Riparian Vegetation Monitoring Effectiveness:

UAVs (drones) vs. Field Crews

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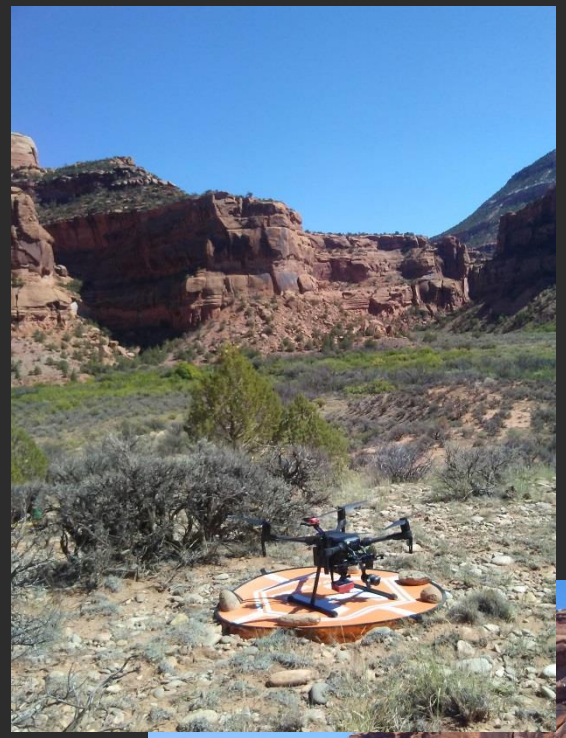
Overview

- The why…
- Information gathering
  - UAV users/operators
  - Partnerships conducting field monitoring



Overview cont…

- Guided a pilot project
- The site: Dolores River reach

Current Practices

Field Monitoring

- Ocular estimates
- Rapid monitoring with % cover
- Restoration progress and moving forward
- Monitoring for management actions
- Inform future treatments, prioritize sites

Tamarisk

Knapweed and Tamarisk

Current Practices

Field Monitoring

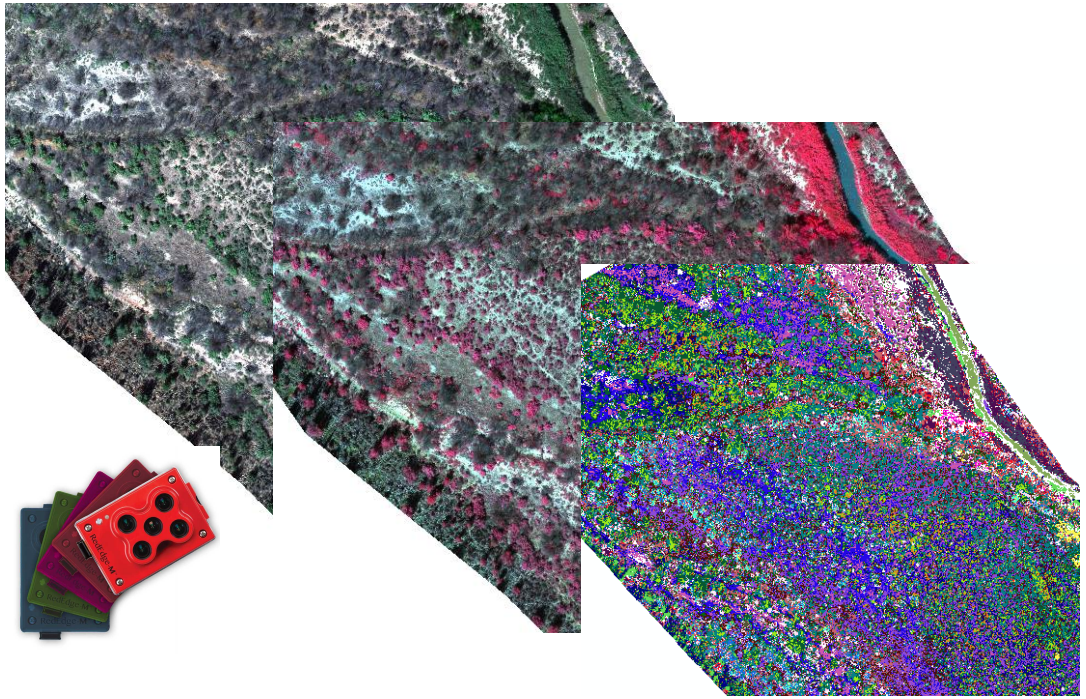
- Pros
  - Qualitative and ability for monitoring
  - Moving fast
  - Rapid monitoring % cover
  - Good site-wide species ID
- Cons
  - Subjective
  - Time restricted
  - Quantitative and ability for monitoring
  - Specific to organization

