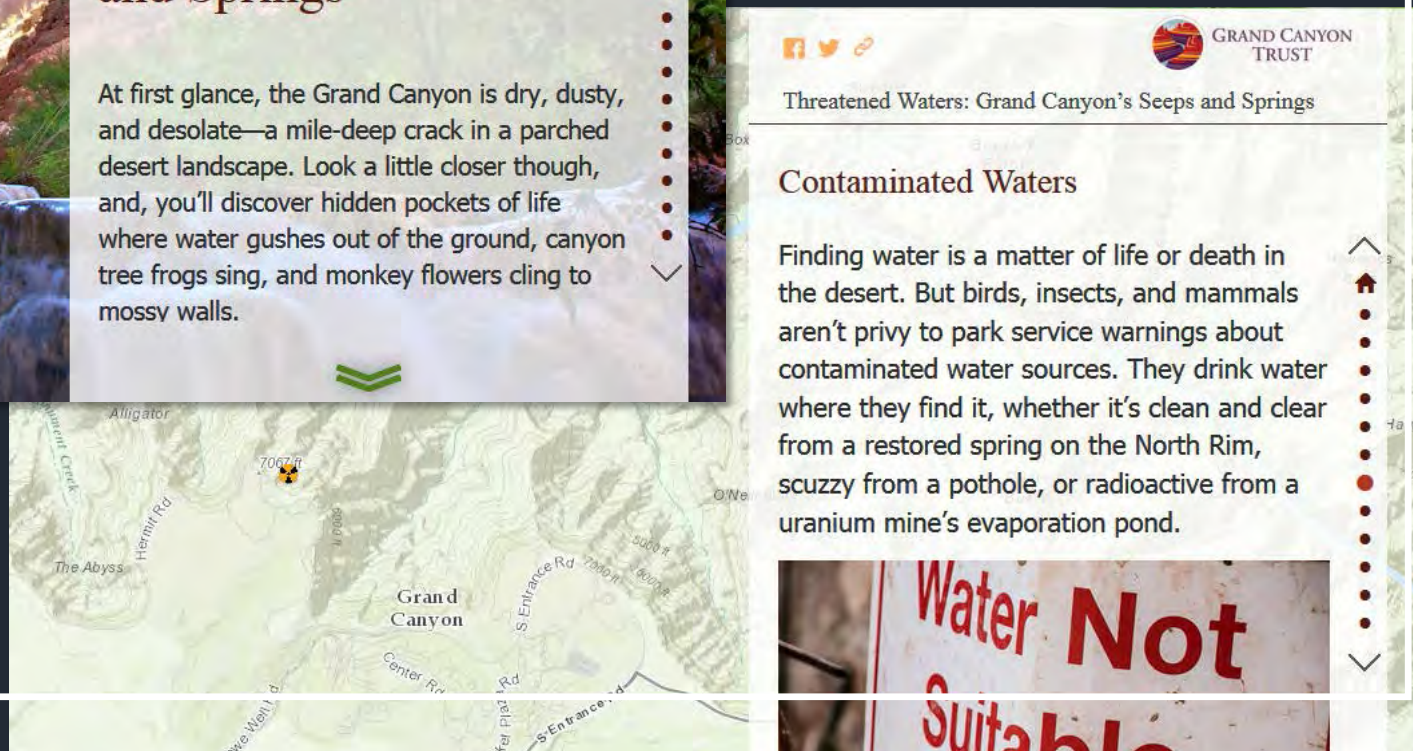
- ❑ **Biodiversity hotspots**
- ❑ **Water resources for livestock, wildlife, people**
- ❑ **Nodes of habitat connectivity**
- ❑ **Climate refugia**
- ❑ **Sensitive indicators**
- ❑ **Sacred + culturally significant**

