The Dolores River "DRAMS" Project:

Patterns of Vegetation Response and Rebound in the Face of Large Flow Variations

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For the full DRAMS team

DRAMS Project

Funding

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

The Nature Conservancy

Southwestern Water Conservation District 75 YEARS

DWCD Dolores Water Conservancy District

Dolores River Restoration Partnership

Partners

RiversEdge West
RESTORE + CONNECT + INNOVATE

Colorado Parks & Wildlife

Bureau of Reclamation

Colorado Mesa University

Conservation Legacy

Four Corners Water Center at Fort Lewis College

Fort Lewis College

U.S. Forest Service

U.S. Department of the Interior Bureau of Land Management

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The Setting - Land Acknowledgement:

The Dolores River flows through the ancestral homelands of the Nuuchiu (Ute) peoples.

2 Big Take-Aways (why care about plants!):

- **Persistent Low Flows** have **negative** impacts on wildlife habitat via vegetation change:
  - Bar colonization
  - Channel simplification
  - Floodplain transition

- Even occasional **Prolonged High Flows** have immediate **benefits**
  - Bar/cobble scouring
  - Floodplain water table recharge
  - Inundation of upland shrubs

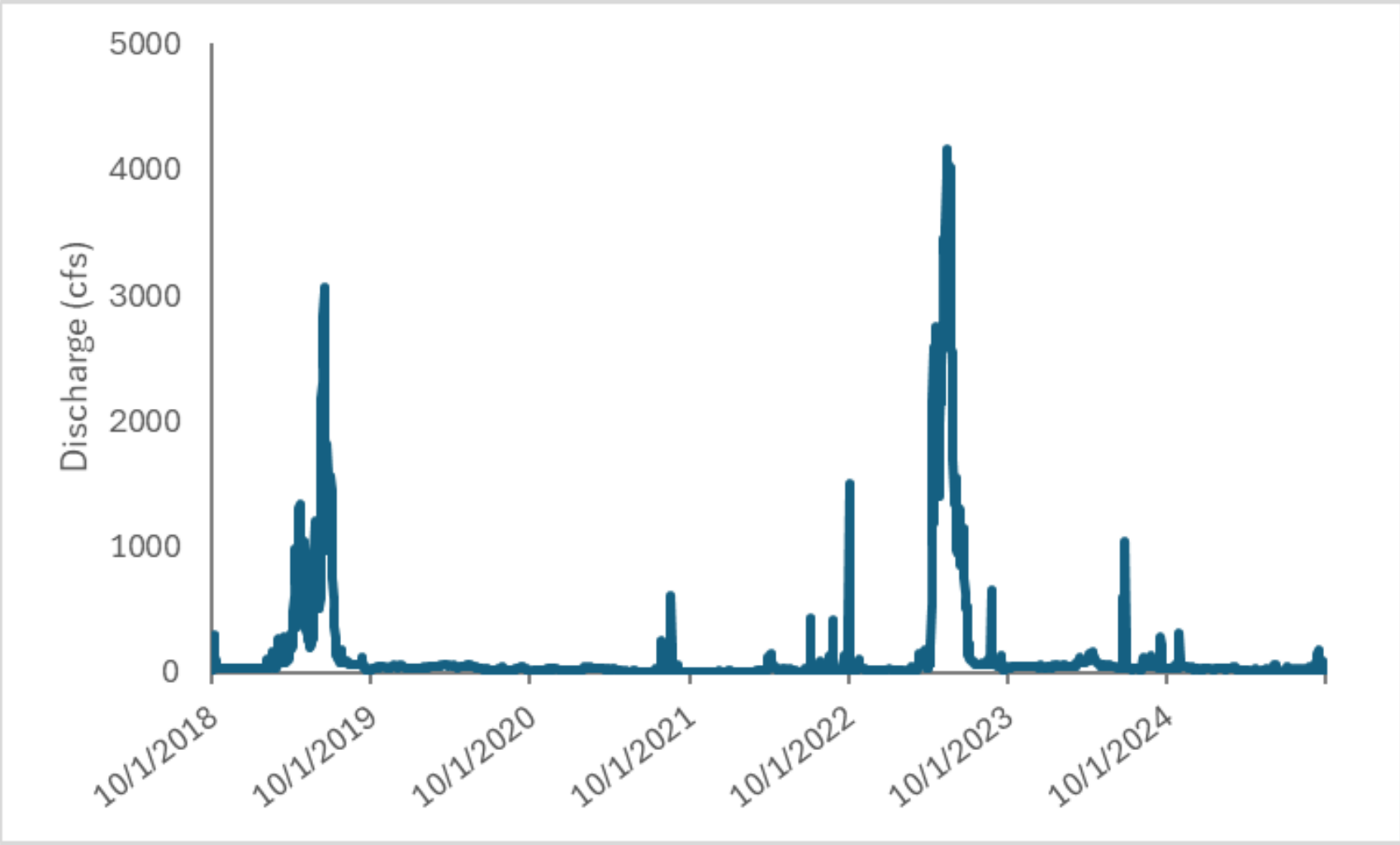
Vegetation Monitoring on the Dolores River

- WHY
- HOW
- FINDINGS
- Management Implications

Vegetation Monitoring on the Dolores River

- **WHY**
  - Many, many stakeholders – both human and non-human; and often not enough water for all

Bedrock, CO - Discharge WY 2019-2025



- **2021-2025**
  Monitoring period
- Large inter-annual variation in flows

USGS gage 09169500
Dolores River at
Bedrock, CO

Vegetation Monitoring on the Dolores River

- **WHY**
- **Monitoring** to increase understanding - how do different flows impact:
  - Native **Fish** & their Habitat:
  - = **Sediment** movement/changes (geomorphology) in & adjacent to channel
  - = **Vegetation** adjacent to the channel and on the floodplain
- **Dynamics** over time of:
  - Geomorphology/sediment
  - **Vegetation** (this talk)
  - Fish populations

