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Fossil Creek, Arizona – Childs-Irving Decommissioning, Fish Restoration, Research & Monitoring

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This presentation includes vital contributions from:

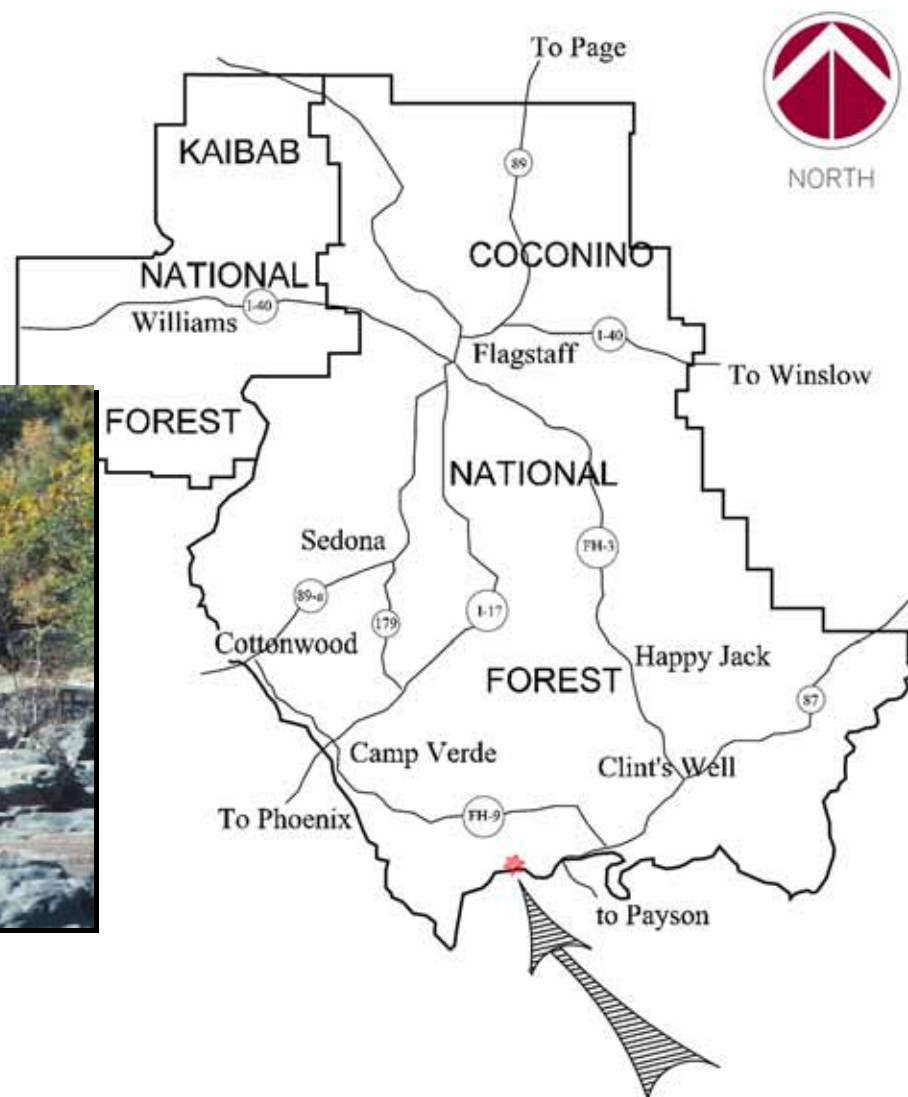
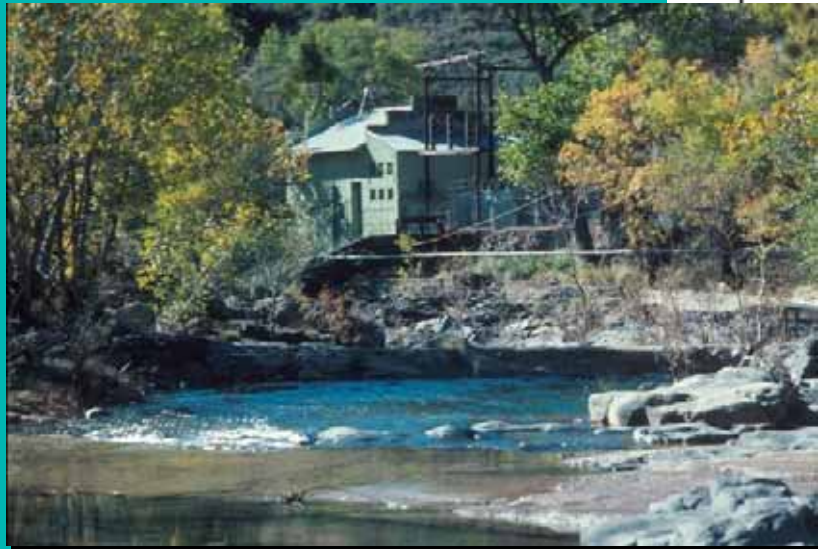


Pool below Fossil Springs

Grant Loomis – Tonto N.F.
Rob Clarkson – USBR
Phil Smithers – APS
Mark Fallon – APS
Dave Weedman – AGFD

Bill Auberle, Martha Lee, Michele James, Abe Springer, Jane Marks, Rod Parnell– all of NAU