Tamarisk

Knapweed and Tamarisk

Drones + Science

Multispectral Imagery and Vegetation Classification



Multispectral Imagery

Unique chemical composition = unique spectral signature

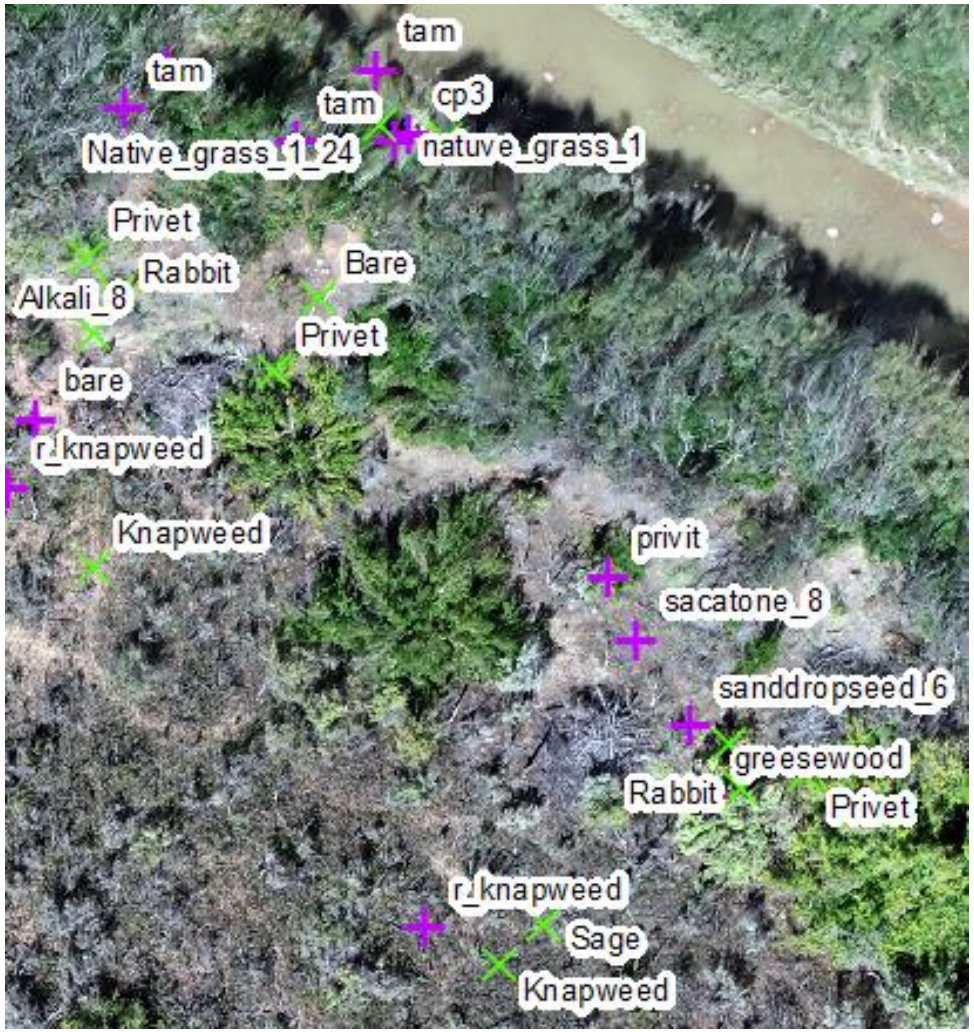
Multispectral Camera

- Captures specific, narrow spectral bands
  - Red
  - Green
  - Blue
  - NIR
  - Red Edge

