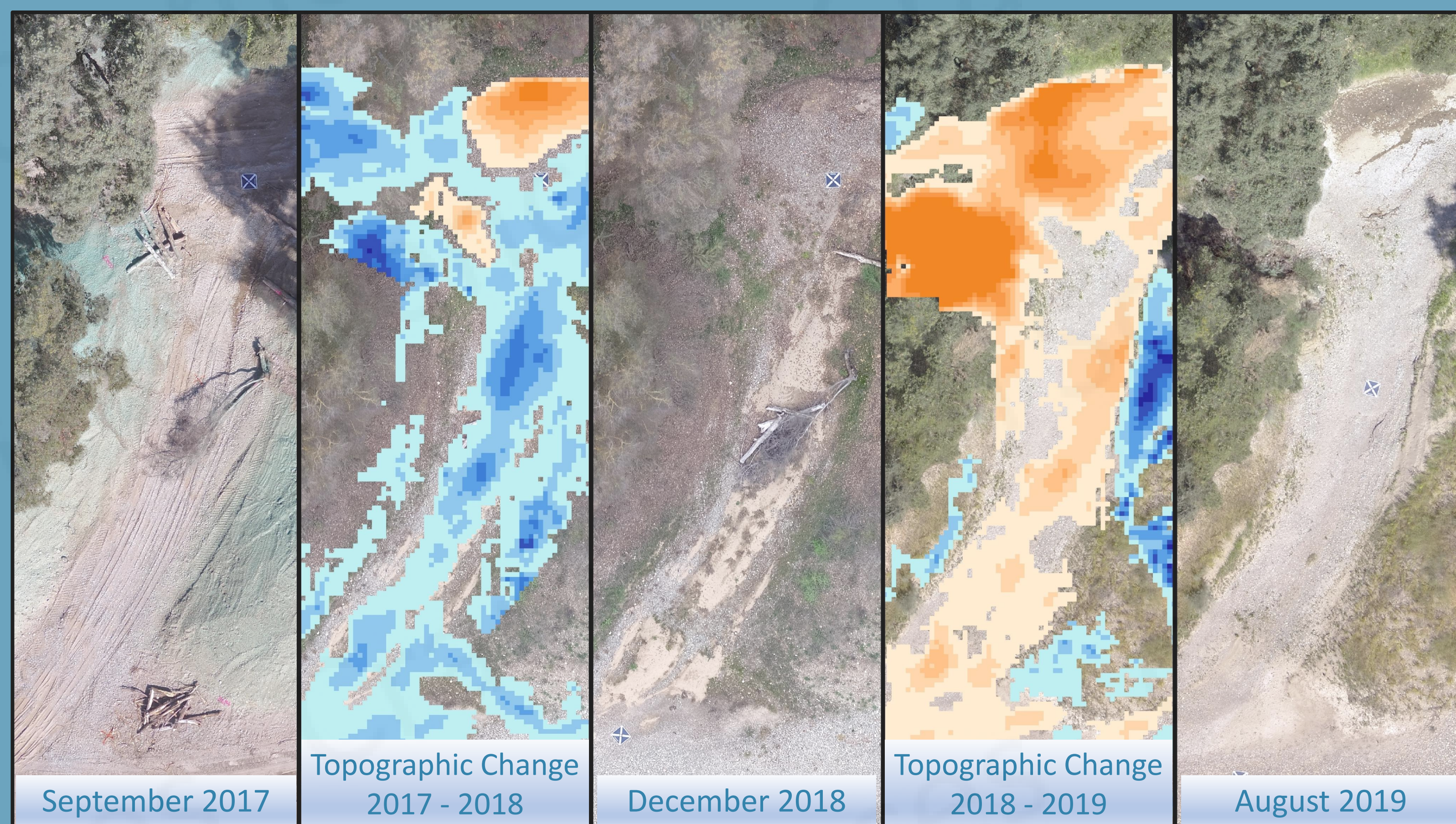


Salmonid Habitat Evolution Following Restoration Under Managed Flows

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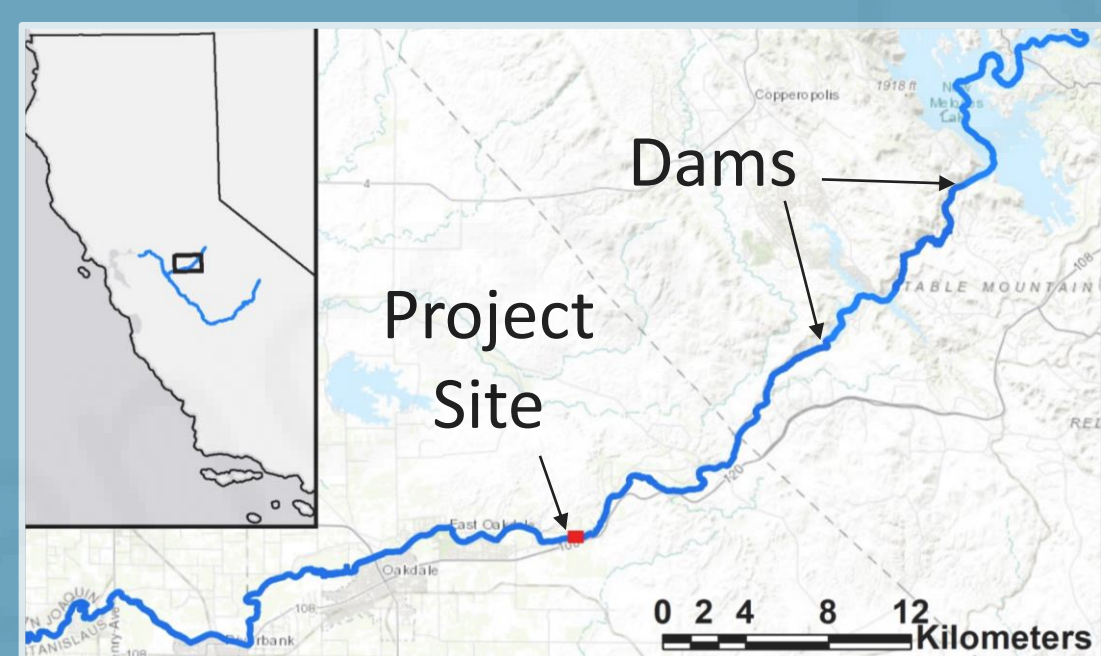


Deposition (blue) and erosion (orange) drive shifts in suitable habitat, and placed woody debris is exported from the project site, in two years following restoration.

Managing sediment may be just as important as managing flow for restored habitat sustainability in regulated rivers

INTRODUCTION

- Little is known about how created/enhanced habitats evolve
- Managed flows are a reality in regulated rivers and likely impact how habitats evolve
- Sediment and woody debris comprise important components of salmonid habitat (e.g. heterogeneity, cover)
- Objective: evaluate Chinook Salmon habitat evolution on a regulated, sediment-limited reach of the Stanislaus River following side channel construction and gravel augmentation