NAU undergraduate and graduate students



PROJECT VICINITY MAP

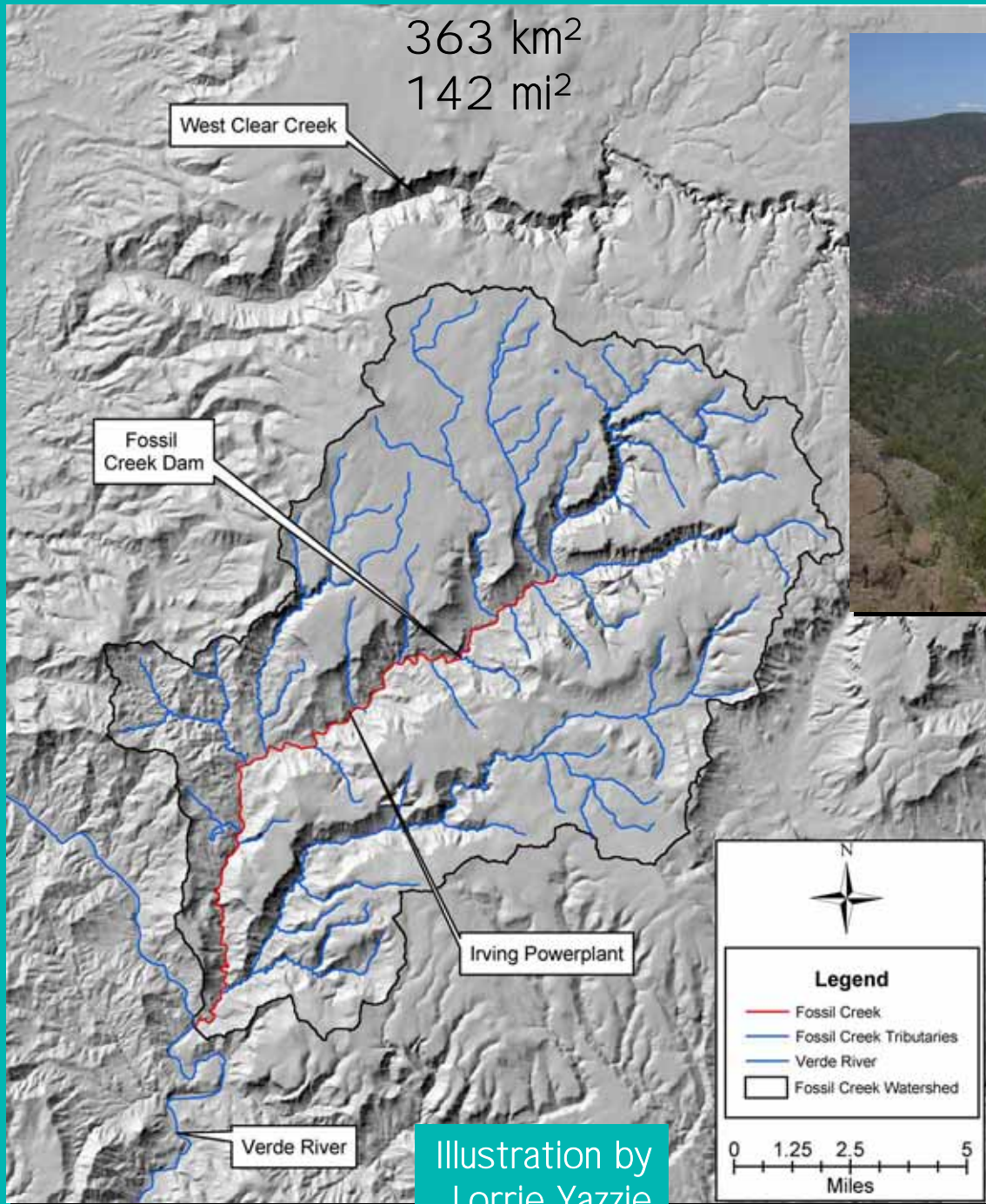


Illustration by
Lorrie Yazzie



View on Road from
Strawberry down to Irving
Photo by Dave Lamkin

Key Players on the Road to Decommissioning

- APS
- Federal nexus:
 - FERC
 - Forest Service – Coconino & Tonto Forests
 - Fish and Wildlife Service
 - Bureau of Reclamation
- State nexus:
 - Game and Fish
 - Environmental Quality – ADEQ
 - Historical Preservation – SHPO
- Yavapai-Apache Nation
- Environmental Partners – NGOs