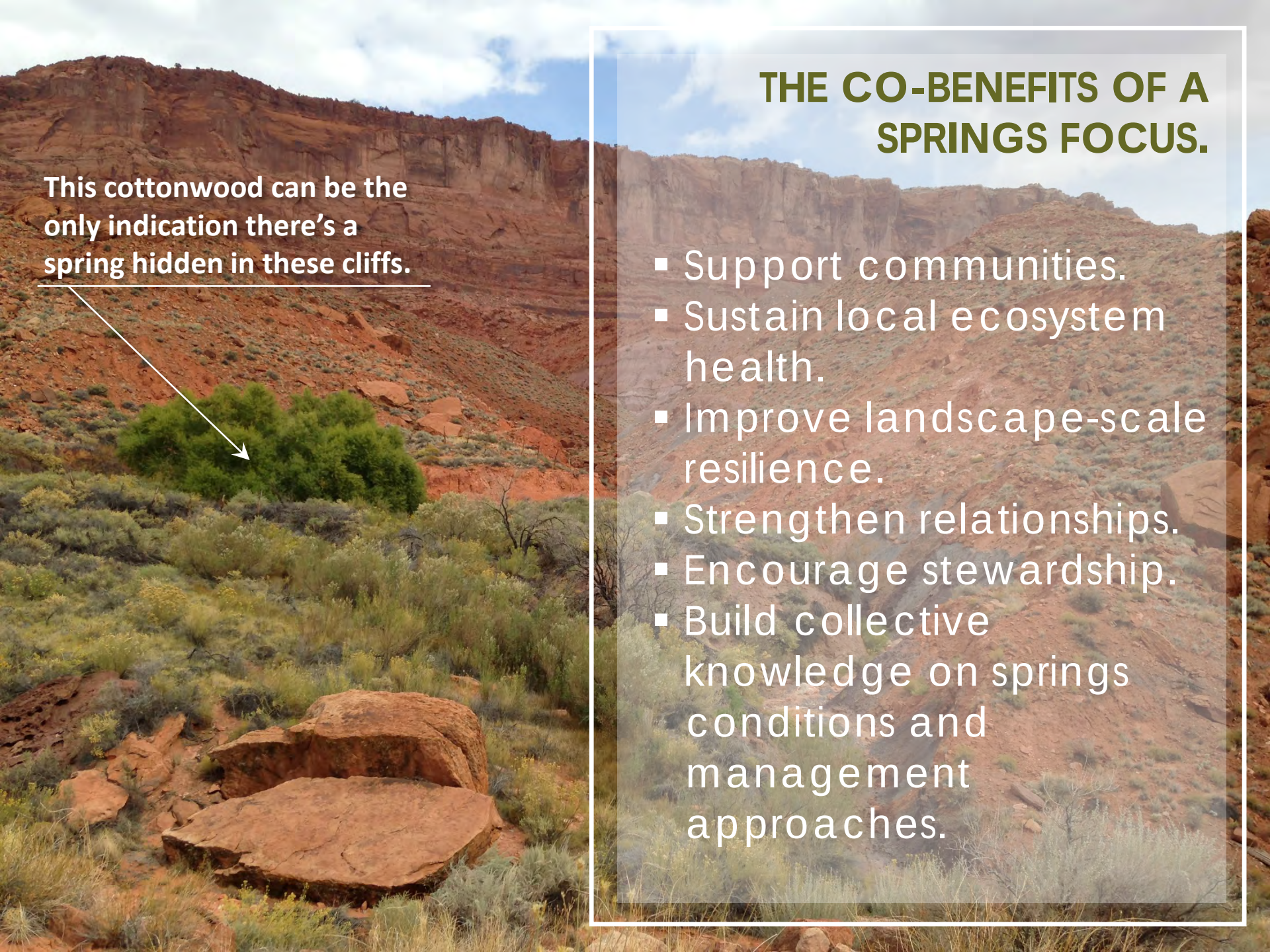


WATER IS LIFE

STORY MAP >> **Threatened Waters: Grand Canyon's Springs + Seeps**

https://s3-us-west-2.amazonaws.com/trustmaps/GrandCanyon/grandcanyonwaters/index.html





THE CO-BENEFITS OF A SPRINGS FOCUS.

- Support communities.
- Sustain local ecosystem health.
- Improve landscape-scale resilience.
- Strengthen relationships.
- Encourage stewardship.
- Build collective knowledge on springs conditions and management approaches.