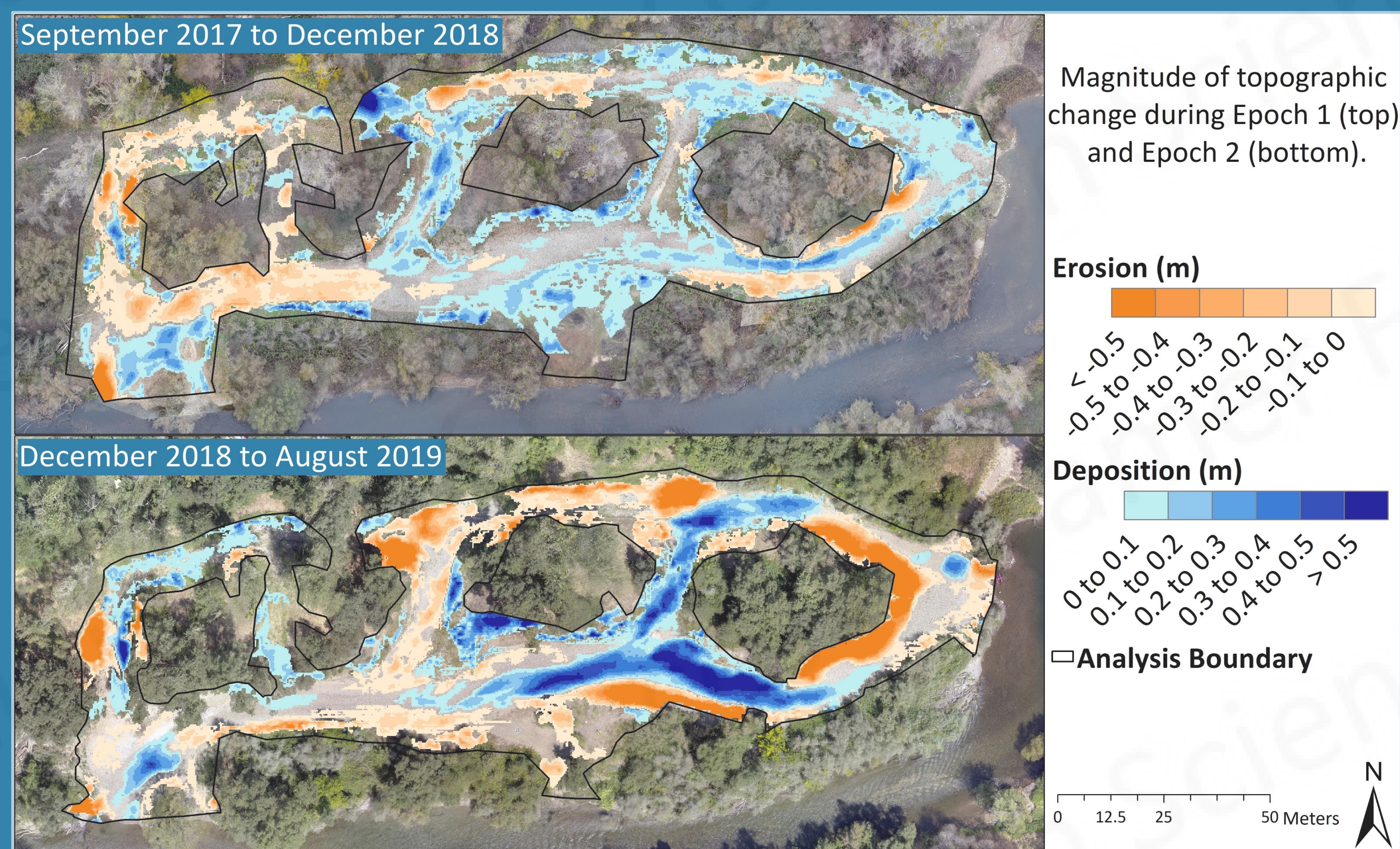