Childs-Irving Decommissioning - Update

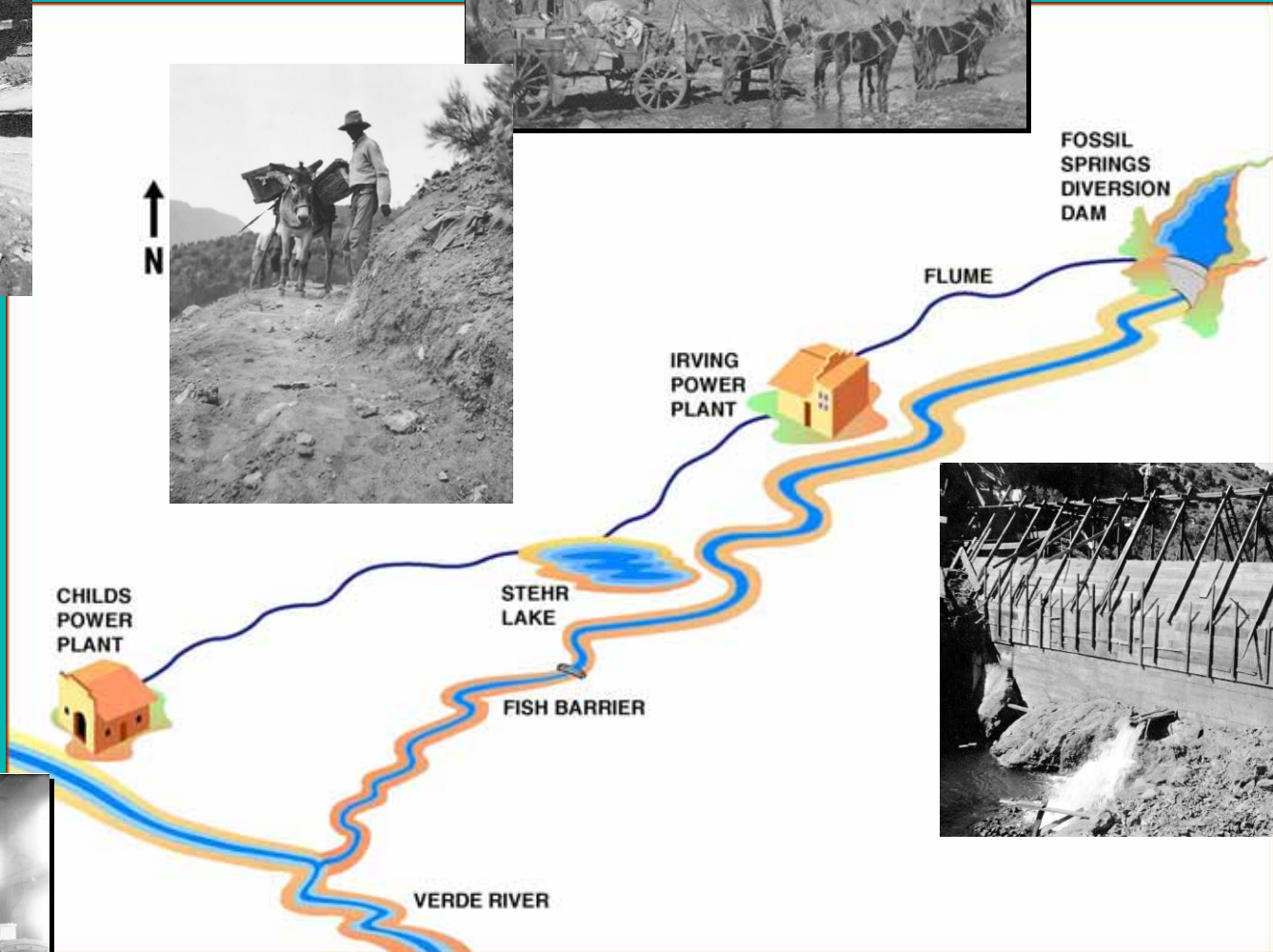


Irving Generating Station,
Photo courtesy of APS / Nick
Berezenko



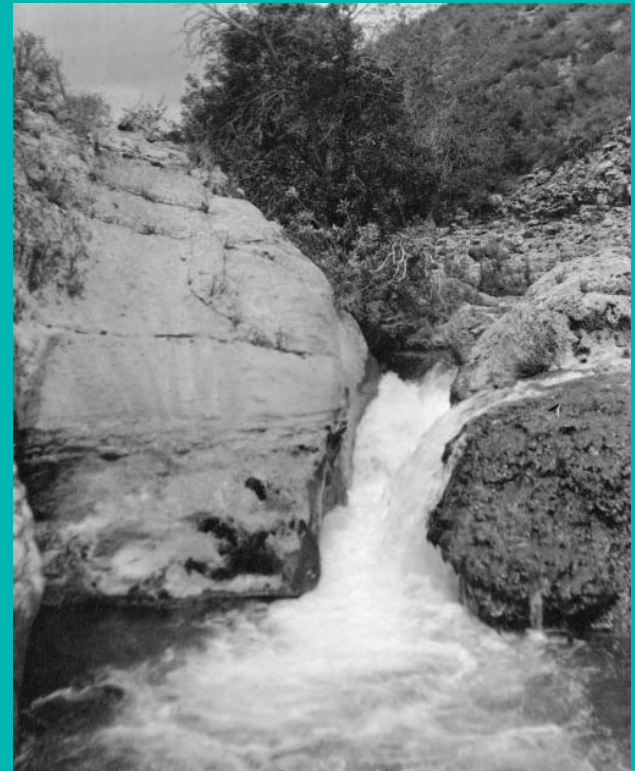


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Childs-Irving Hydroelectric Project

- Childs – 2.8 MW (2 Units)
- Irving – 1.4 MW (1 Unit)
 - 11,000' Steel Flume on Wooden Trestle
 - 10,000' Concrete Flume
 - 10 Pipe Bridges (2460')
 - 7 Tunnels (9000')
 - 17,200' Penstock and Siphon pipe
 - 2 concrete diversion dams
 - 3 earthen dams (at Stehr Lake)
- 42 cfs flow powers each site
- Since 1909: Removed most of the baseflow from 14 miles of Fossil Creek



Re-licensing & Settlement Agreement

- 1992: APS began FERC re-licensing process
- 1998: FERC is prepared to issue license; APS began discussions with interveners...
- 9/2001: historic Settlement Agreement
- Signatories include:
 - Center for Biological Diversity
 - American Rivers
 - Yavapai-Apache Nation
 - N. AZ Audubon Society
 - AZ Riparian Council
 - Nature Conservancy – AZ Chapter

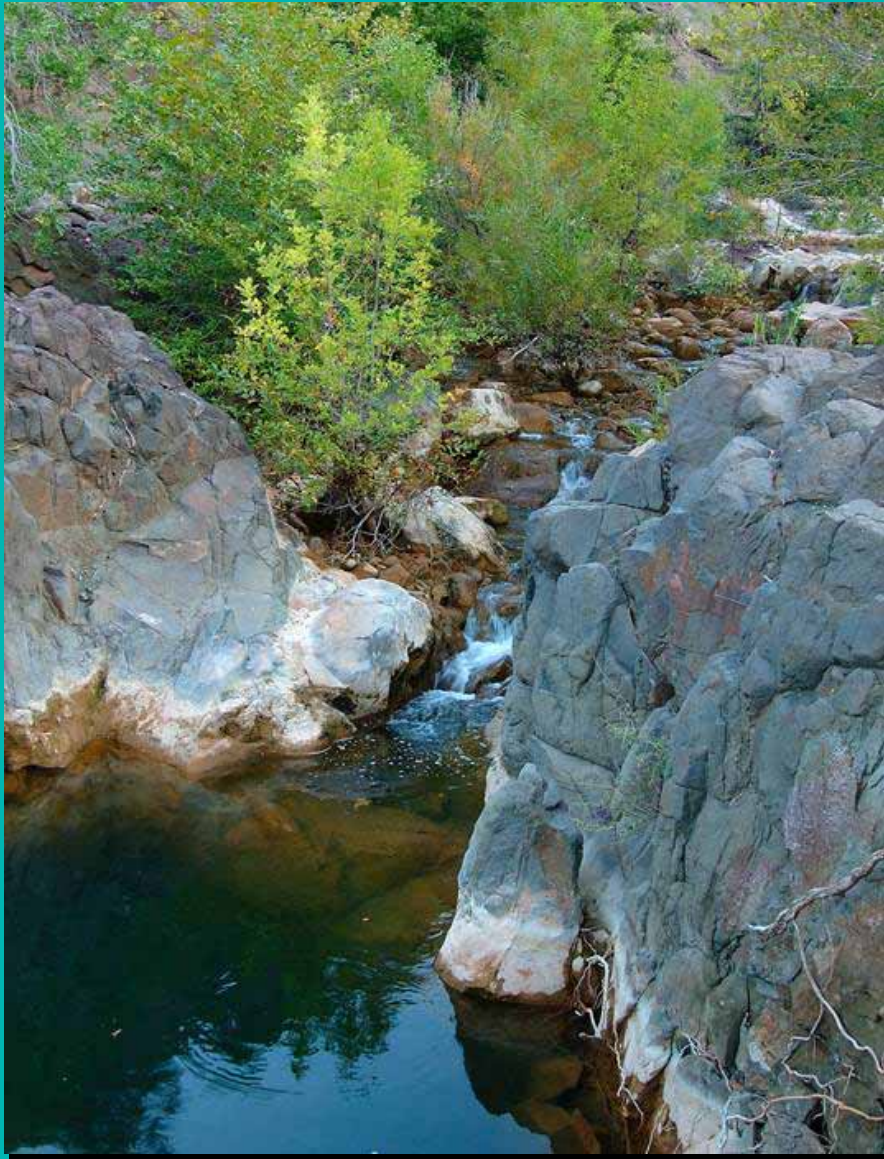
Why is APS Decommissioning?