Vegetation Monitoring on the Dolores River

- WHY
- **HOW**

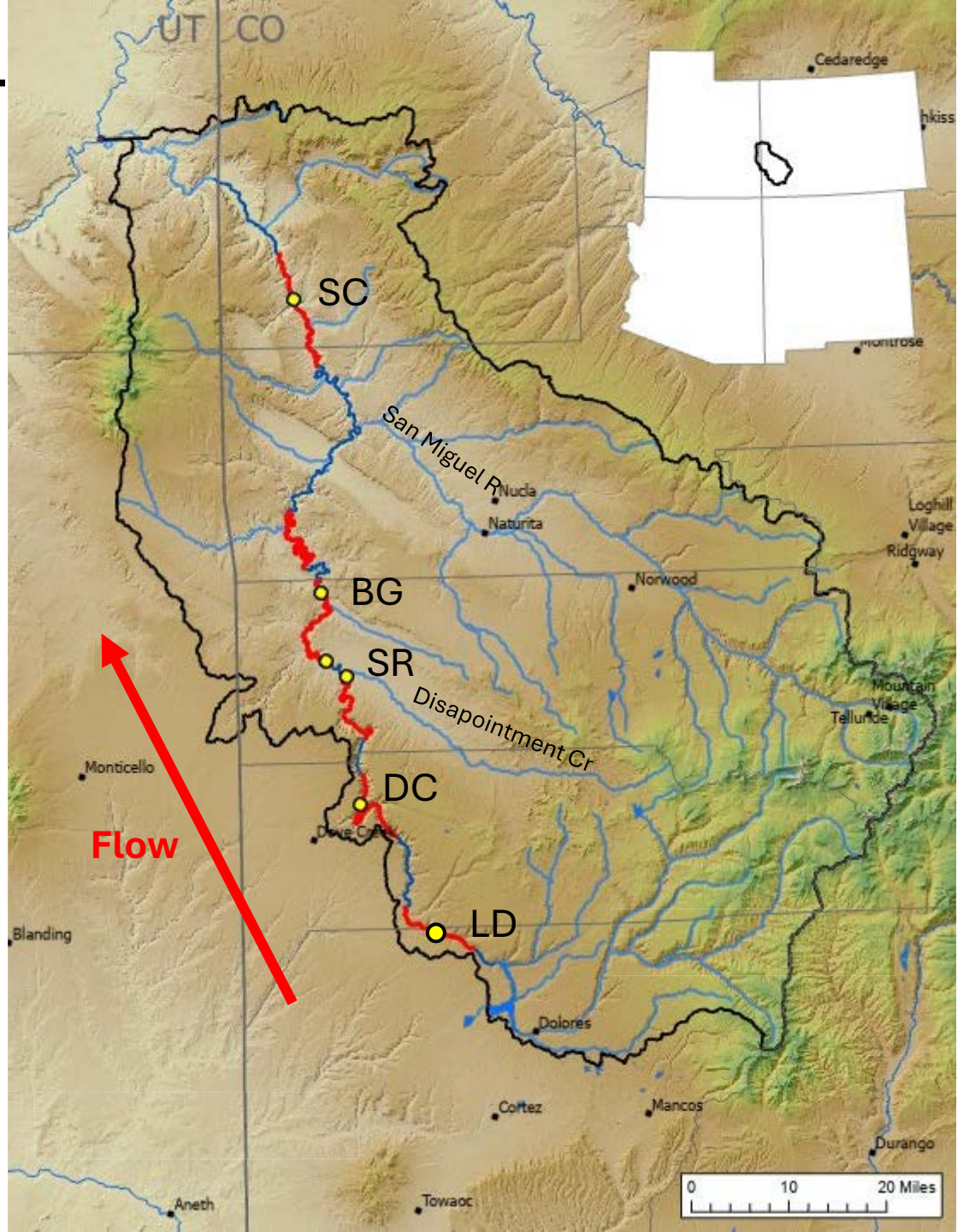
- Transects (line-intercept) – 2 types

- Quadrats – 8-12 per transect

DRAMS Vegetation Monitoring – *How*:

6 study sites for annual field visits

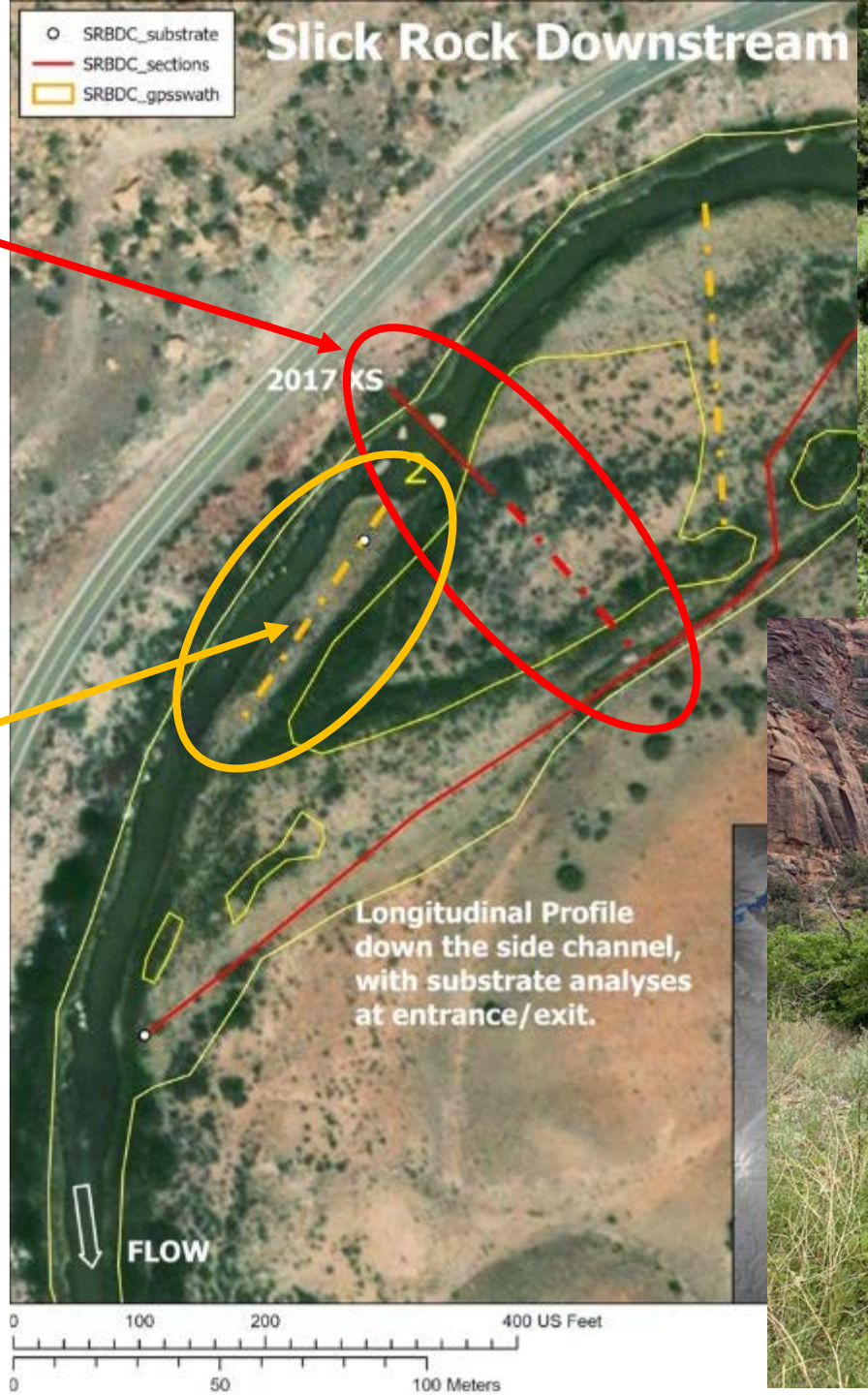
- Lone Dome (LD)
- Dove Creek Pumps (DC)
- Slick Rock above Disappointment Cr.
- Slick Rock below Disappointment (SR)
- Big Gypsum (BG)
- Salt Creek (SC)
  (sampled by Conservation Corps strike teams)



Cross-section Transects

- Woody plants % cover

Long-section Transects



Slick Rock Downstream site; map by Jon Harvey

Transect Lines:

Through thick, & thin…

2m x 0.5m Quadrats:

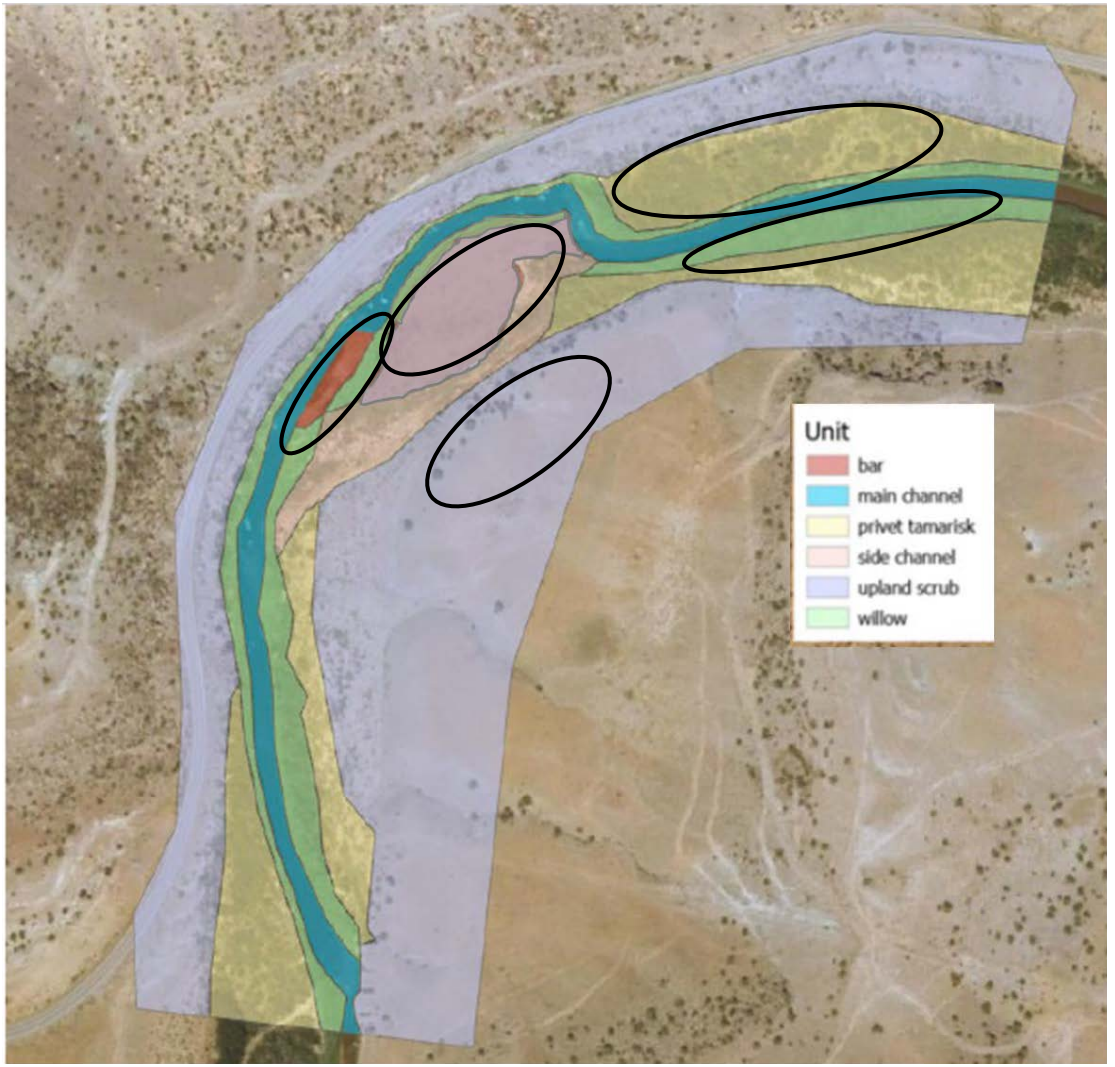
- Stem counts
- % cover herbs, bare ground

Vegetation Monitoring on the Dolores River

- WHY
- HOW
- FINDINGS
  - Divide sites into four major ***eco-geomorphic*** *surfaces or zones*
  - Based on position relative to river channel and dominant vegetation types

Vegetation Monitoring on the Dolores River

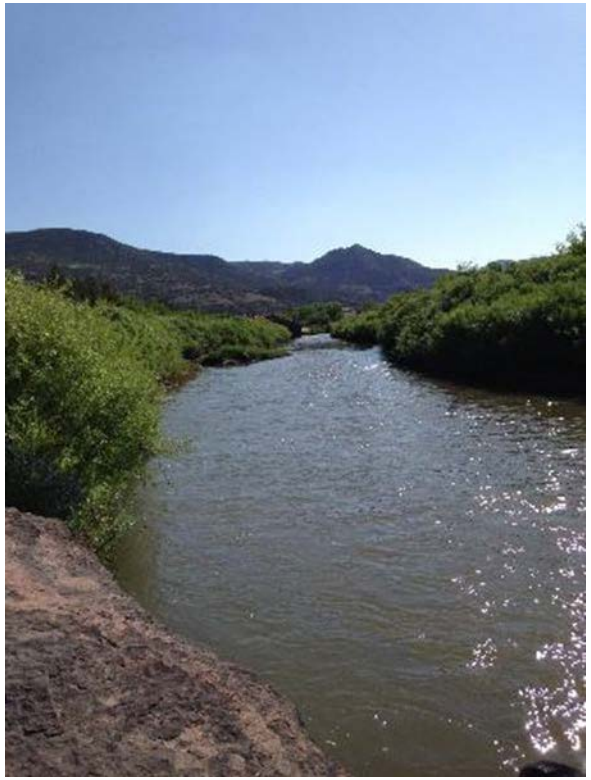
- Divide sites into four major ***eco-geomorphic*** *zones*
  - Densely vegetated bank
  - Open Bar/Bank habitat
  - Upper Floodplain
  - Upland Shrub zone



Slick Rock Downstream site; map by Joel Sholtes & Jon Harvey

1 – Densely vegetated banks

- Green “fringe” of mostly willow *(Salix exigua);* also *Phragmites,* alder (at upstream sites)



1 – Densely vegetated banks

- Green “fringe” of willow

- Vegetation encroachment on the channel margin is a key component in the channel narrowing and habitat simplification that is impacting native fish

Big Gypsum Valley, 2024

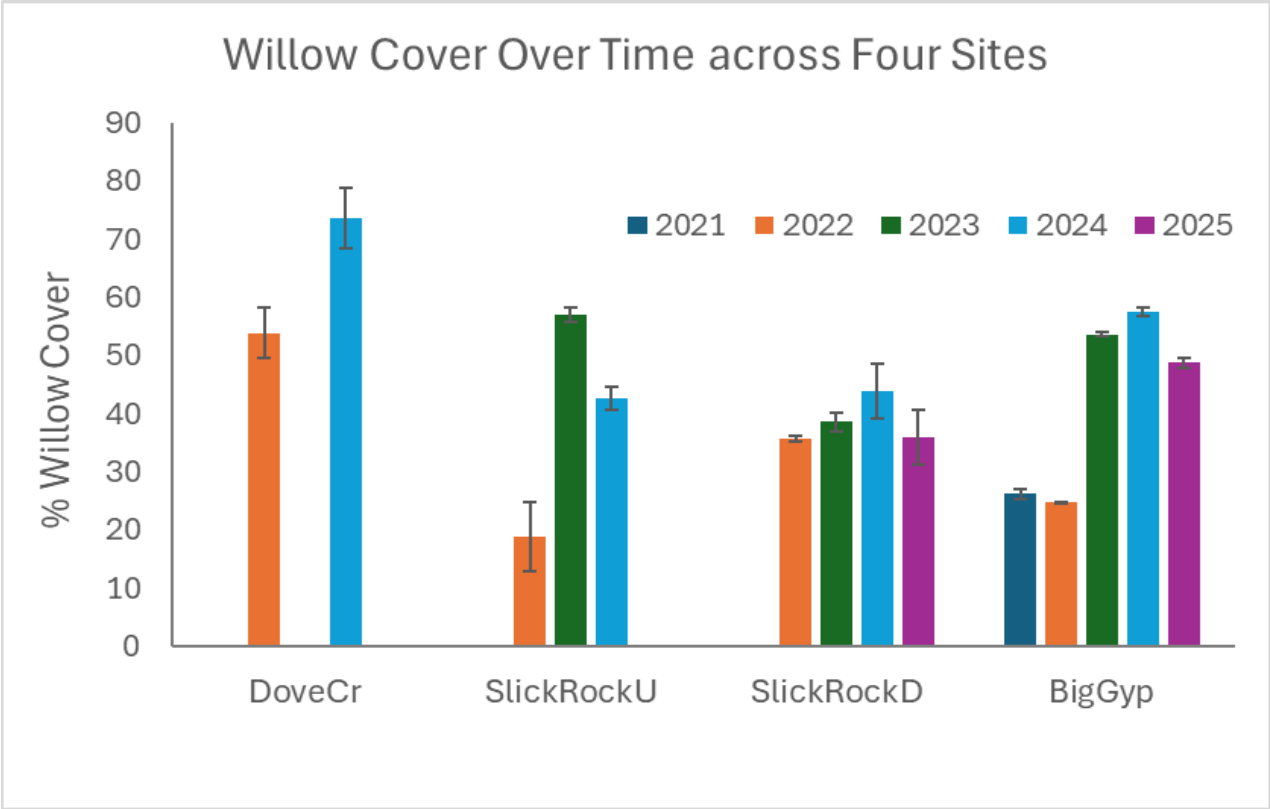
1 – Densely vegetated banks

- Green “fringe” of willow:
  - Stem density 10-30+/m^2
  - With few exceptions, no change over study period
  - Height 1-3+ m tall

1 – Densely vegetated banks

- At all sites, significant increases in willow cover after 2023 high flows

- Least change at Salt Creek (below confluence with San Miguel River)



Willow cover increased significantly at most sites after 2023 high flows, and then stayed high (p=<0.001 to 0.03), n=4).