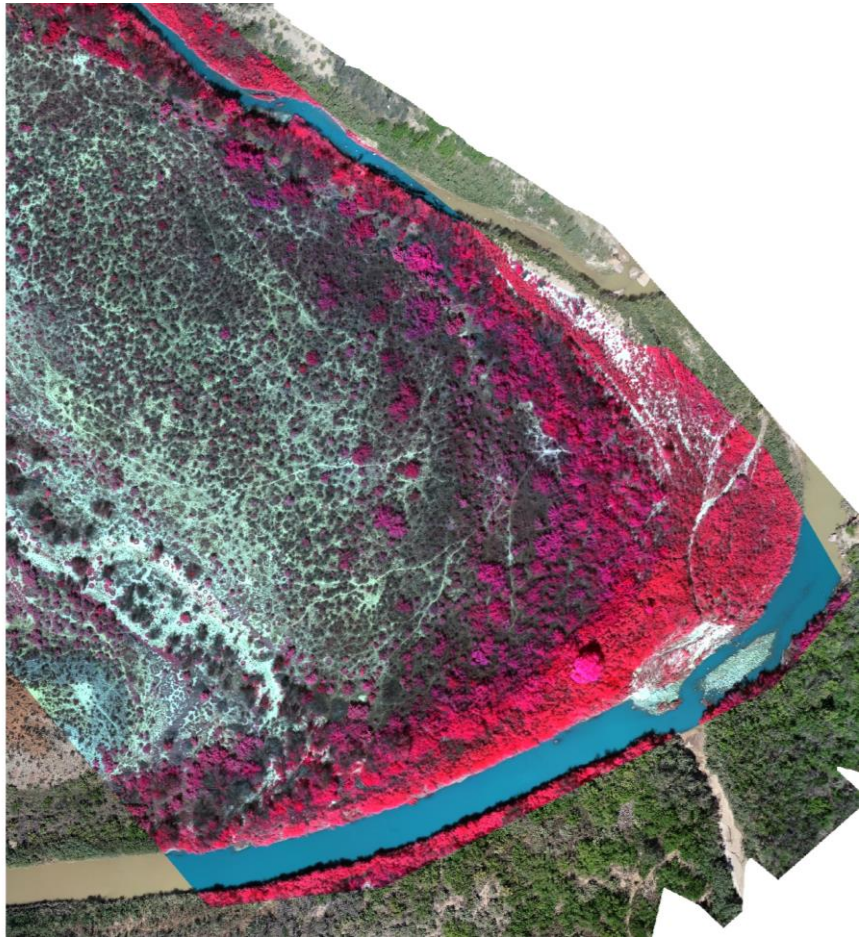
Multispectral Imagery

Vegetation classification

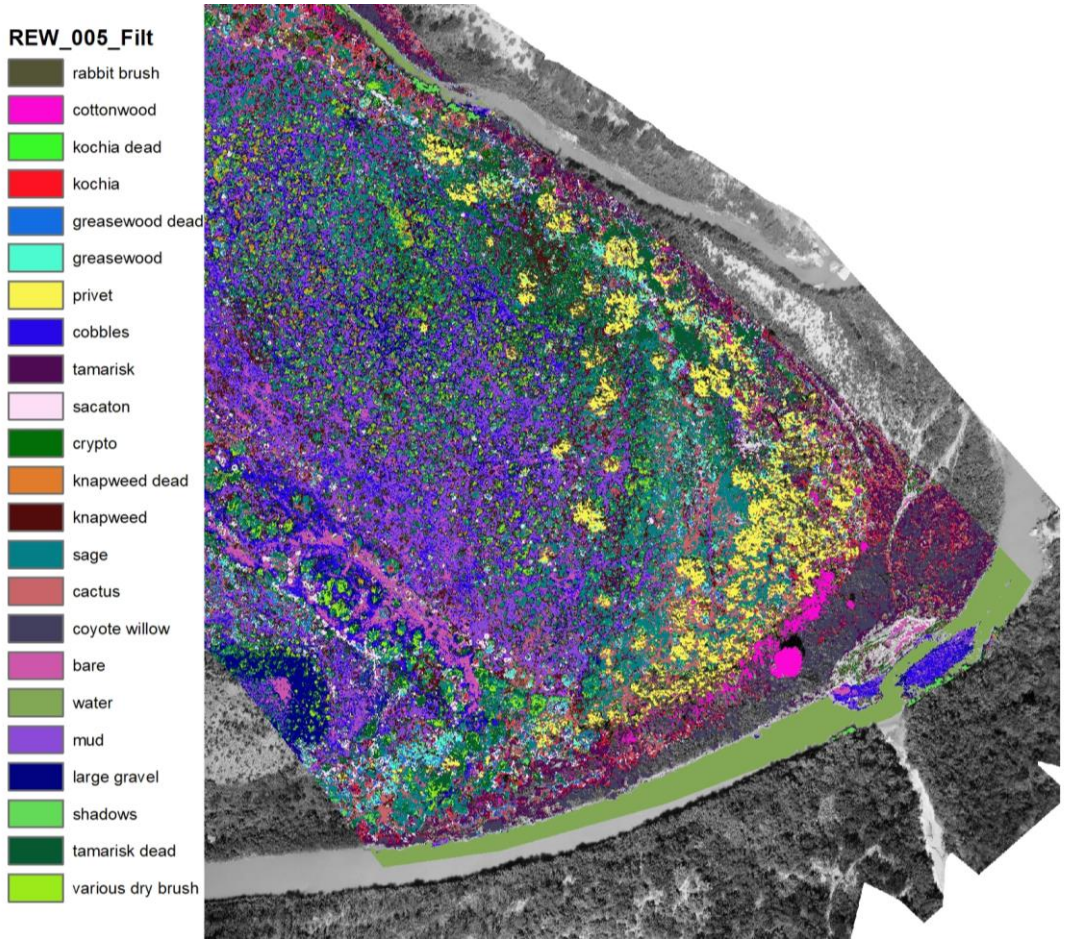
- Training sites correlate plant to the spectral signature
  - RTK-GPS used to 13 species at several locations
    - Tamarisk,
    - Privet,
    - Greesewood,
    - Russian Knapweed
    - Kochia
    - Etc.