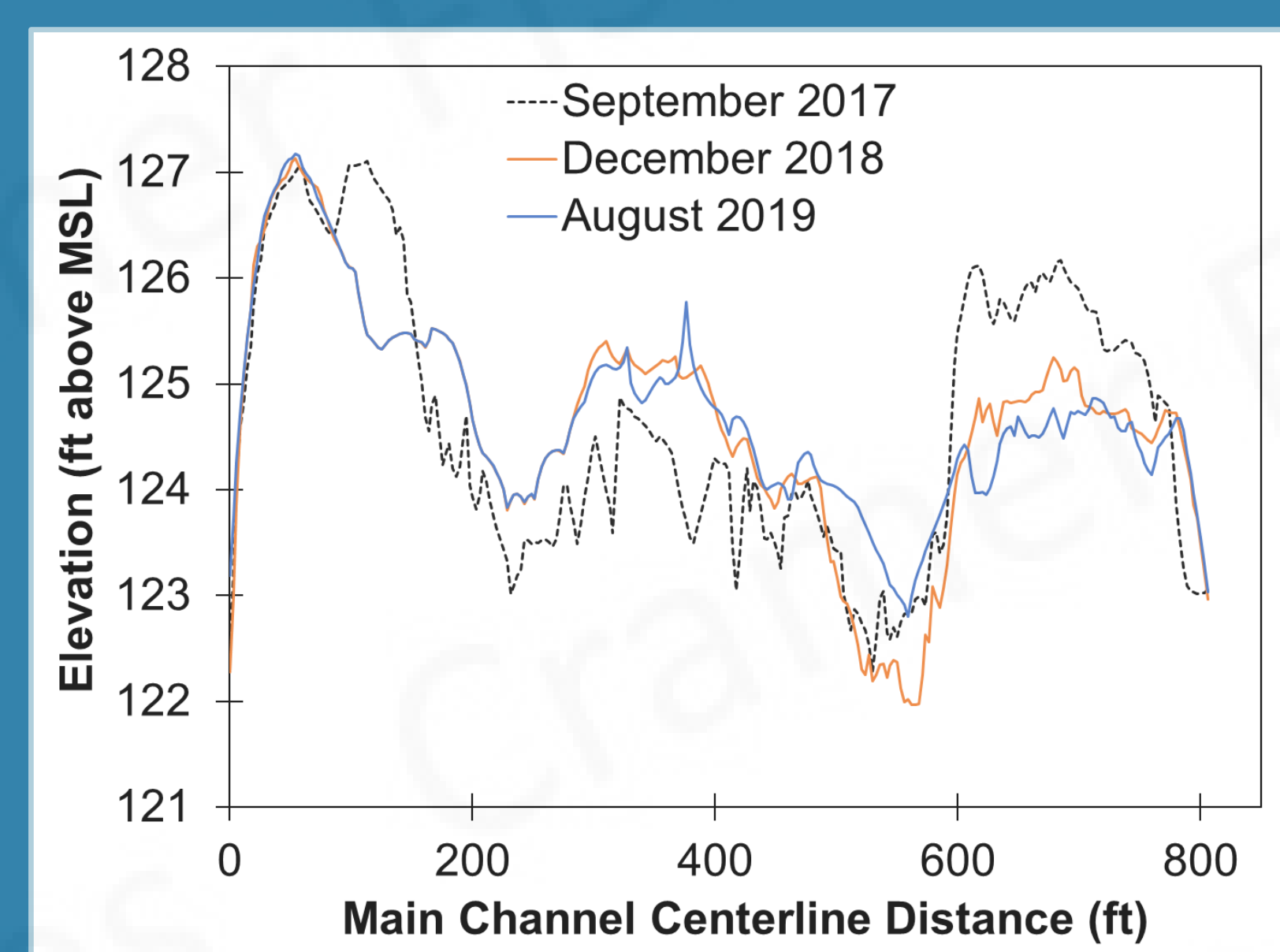