PILOT SPRINGS RESTORATION

Spring 2013 – Summer 2017

Restoration Accomplished:

- Ephemeral wildlife pools constructed
- Invasives removed, little regrowth
- Native rushes transplanted
- Check dams slowed sediment flow
- Spring box modification → seasonal wildlife water

7 Volunteer Trips

3,000+ hours

Approach: Invasive removal and erosion control

BEFORE

- Eroded bank
- Tamarisk invasion

AFTER

- Surface water uncovered
- Erosion managed
- Tamarisk removed
- Native rushes planted

RESTORED

- Perennial surface water
- Native plants established

Approach: Development modification and wildlife waters

SPRING BOX MOD.

- Livestock water development piped nearly all water off site
- Adjustable valve allows for seasonal on-site water

CHECK DAMS

- Flood event eroded drainage
- Check dams slow and redirect flow

WATER ACCESS

- Surface water for wildlife

Approach: Development modification and wildlife waters

PIPELINE MOD.

- Livestock water development piped nearly all water off site
- Pipeline redirected to on-site pool, spring box left

POOL CONSTRUCTION

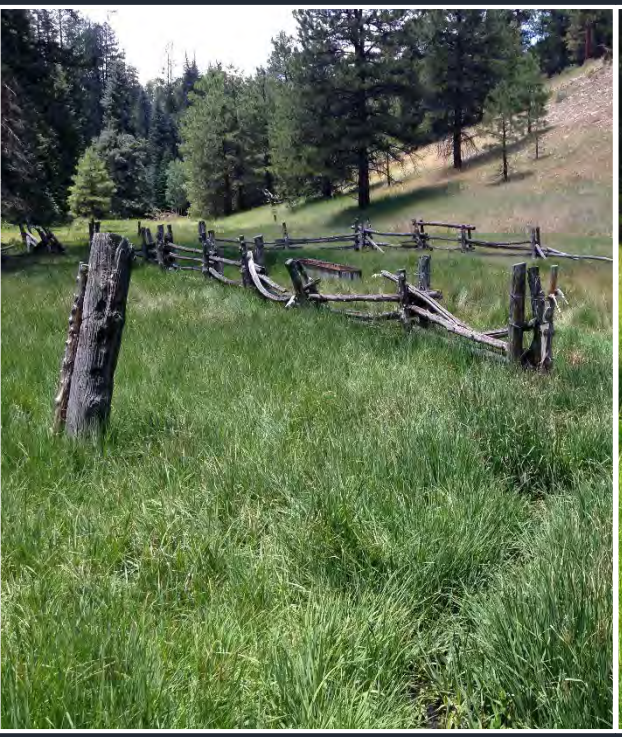
- On-site pool created
- Native rushes and willows transplanted