Results

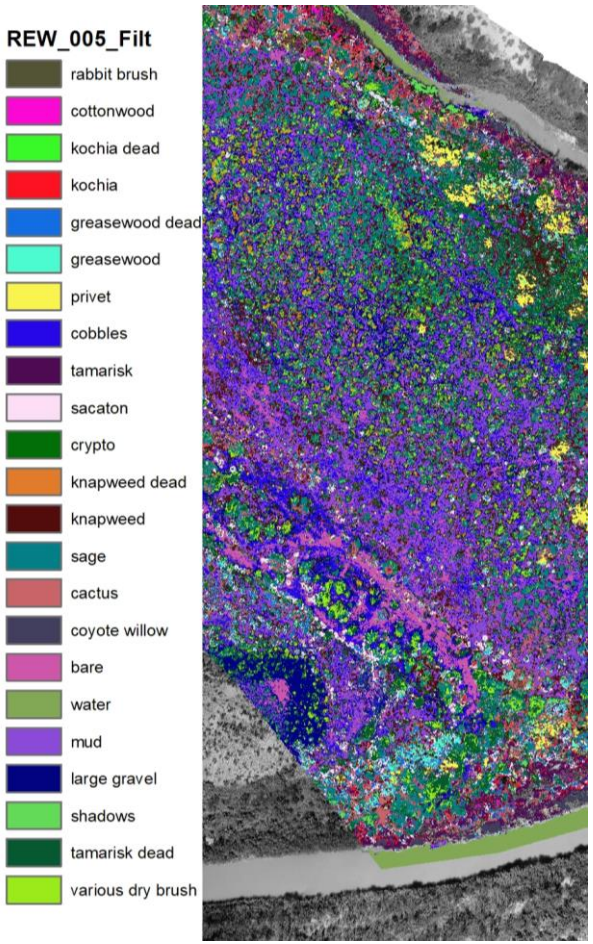


Multispectral Mosaic

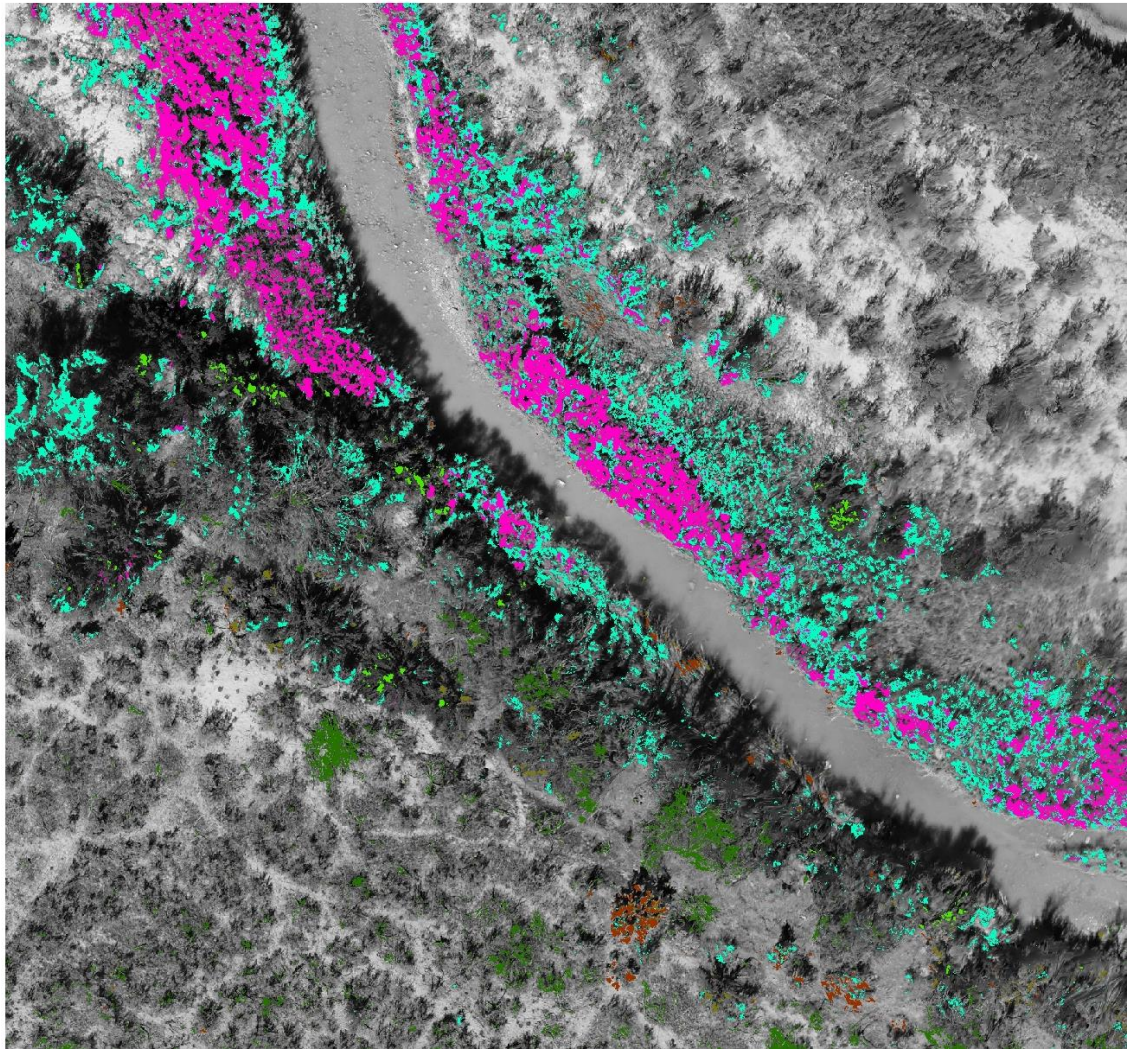


Vegetation classification

Results


REW_005_Filt
rabbit brush
cottonwood
kochia dead
kochia
greasewood dead
greasewood
privet
cobbles
tamarisk
sacaton
crypto
knapweed dead
knapweed
sage
cactus
coyote willow
bare
water
mud
large gravel
shadows
tamarisk dead
various dry brush

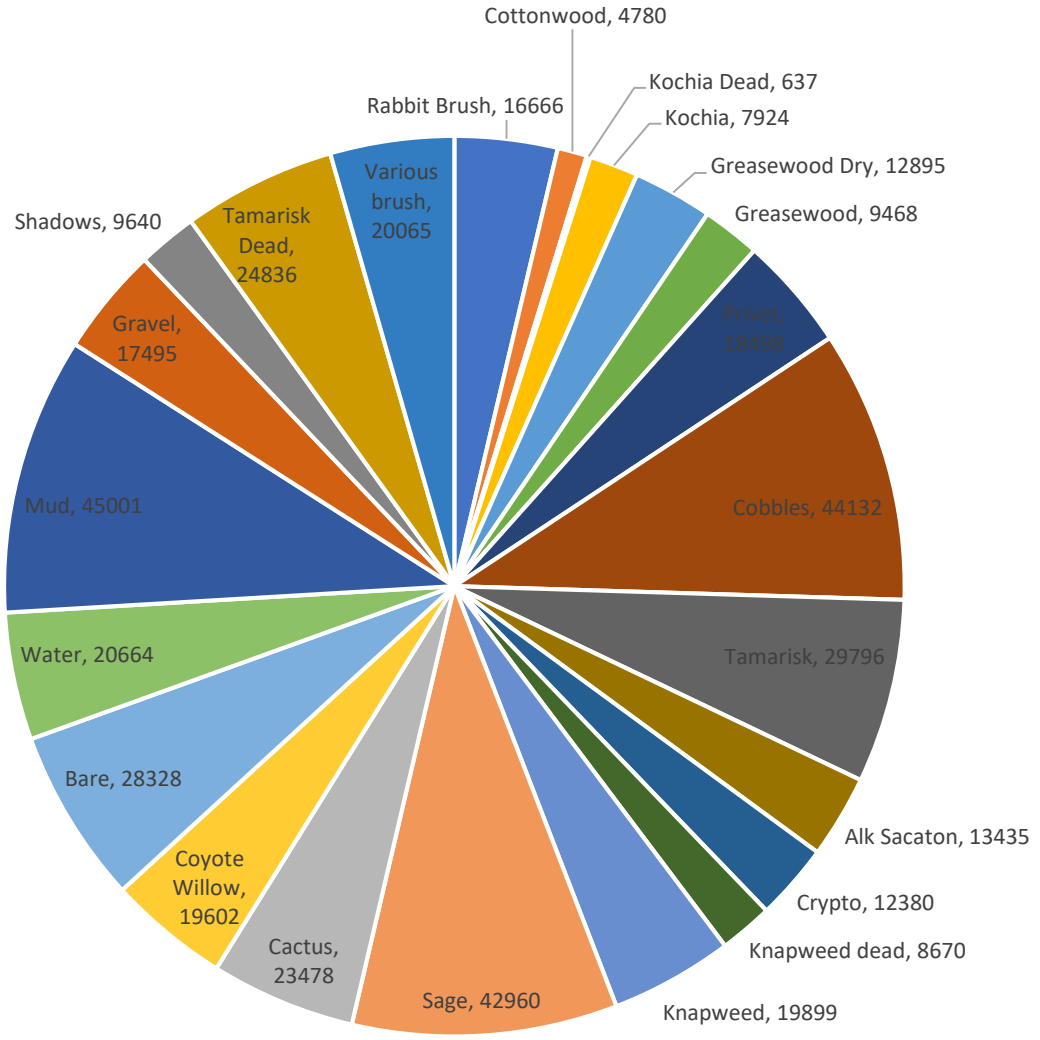

coyote willow
greasewood
privet
tamarisk
tamarisk dead



Results

Area (sq ft)