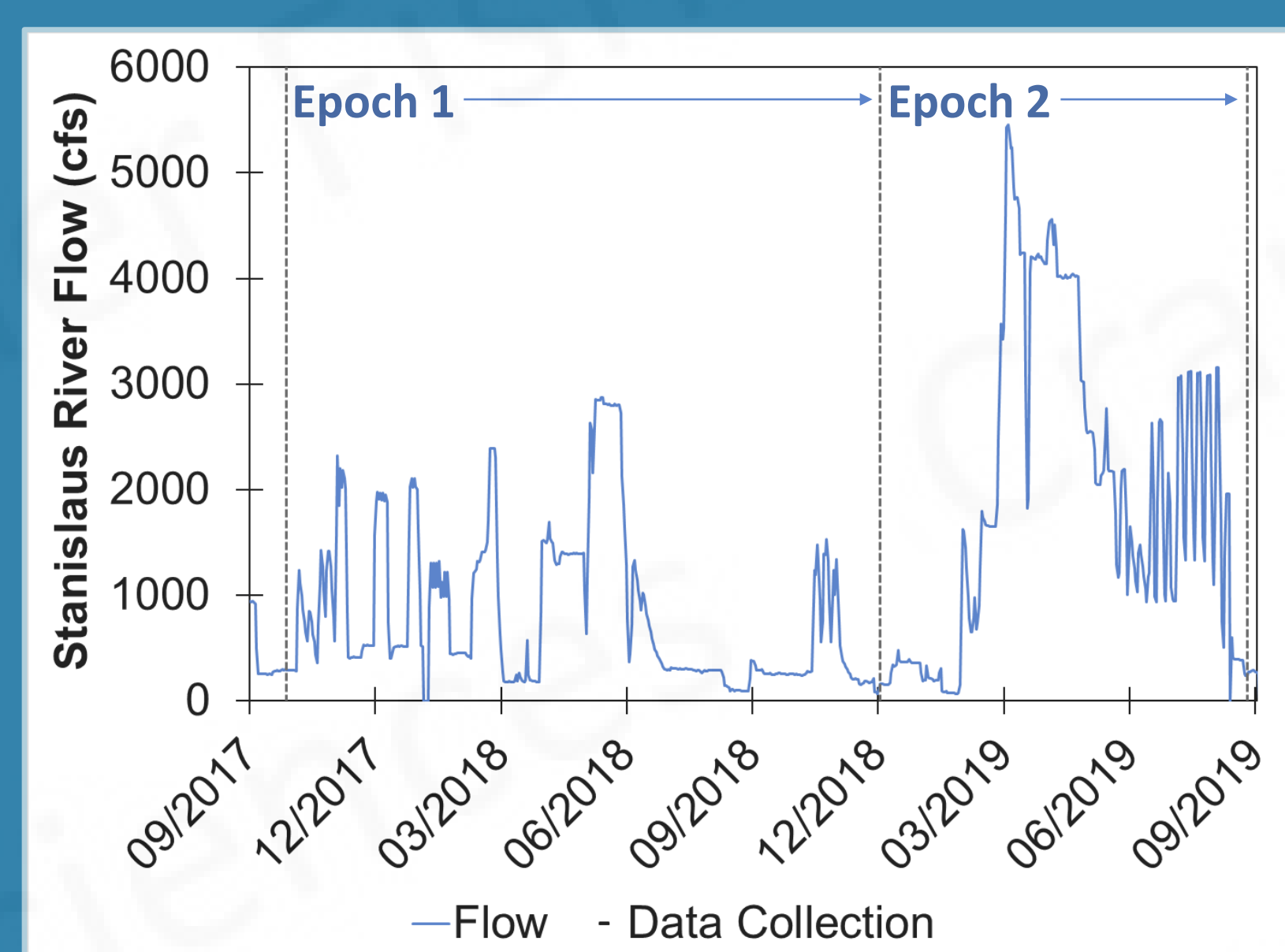