- This is a unique opportunity to return the baseflow to 14 miles of stream channel, and re-establish a vibrant riparian corridor – of which we have all too few in Arizona.
- Fossil Creek deposits travertine and once flows are restored it will again be the 4th largest such system in North America.



Presently...

- October 2004: FERC approval of APS License Surrender, after completing NEPA, Historic Preservation, etc., processes
- March 24, 2005: FERC approval of decommissioning construction documents
- Return of flows to Fossil Creek
– on June 4th
- Decommissioning: Summer 2005 – 2009



Fossil Creek, with a few cfs, and with the full 46 cfs baseflow (Photographs provided by APS)

Native Fish Restoration – Purpose

- Gila River basin native fishes are critically imperiled
- Decommissioning and the return of baseflow to Fossil Creek presented a unique recovery opportunity for native fish

Longfin Dace
M. Jakle



Fish Barrier

- Fish barrier was required to inhibit re-invasion
- Challenges:
 - protect Wilderness and Wild and Scenic values
 - limited use of mechanized equipment
 - no road access
- Construction: Fall 2004







Fish Renovation



- (Build Barrier)
- Salvage existing native species
- Remove non-natives w/chemical application
- Restock salvaged native species
- Monitor before and after flow restoration



Exotic fishes

Green sunfish
J. Humphrey – FWS



Smallmouth bass
Steinhart



Desert sucker
S. Hedwall



Roundtail Chub
S. Hedwall



Sonoran sucker
I. Reed

Native fishes



Crew electrofishing to capture native fish



Hoop nets for catching fish



Drip buckets for applying piscicide to the main channel



Backpack sprayers for applying piscicide to channel margins

Special Status Species



Common Black Hawk

Arthur Morris



Lowland Leopard Frog

Jim Rorabaugh – USFWS



Yellow-Billed Cuckoo

Troy Corman – AGFD



NAU's Research and Monitoring

6 principal areas:

- Travertine development
- Aquatic species and interactions with travertine
- Sediment, stream morphology and hydrology
- Springs characterization
- Recreation impacts and visitor use
- Coordination, education, outreach

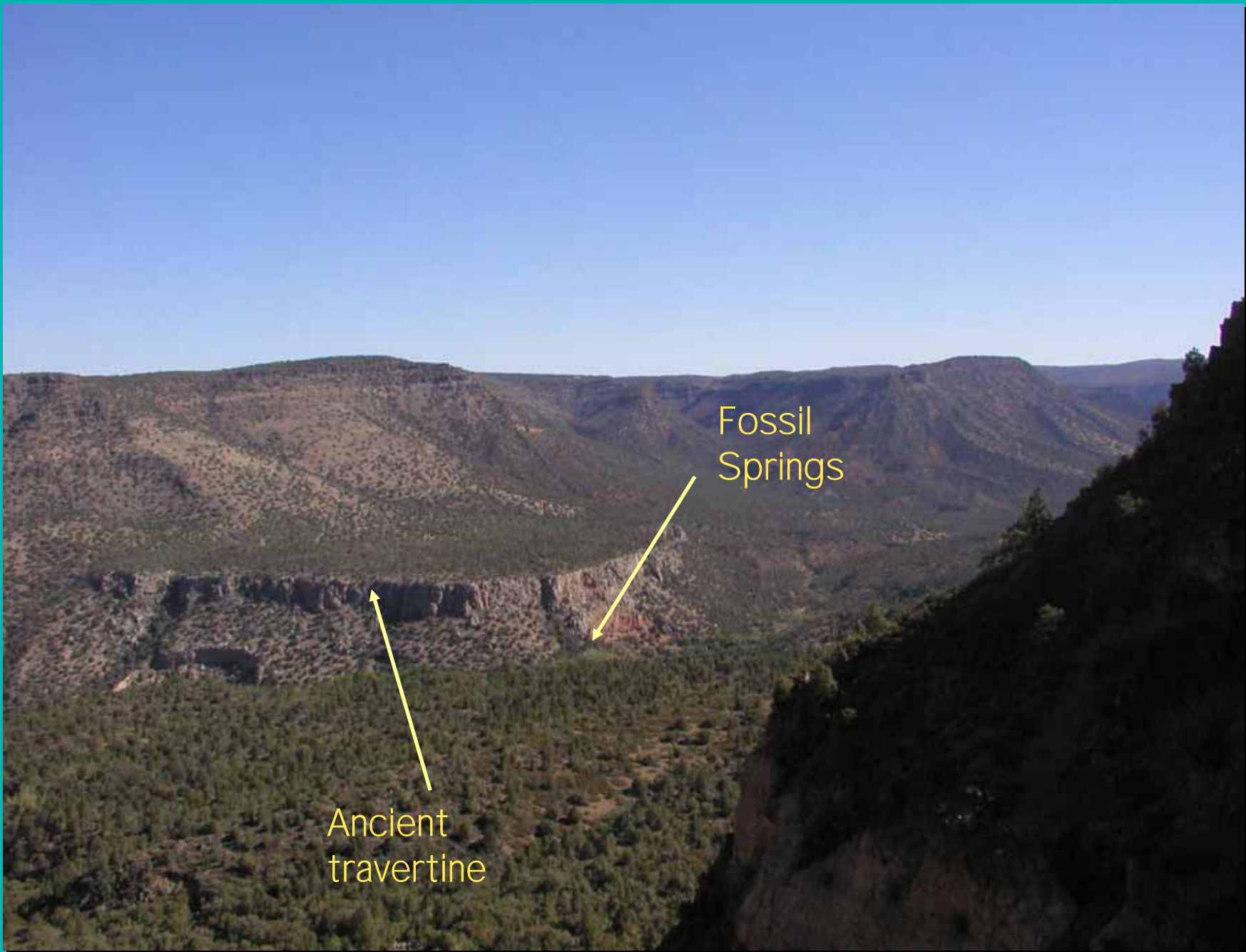


Travertine Research

Objectives:

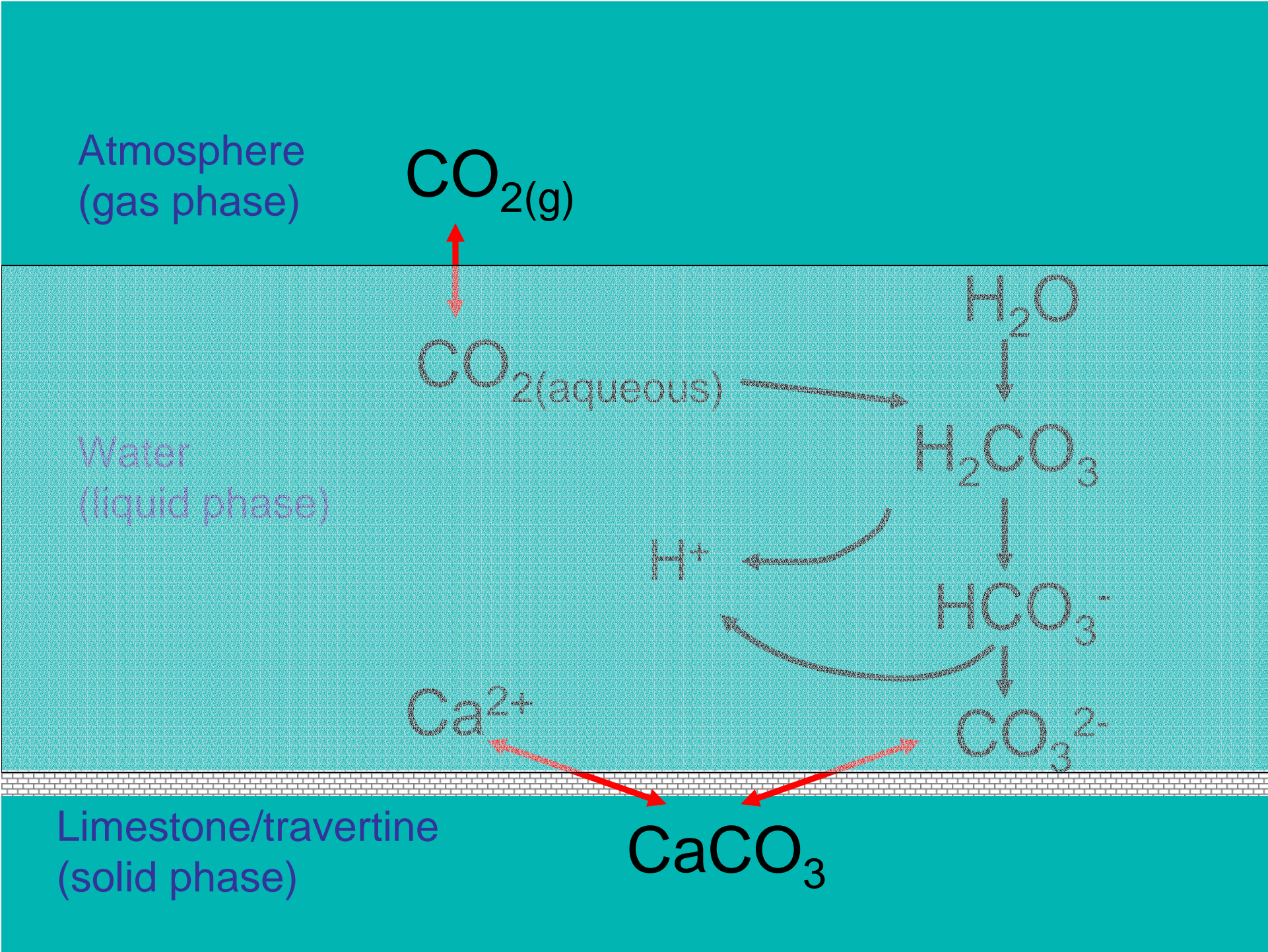
- Examine rates of travertine deposition
- Quantify recovery of travertine dams in the stream reach below the Fossil Springs Diversion Dam
- Investigate the role of algae and leaf litter in travertine formation