WATER ACCESS

- Willow, cattail, and rushes establishing
- Perennial water resource

Approach: Protecting sources with exclosures

BEFORE RESTORATION



- **Dilapidated fence left wet meadow and spring source exposed to trampling.**

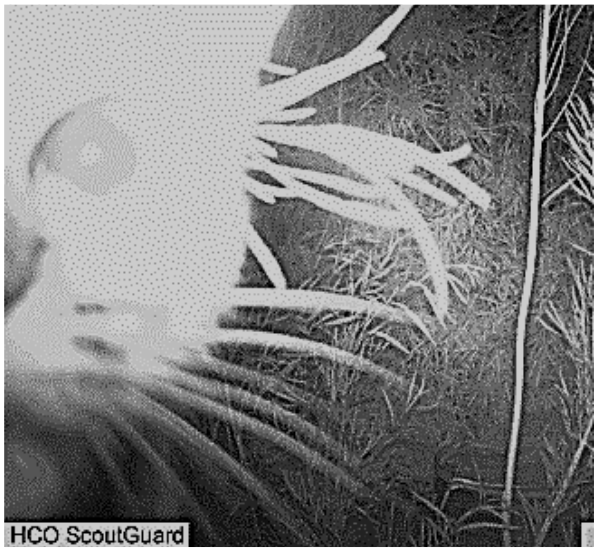
DURING RESTORATION

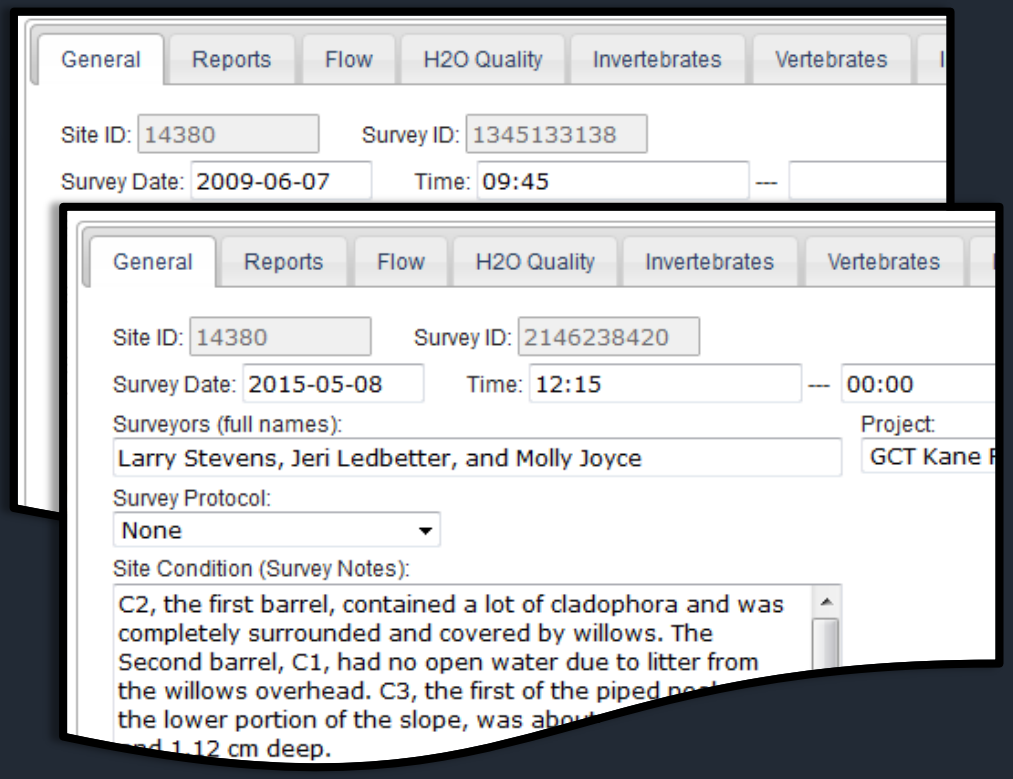
- **Exclosure fence re-built to keep out cattle and bison.**

AFTER RESTORATION

???

Approach: Pilot monitoring + ongoing assessment





Springs Stewardship Institute
a Global Initiative of the Museum of Northern Arizona

www.springsstewardshipinstitute.org

Results: Wildlife presence








Results: Collaboration + stewardship

USDA

U.S. Forest Service
Kaibab National Forest
800 S. 6th St.
Williams, AZ 86046
Voice: (928) 635-8200
Email: mailroom_r3_kaibab@fs.fed.us
Web: www.fs.usda.gov/kaibab

News Release

Media Contact: Jacqueline Banks
(928) 635-8314
jcbanks@fs.fed.us

Hopi Tribe and Kaibab National Forest recognized for partnership on springs restoration work

Williams, Ariz., Feb. 25, 2016—For Immediate Release. The Hopi Tribe and Kaibab National Forest

NEXT STEPS

→ Citizen science + springs assessment
→ Plan + implement restoration, protection, adaptation
→ Gather knowledge + best practices for developed waters
→ Work with managers to increase climate change + springs considerations
→ Continue to advocate for water protections

MANY THANKS

Patagonia
Wildlife Conservation Society
Wilburforce Foundation
AZ Game & Fish Department
US Fish & Wildlife Service
US Forest Service
Springs Stewardship Institute
GCT Volunteer Program
Many many volunteers!

OUR ASK

↓

Come volunteer
Be an advocate
Share your expertise
Stay in touch

!