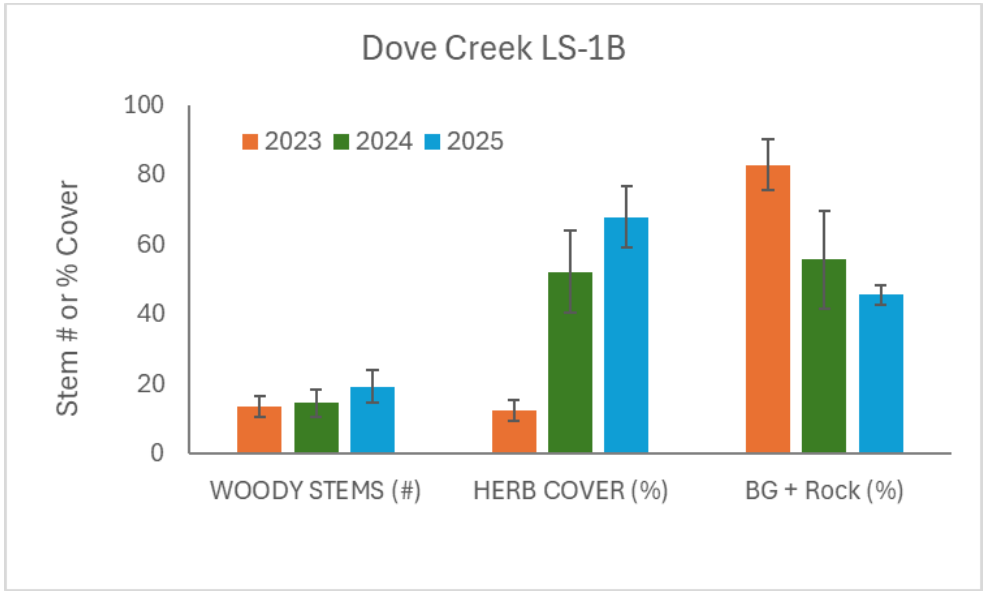
SRD trend not significant (p=.37), but stem density increase sig. (p=.045).

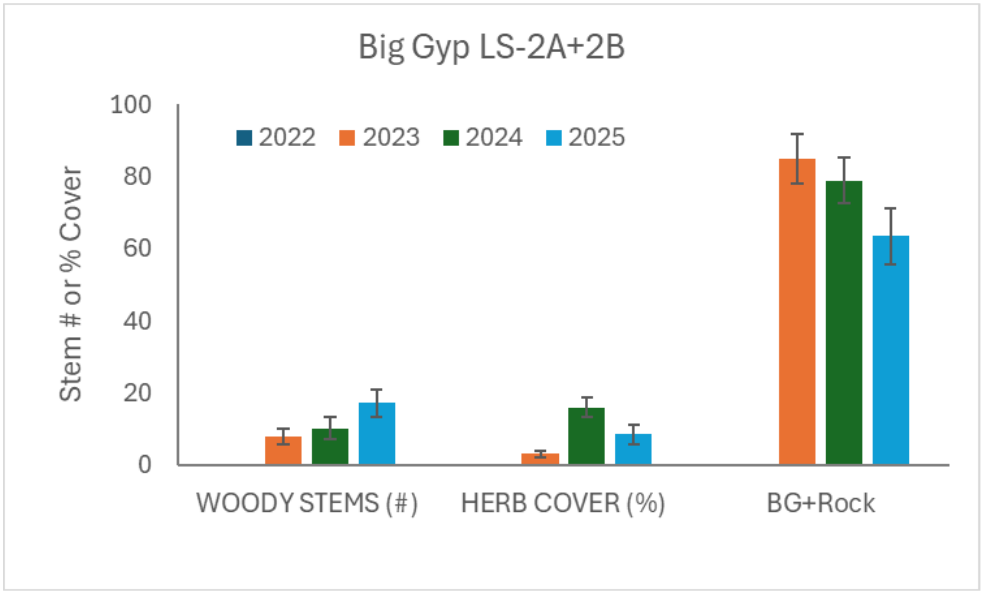
2 – Open Banks & Bars

- Cobble bars/islands and banks with more potentially open habitat *(stream-parallel transects)*

- Are being actively colonized, by both willows and herbaceous plants
- Very dynamic and variable

2 – Open Banks & Bars





- Number of stems (willow, other) *increasing trends* (p near or >.05)
- Herb cover *increase* (p<.001)
- Bare ground/rock cover *decrease* (p<.001)

3 – Upper Floodplain Zone

- Mix of native (and some non-native) woody plants (privet, tamarisk, 3-leaf sumac, etc.)

3 – Upper Floodplain Zone

- Mix of native (and some non-native) woody plants
- Privet and others = dense, stable
- Tamarisk rare* except at Salt Creek; there = mostly defoliated
- Little to no change over time in this vegetation type

- *Tamarisk & RO = rare due to efforts of DRRP & Conservation Legacy crews!