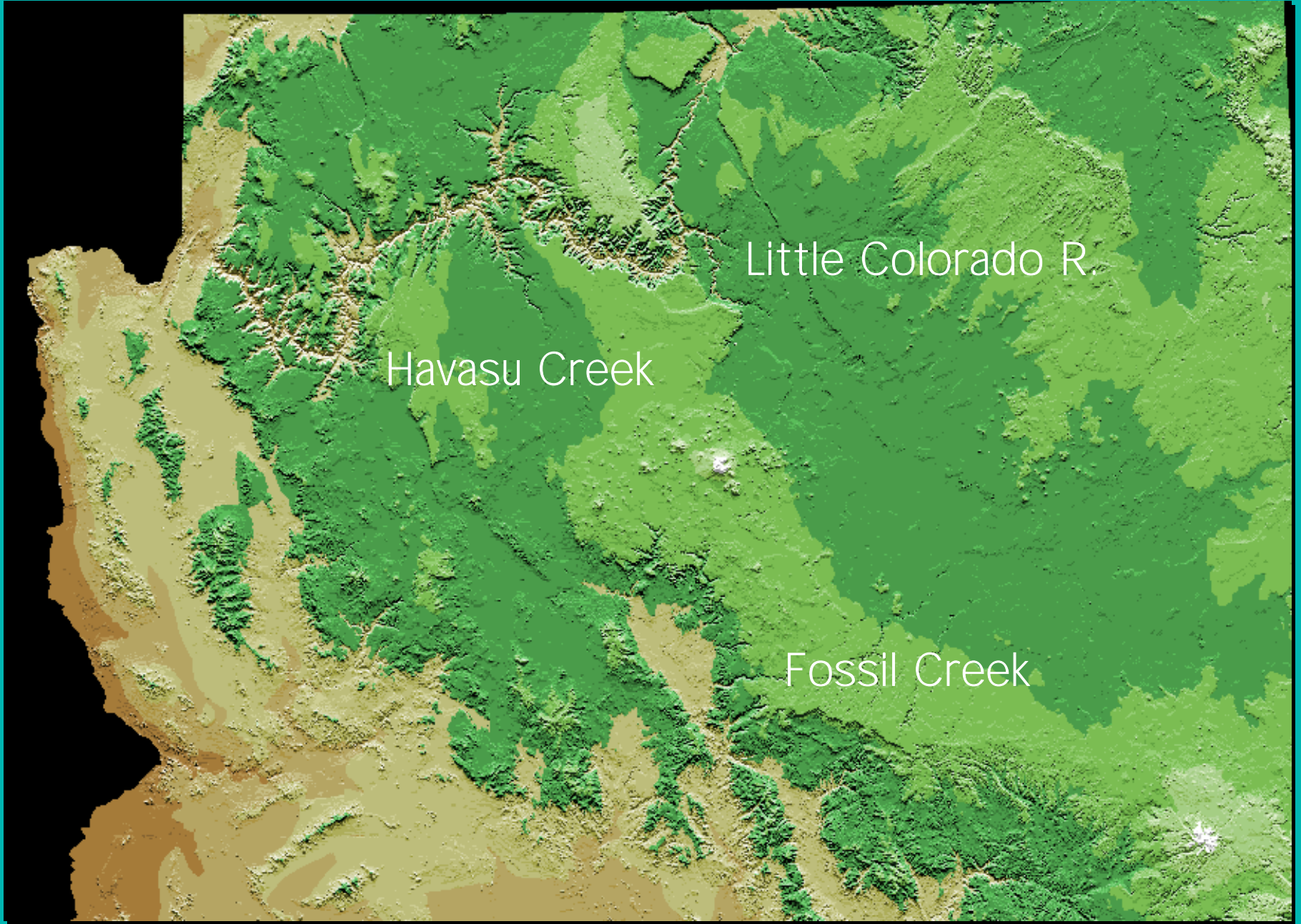




Fossil
Springs

Ancient
travertine





Little Colorado R.

Havasu Creek

Fossil Creek



Streamflow Gaging

Rationale

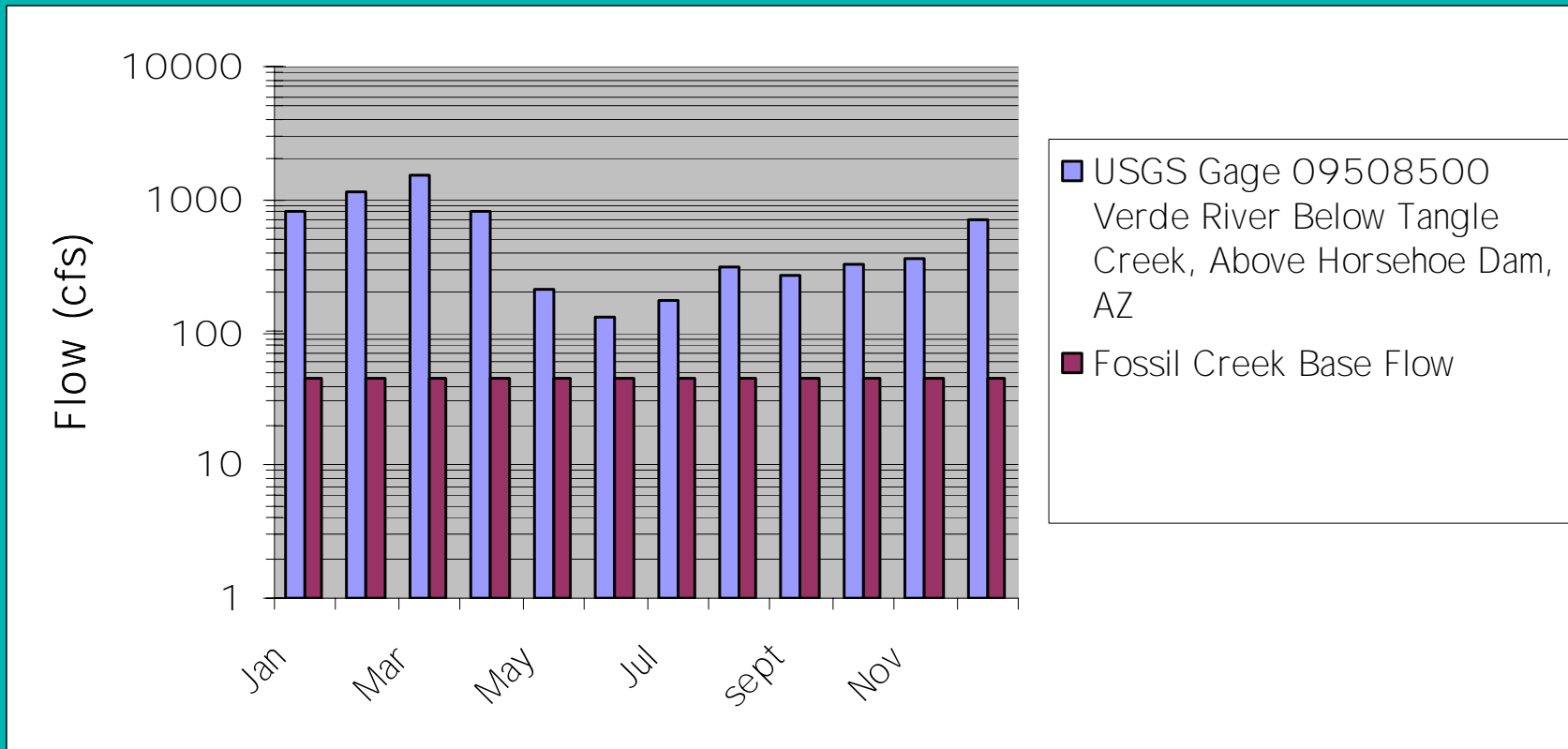
- Ecosystems, recreation, fish restoration, and travertine recovery depend critically on Fossil Springs baseflow

Objectives

- Identify gaging location(s) & method(s)
- Facilitate agreements for long-term O&M
- Install one or more gages in Fossil Creek
- Monitor springflow, research hydrology