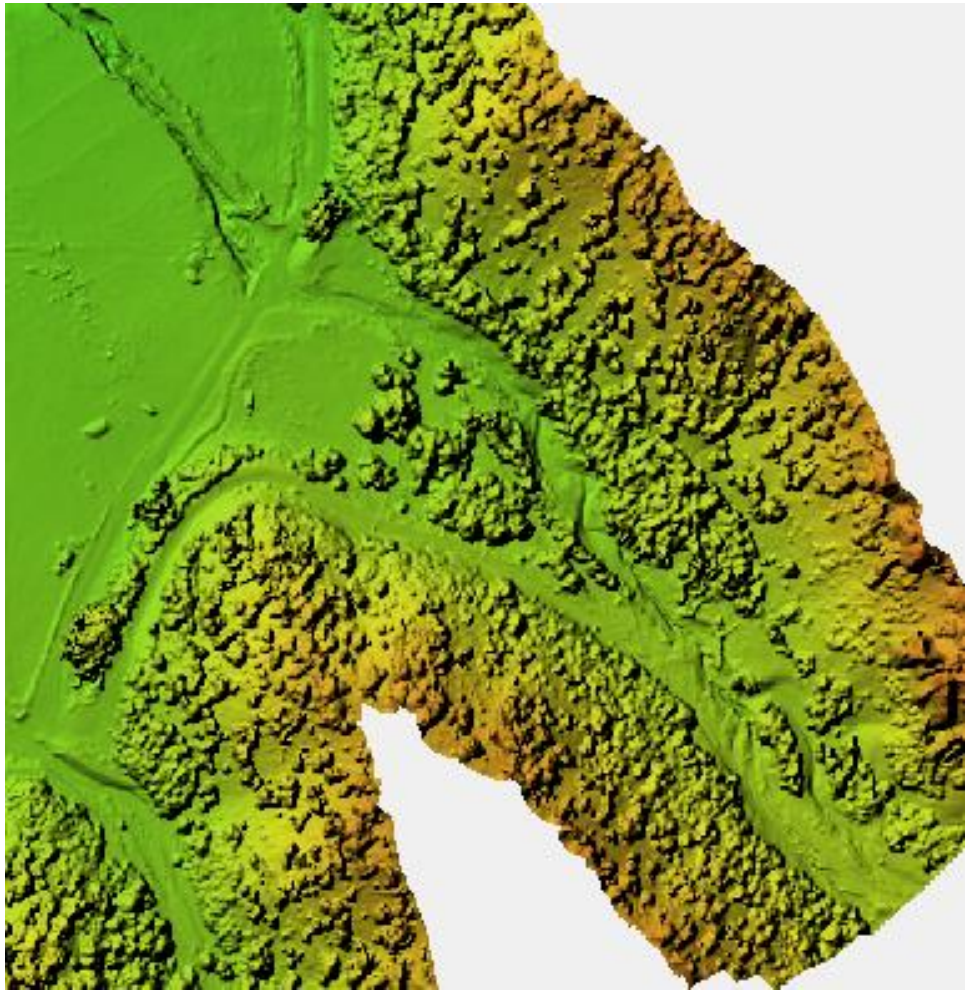
- Tamarisk = 29,796
- Greesewood = 22,363
- Russian Knapweed = 19,899
- Privet = 18,498
- Coyote Willow = 19,602
- Cottonwood = 4,780