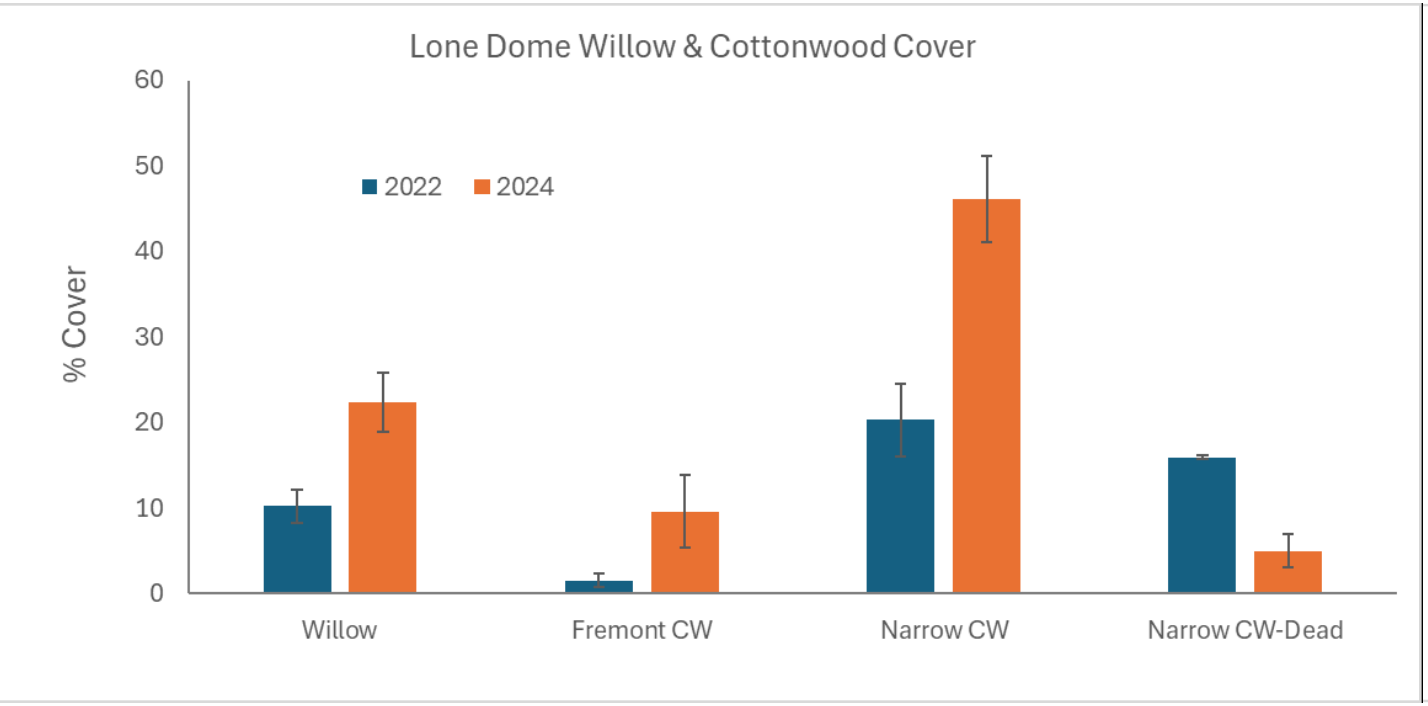
3 – Upper Floodplain Zone

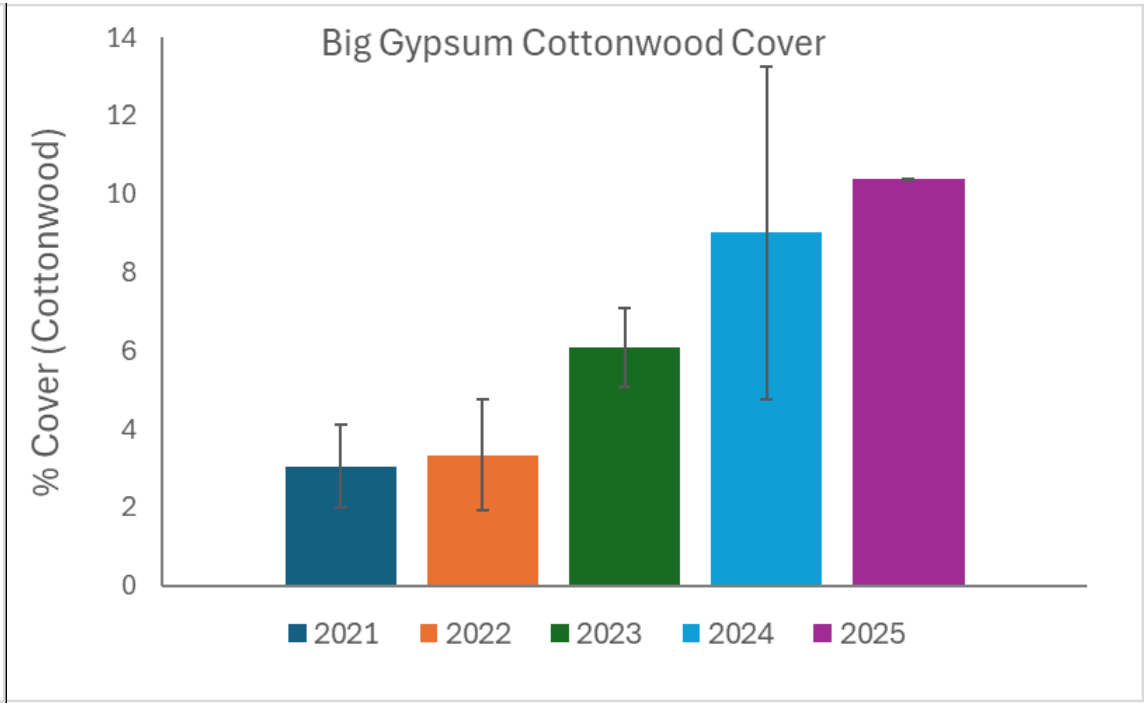
- Cottonwoods also most abundant in this zone and where well-established showed increases

Lone Dome – both saplings (narrow-leaf) and large canopy trees (mostly Fremont).

Big Gypsum – small trees (<4m tall, Fremont), re-sprouting post- browsing (beaver, cattle, etc.).

3 – Upper Floodplain Zone





- Cottonwood cover increased after 2023 high flows raised water table
- Fremont (both sites) and narrow-leaf (Lone Dome only) both responded

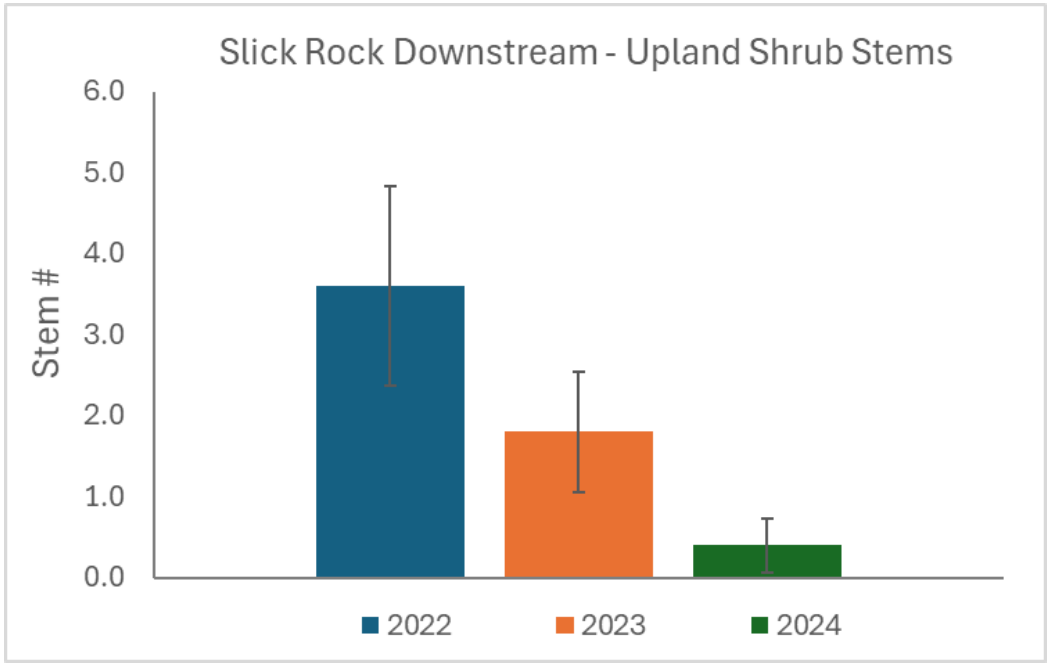
- At Lone Dome, willow and narrow-leaf changes = significant (p=.042 & .014); Fremont trends not sig. at either site. Amount of apparently “dead” narrow-leaf saplings declined significantly after 2023 (p=.005).