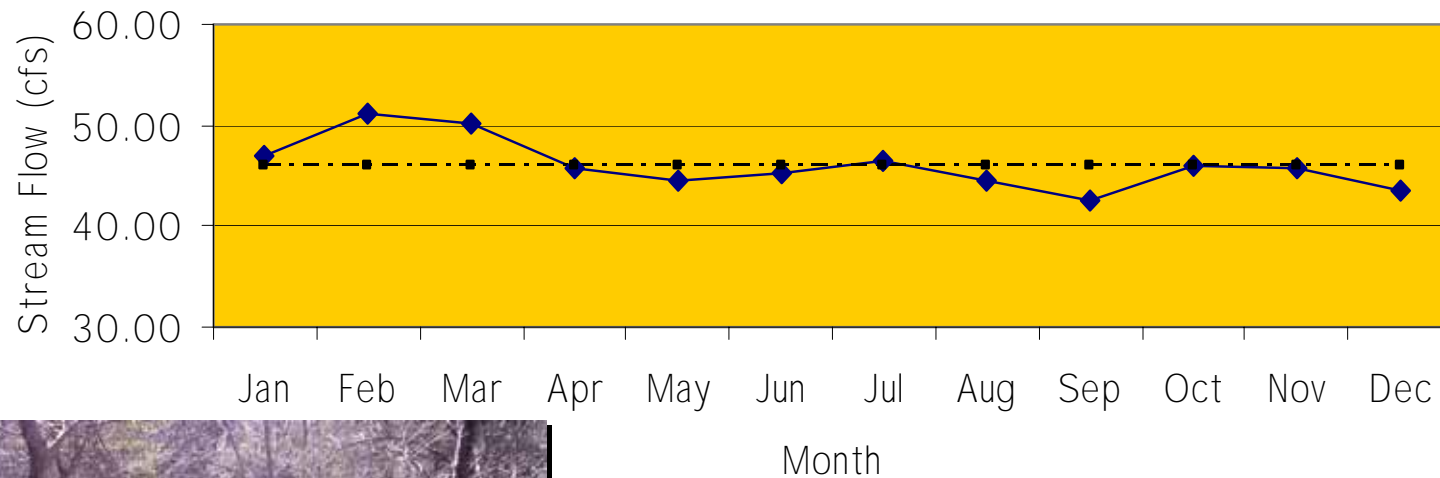


Streamflow Gaging - Context



Recent USFS Streamflow Data

Fossil Creek Flows (2000-2003)
Median Monthly Flow & 46.0 cfs Mean Annual Flow



Sediment Research & Monitoring

FERC stipulated dam lowering of 14-ft...

- Investigate how sediment presently behind the dam moves downstream in response to floods
 - Establish the baseline: 2005
 - Periodically monitor: 2006 – ?
- Stream channel morphology – headwaters to confluence with Verde River

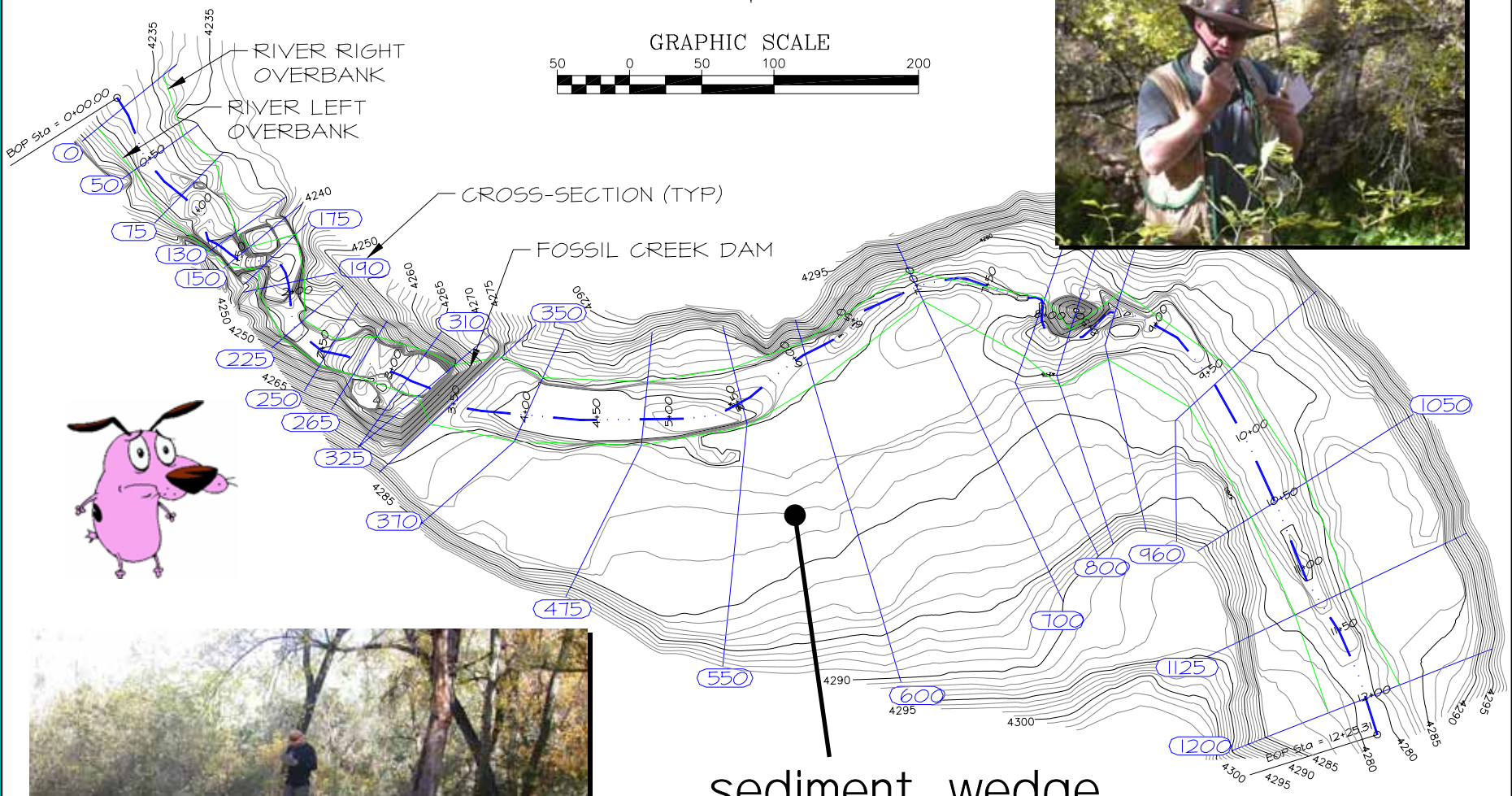
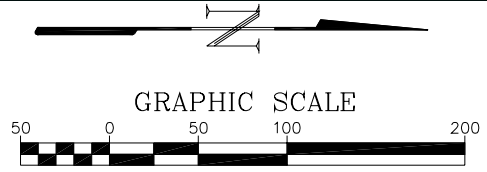


