Quantifying infiltration in ephemeral streams

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Problem:

Dryland streams are flashy

- Can’t support much vegetation
- Fluxes are hard to measure
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Gabions

Commonly used in SW.

Intended to:

- Retain sediment
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Other potential effects:
- Increase greenness
- Increase infiltration
Previous studies:

Effect of gabions on vegetation
(Norman et al. 2014)
Gabions:
What happens below the surface?

A. No gabion
B. Gabion increases infiltration & recharge
C. Gabion increases infiltration & shallow storage
Gabions: How do they work?

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Gabions: How do they work?

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Approach:

Use temperature time series to quantify infiltration flux. (Blasch 2004)

Use wildlife cameras to quantify ponded surface area.

Scale flux up to get a volume per time.
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HYDRUS model:
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\[ Q = qA \]

- **Q** is infiltration flow
- **q** is infiltration flux
- **A** is ponded area
Research site: Babocomari Ranch
Most of the time it looks like this.
During flow it looks like this:
Nighttime imagery:
Problems:

- Only two flow events
- Both very large
- Both extended into the night
- Both drained quickly (~180 min)
Temperature data: During flow

Rod #5 with Precipitation 08/14 to 08/28

- Sensor rod buried (~10 cm)
- First flow at 6:10 PM on 8/20
- Second flow at 9:05 PM on 8/26
- Rainfall in Canelo Hills (2.25 in and 2.44 in)
Temperature data: Comparisons

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Findings so far:

- Our conceptual model of ponding followed by slow drainage does not describe the flows we saw.

- Rapid drainage suggests these gabions may be causing increased recharge but not storing moisture in the vadose zone.

- Cameras are useful for a variety of reasons beyond recording ponded area.
Other benefits of using wildlife cameras:
Questions?

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Extra information
More wildlife photos:

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Rainfall data: 3 rain gauges from rainlog.org
Photos from wildlife cameras
Don’t always match up!
Effects of cloud cover:

![Temperature and Cloud Cover Graph](image-url)
Setup:

Sensor rods:
5 upstream
3 downstream
2 at control site

4 iButtons per rod:
0, 25, 50, 100 cm
Sensor rods:

- Screw-on cap
- Inner PVC tube (5/8” outer dia., 1/2” inner dia.) with notches cut out for iButtons
- Outer PVC tube (3/4” inner dia.), remains in streambed while inner tube can be removed to access iButtons
- End cap
- Outer tube (3/4” inner dia.)
- Inner tube (1/2” inner dia.)
- Cross-section
- Space between outer and inner tube: 1/8”

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