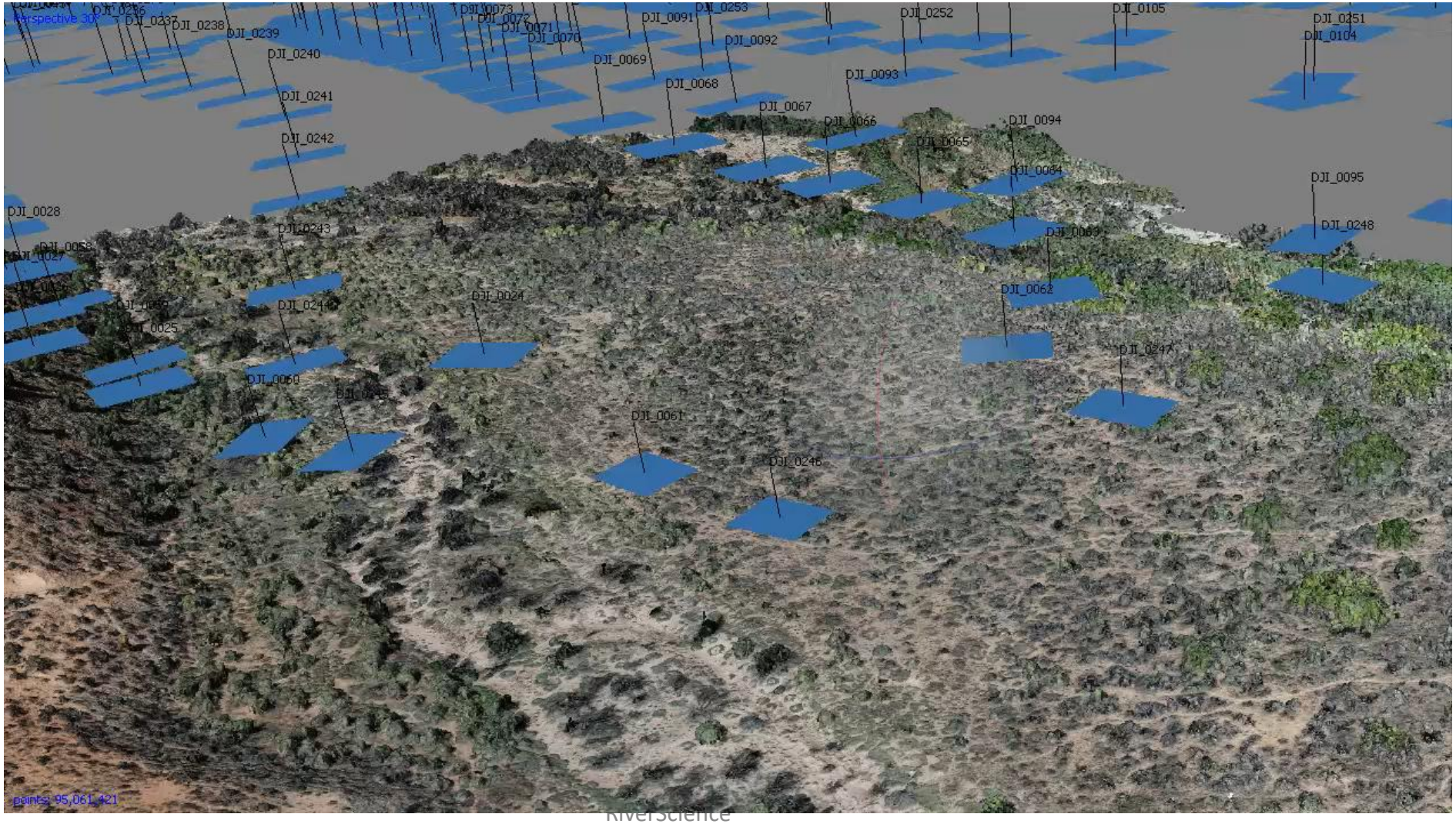
Volume

We have the area of Tamarisk (29,796 sq ft)

Can we get volume and biomass?