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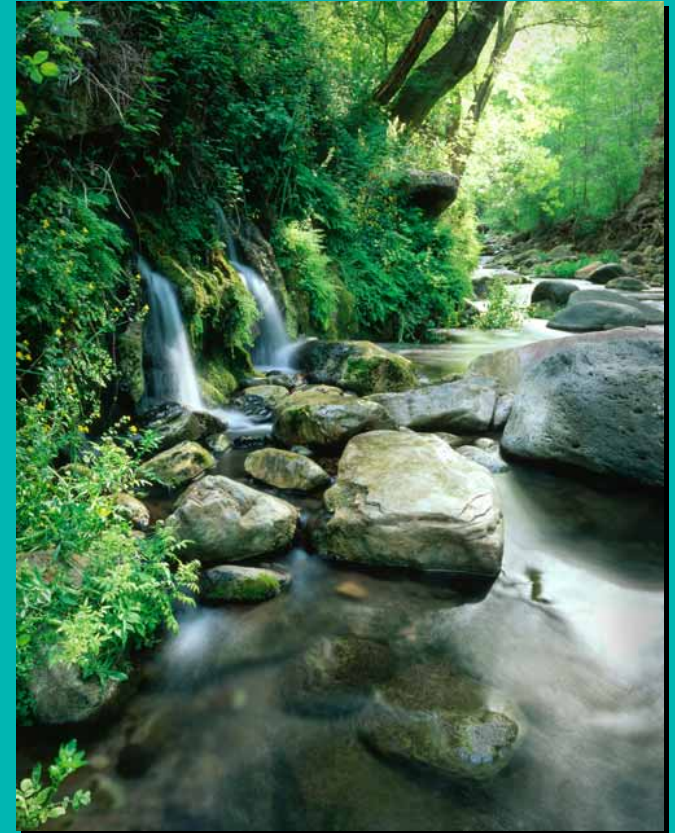
Fossil Creek travertine,
Photo courtesy of APS /
Nick Berezenko



sediment wedge

Recreation and Visitor Impacts

- Visitor Survey
 - Demographics
 - Preferred means of communication
 - Responses to proposed management strategies
 - Activities & experiences
- Monitoring Camping Impacts
 - Continuation of a USFS effort
 - Mapping & condition monitoring
- Research:
 - Identify strategies for successful implementation of a Recreation Management Plan



Fossil Springs
Photo courtesy of
APS / Nick Berezenko



Uncontrollable Crowd
Bill Auberle – NAU



Childs Hot Springs
Roy Aikins – AGFD



Other Signage
Rory Aikins – AGFD

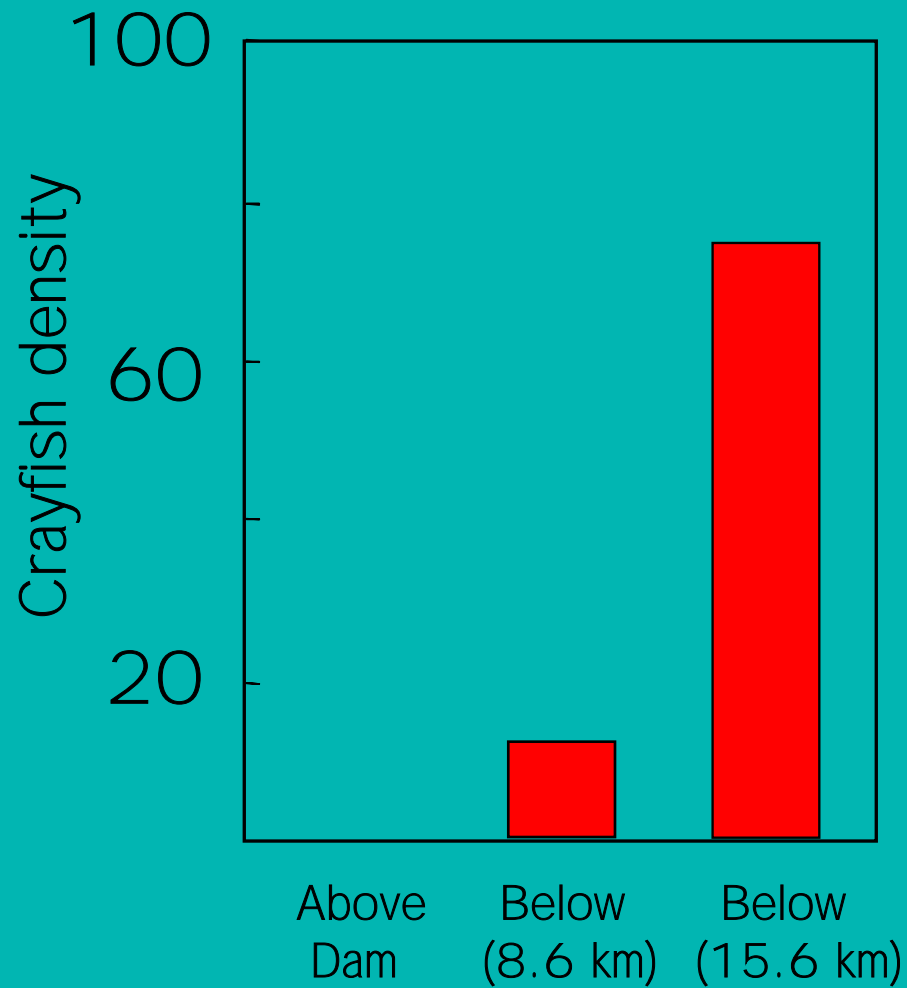


Riparian Campsite
Matt Jedra – NAU

Aquatic Species, Food Webs & Ecosystem Processes

- What are the current distributions of native and exotic species and how will they change with restoration?
- How will increased travertine deposition affect primary and secondary productivity and nutrient cycling?
- How has water diversion and exotic species affected native fish and invertebrate feeding patterns; will flow restoration and exotic fish removal revive native food webs?

Invasive Aquatic Species – Crayfish



Fossil Springs Diversion Dam
Jane Marks

Springs Research & Monitoring

- *Discharge*

- Locate and survey spring orifices
 - Nearly 100 individual orifices
 - < 1 gpm to > 5 cfs
- Surveyed locations permit monitoring at individual orifices

- *Chemistry*

- Elevated Helium concentrations in certain springs – suggestive of a deep origin for gases
- There is a mantle-derived Helium component in spring water – possibly associated with magmatic CO₂

Research & Monitoring Coordination

- Research & Monitoring Inventory
 - web-based
 - Who, how, what, when, where and why
- State of the Watershed Report
 - Due out in 2nd Quarter 2005
 - web-based
- Facilitate Communication



For More Information:

www.verde.nau.edu/FossilCreekProject

www.aps.com/aps/CI/Default.html

Contact: Michele James
Project Coordinator
Michele.James@nau.edu
928-523-2995





Southwestern willow flycatcher

USFWS