4 – Upland Shrub Zone

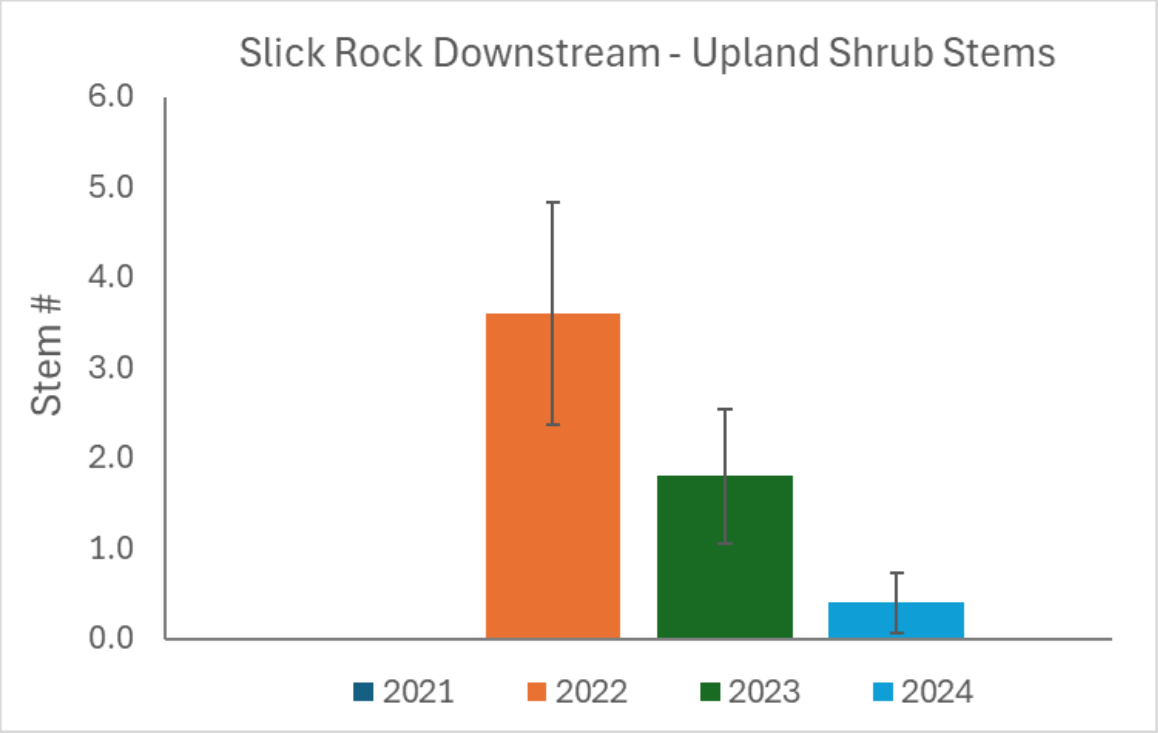
- Higher and drier locations mainly outside of floodplain, but also moving onto upper floodplain in some cases
  - Sagebrush, rabbitbrush, saltbush = main species

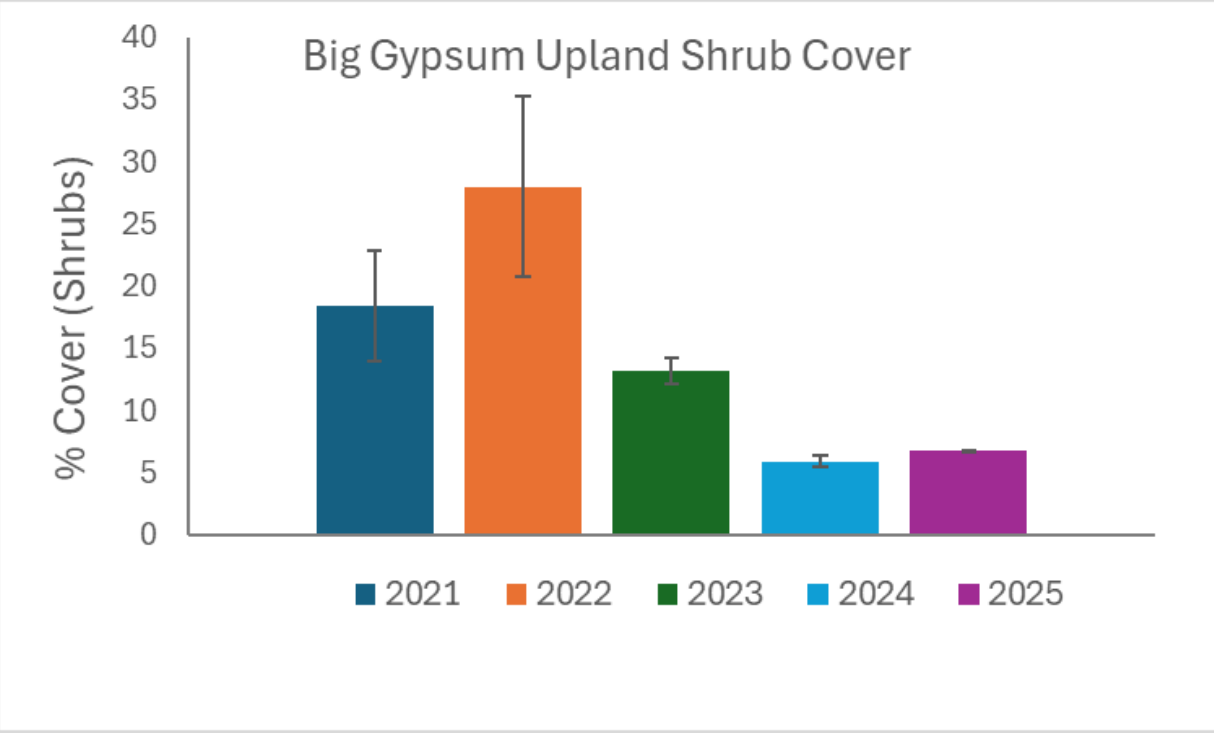
4 – Upland Shrub Zone

- Upland species do not tolerate prolonged inundation or sediment deposition



4 – Upland Shrub Zone

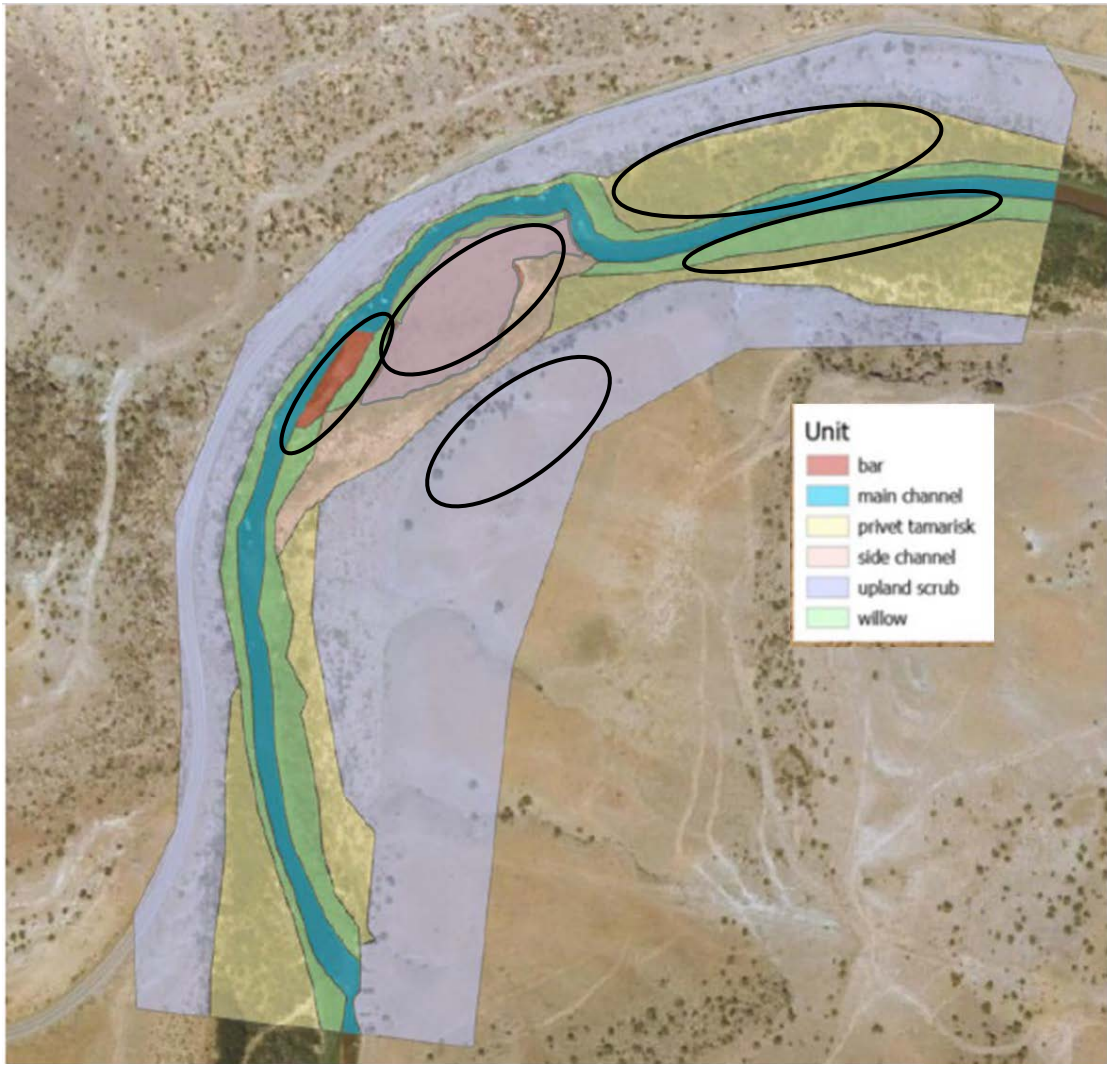




- Both stem counts (lower Slick Rock) and % cover (Slick Rock & Big Gypsum) of upland shrubs declined after 2023 high flows and 2024 monsoon inundation (p=.029 & .043)
- Previous dry years led to an increase in these species on the floodplain