Elevation


DJI_0028
DJI_0027
DJI_0025
DJI_0024
DJI_0243
DJI_0244
DJI_0060
DJI_0061
DJI_0246
DJI_0062
DJI_0247
DJI_0063
DJI_0064
DJI_0065
DJI_0066
DJI_0067
DJI_0068
DJI_0069
DJI_0070
DJI_0071
DJI_0072
DJI_0073
DJI_0091
DJI_0092
DJI_0093
DJI_0094
DJI_0095
DJI_0248
DJI_0251
DJI_0104
DJI_0105
DJI_0252
DJI_0253
DJI_0240
DJI_0241
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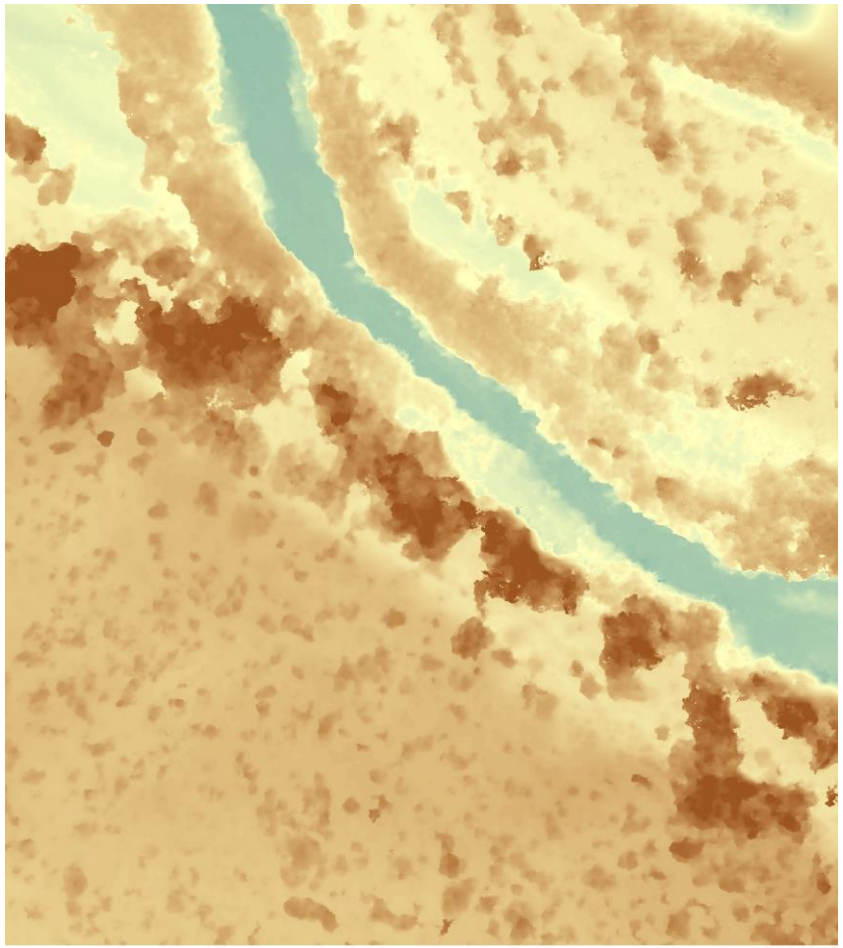
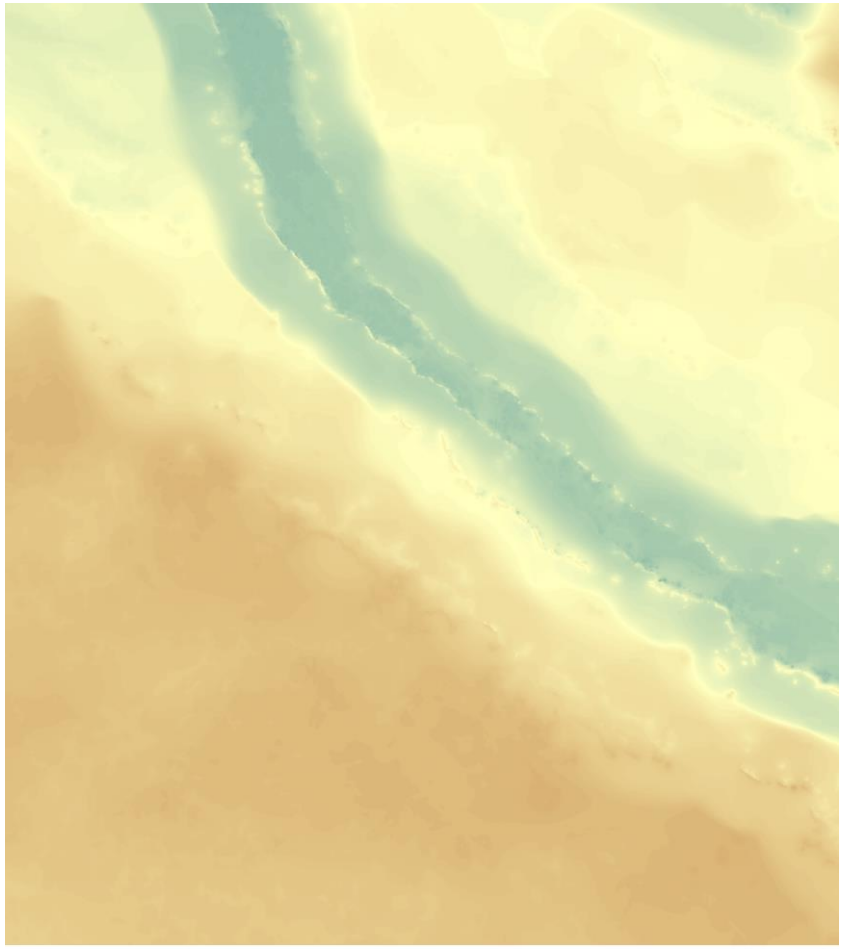
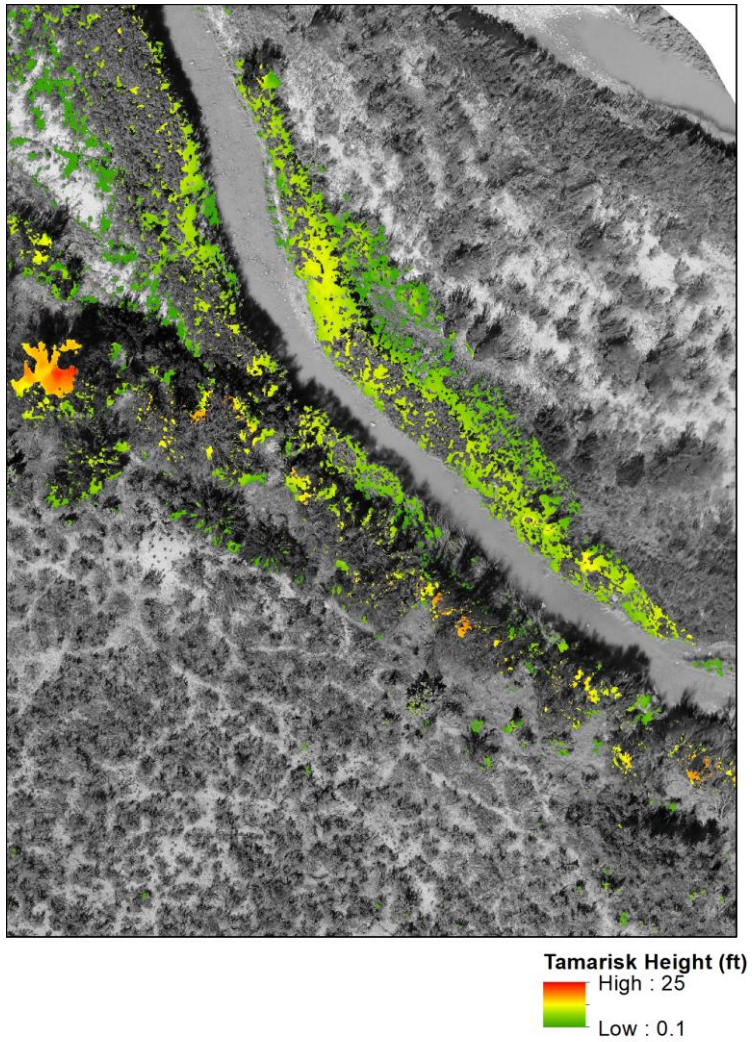
DJI_0239
DJI_0238
DJI_0237
DJI_0236