Vegetation Monitoring on the Dolores River

- Divide sites into four major ***eco-geomorphic*** *zones*
  - Densely vegetated bank
  - Open Bar/Bank habitat
  - Upper Floodplain
  - Upland Shrub zone



Slick Rock Downstream site; map by Joel Sholtes & Jon Harvey

Vegetation Monitoring on the Dolores River

- WHY
- HOW
- FINDINGS – across 4 eco-geomorphic zones

- Management Implications?

2 Big Take-Aways for Management:

- **Persistent Low Flows** have **negative** impacts on wildlife habitat via vegetation change:
  - 3 points, 5 slides

- Even occasional **Prolonged High Flows** have immediate **benefits**
  - 3 points, 4 slides

Problems with Persistent Low Flows:

- Willows **colonizing open bar habitat**:

Willow sapling established on cobble bar

Salix exigua colonizing cobble bar


7/13/2023; 84 cfs
Big Gypsum Mid-Channel Bar: 2023 (above) & 2025
7/15/2025; 14 cfs

Problems with Persistent Low Flows:

- This leads to **Channel simplification** via willow encroachment:

Management Implications

- Implications for **Fish Habitat:**

- Many reaches now = narrow, single-thread, low potential for fish spawning and young fry habitat

Photo: Lower Slick Rock fall 2023, Jon Harvey

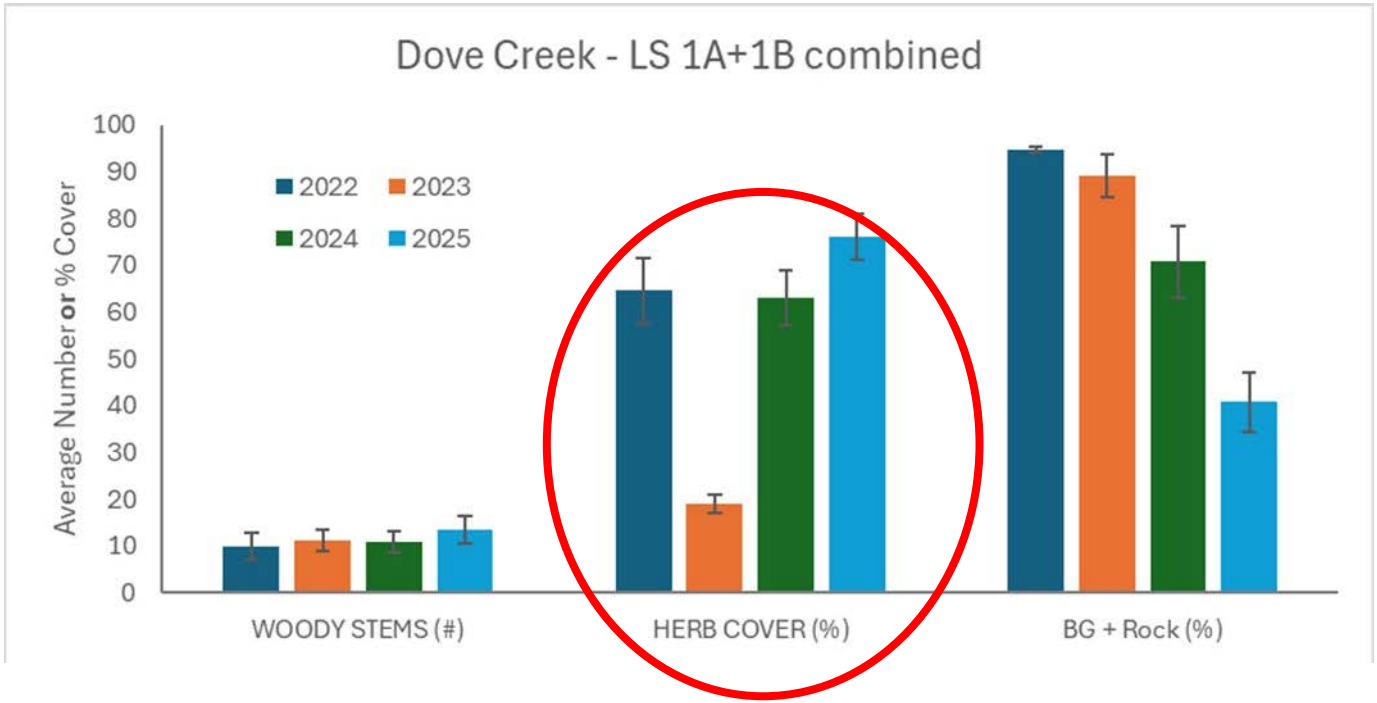
Problems with Persistent Low Flows:

- **Floodplain transition**:
- Multiple dry years are detrimental to riparian species & wildlife habitat

Lone Dome: dead or dying cottonwood on upper floodplain

Benefits of Prolonged High Flows:

- High flow events inundate and **scour bars** and banks,
- Slowing down colonization
  (but repeated scouring needed to keep bars open)



Management Implications

- Implications for **Fish Habitat:**

- Open cobble bars are important fish spawning habitat; need frequent high flow scouring to slow vegetation expansion and remove silt

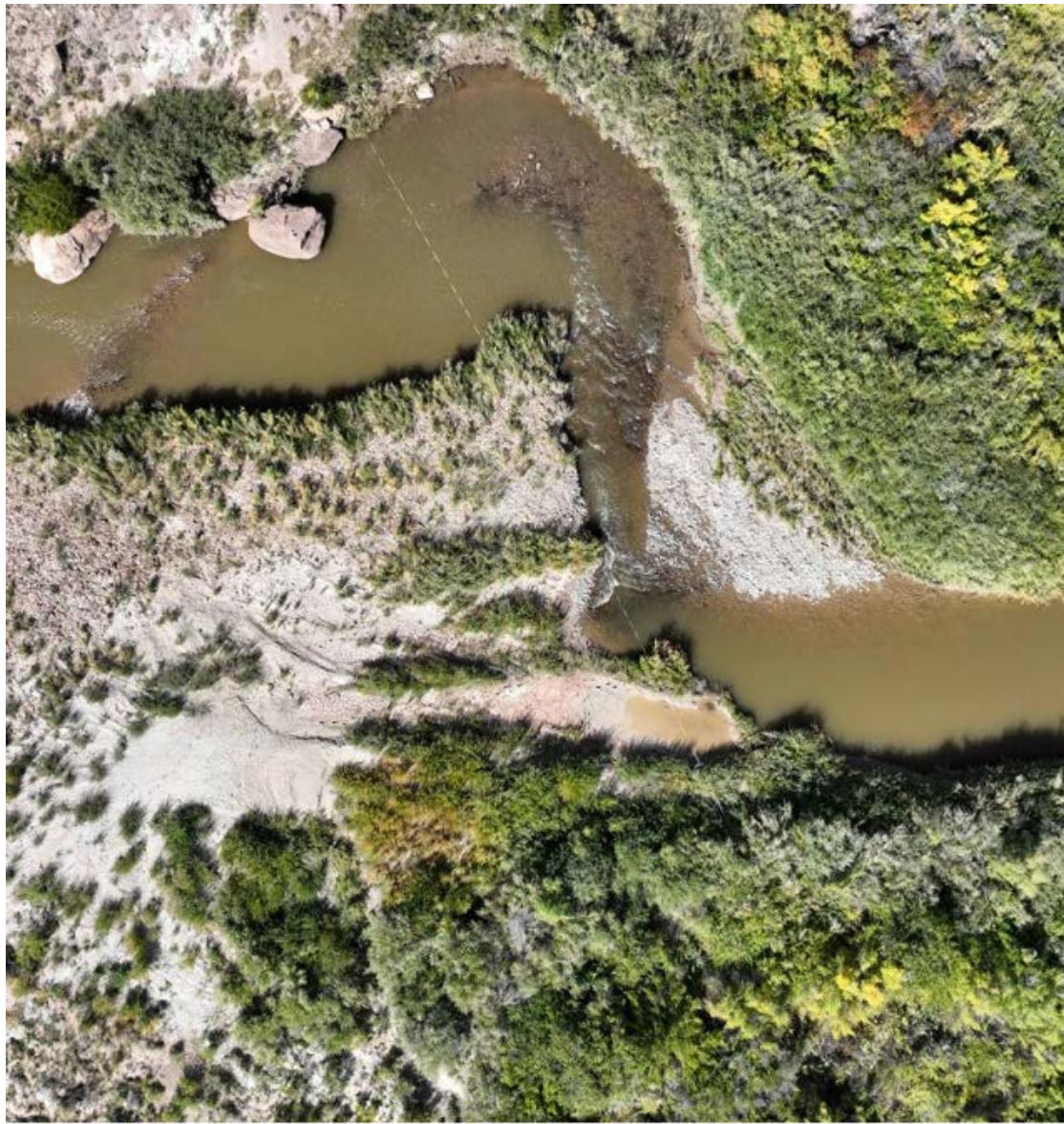
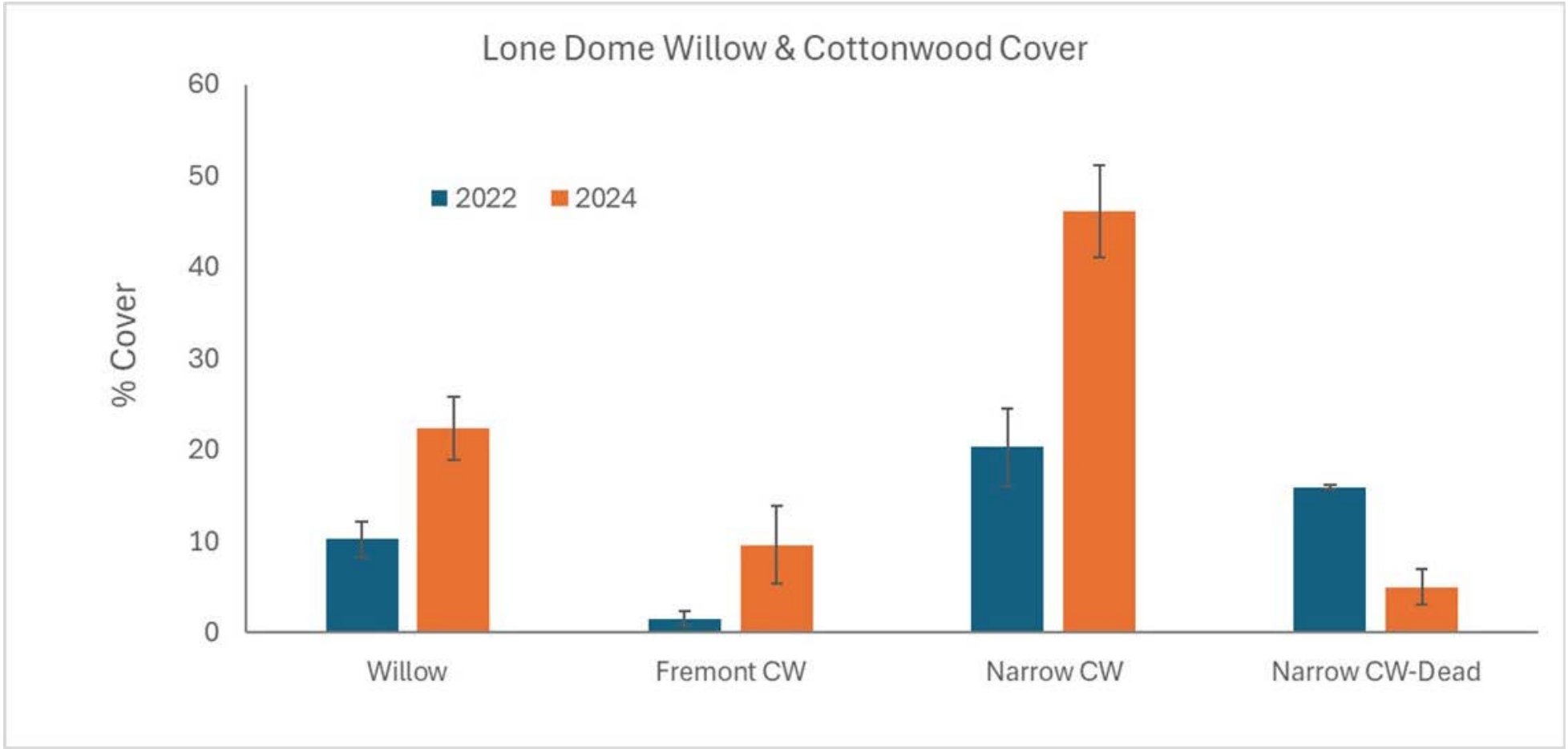


Photo: Lower Slick Rock fall 2023, Jon Harvey

Benefits of Prolonged High Flows:

- High flow events **re-charge and raise the water table**
- Immediate benefits to riparian willows and cottonwoods



Benefits of Prolonged High Flows:

- High flow events **“re-claim” the upper floodplain** from take-over by upland shrubs

2 Big Take-Aways:

- **Persistent Low Flows** have **negative** impacts on wildlife habitat via vegetation change:
  - Bar colonization
  - Channel simplification
  - Floodplain transition

- Even occasional **Prolonged High Flows** have immediate **benefits**
  - Bar/cobble scouring
  - Floodplain water table recharge
  - Inundation of upland shrubs

Management Implications

- More implications for **Fish Habitat:**

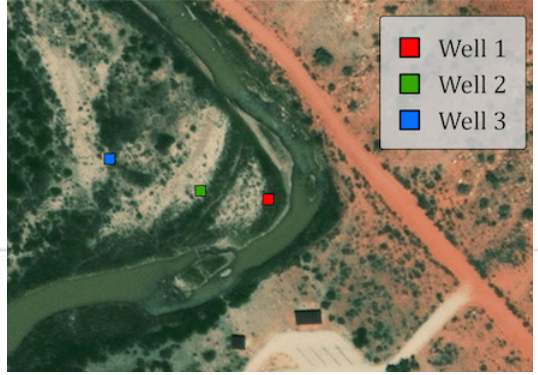
- Willow growth favored by high flows = problematic
- Block access to potential side-channel habitat for young fish
- = *Sites for focused vegetation removal at upstream ends of side channels?*

Big Gypsum boat ramp

Questions?

With gratitude to many FLC Undergrads & Others – my fearless field crews

& to the Dolores River and its plants, especially the willows…



2023: Big Gypsum

Hydraulic Head (ft)
1620
1619
1618
1617
1616
1615
1614
1613

Discharge (cfs)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0

4/4/2023
5/4/2023
6/3/2023
7/3/2023
8/2/2023
9/1/2023
10/1/2023
10/31/2023

Date

Well 1
Well 3
Discharge

- Contrast between sites depending on flow dynamics

- Salt Creek:
  - Much lower willow cover
  - Lower upland shrubs
  - More Privet & (dead!) Tamarisk
    - DRRP, Cons. Corps Crews!