Elevation

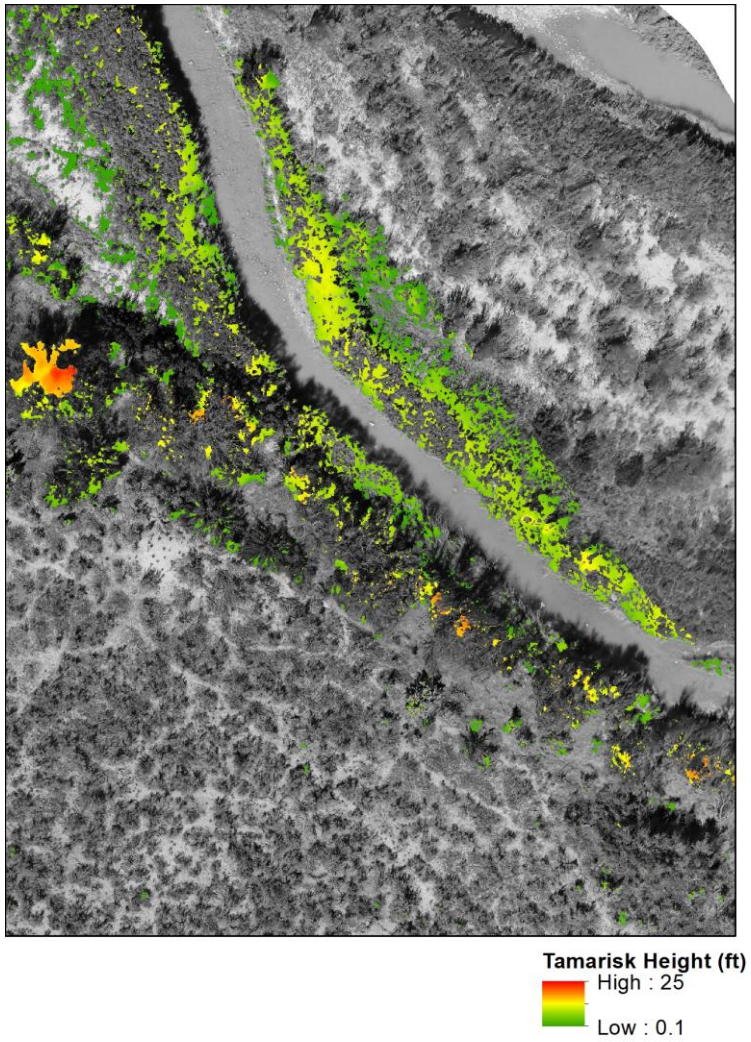

0 25 50 100
Feet
DEM
(ft)
High : 4980
Low : 4950

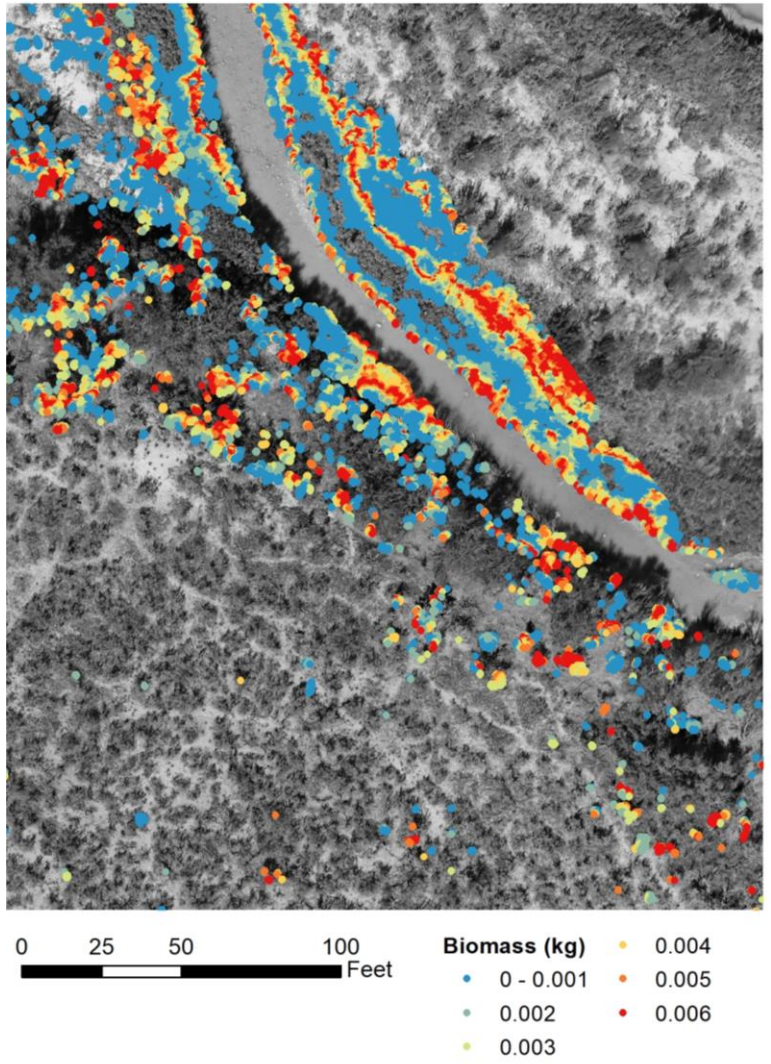

0 25 50 100
Feet
DEM Veg Removed
(ft)
High : 4980
Low : 4950

Results



Results





Biomass = 3,801 kg

Evangelista, et al. (2007)

Management action

- Field strategy
- Equipment
- Methods
  - Piles?
  - Chip?
  - Windrow?

- Wildfire prediction
  - Fuel load
  - Burn severity
    - Beetles
    - Green or dry
    - Density

Drone Survey

Pros

- Highly Quantitative
- Not subjective
- Scalable

Cons

- Post processing the data is technical
- Drones limited in wind, battery life, and can’t detect species beneath canopies

Comparison

Field Monitoring

- $15-27.50 per hour per person
- Up to 80 acres per week (with 2 person crew)

Drone Monitoring (including training survey)

- $100-$200 per hour
- Drones cover 640-1200 acres a day

Drones offer advantages if sites are > 40 acres or dangerous/difficult site

Both require an onsite person skilled in identifying all the local vegetation

Fit for the purpose?

Thank You


lotic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Conservation
Corps


WALTON FAMILY
FOUNDATION

Evangelista, P., Kumar, S., Stohlgren, T. J., Crall, A. W., & Newman, G. J. (2007). Modeling aboveground biomass of Tamarix ramosissima in the Arkansas River Basin of Southeastern Colorado, USA. *Western North American Naturalist*, *67*(4), 503–509. https://doi.org/10.3398/1527-0904(2007)67[503:MABOTR]2.0.CO;2

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