Study site on the lower Stanislaus River in California's Central Valley

METHODS

- Repeat surveys of topography, bathymetry, large woody debris, and drone imagery
- Digital elevation model development and differencing
- Chinook Salmon rearing habitat suitability indices applied to 2D hydraulic models
- Large woody debris tracking

TOPOGRAPHIC CHANGE DETECTION



Top left

- Epoch 1 (2017-18) – moderate flow pulses
- Epoch 2 (2019) – sustained flood control release

Top right

- Gravel placed in main channel was redistributed during both epochs

Bottom

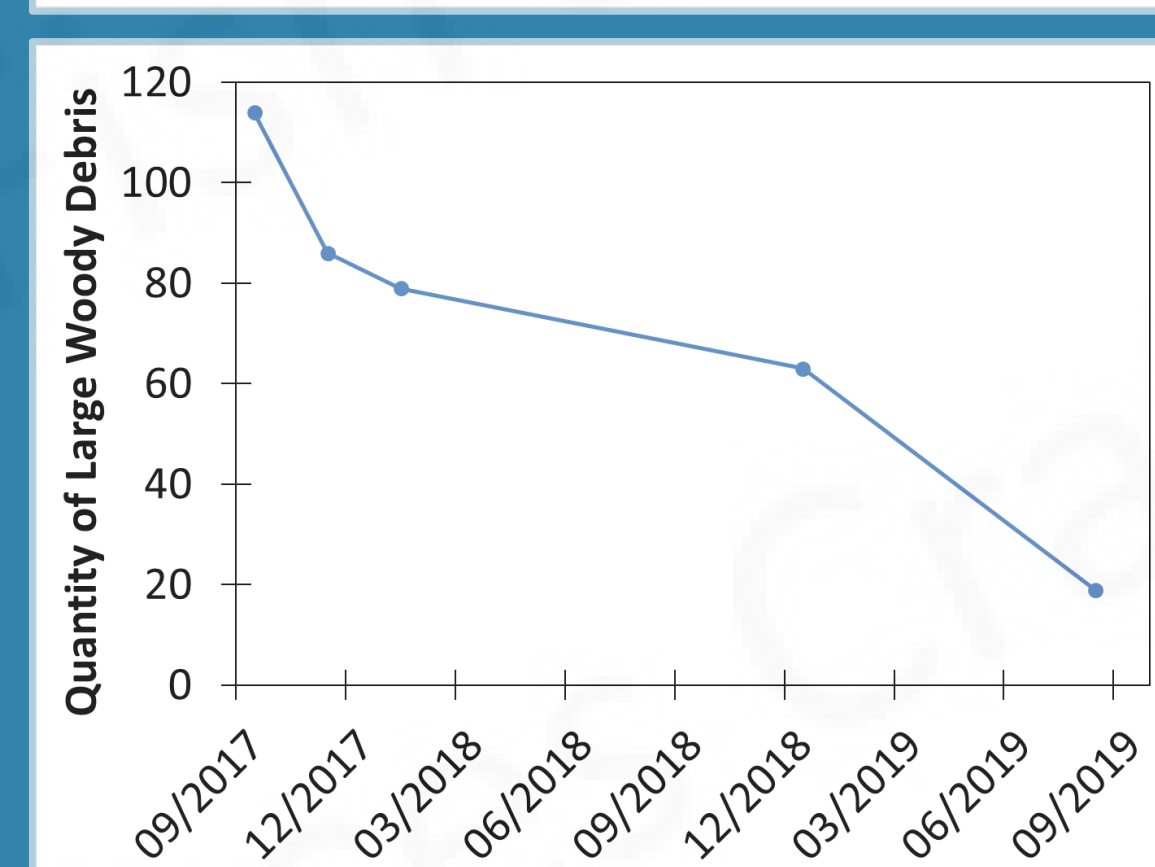
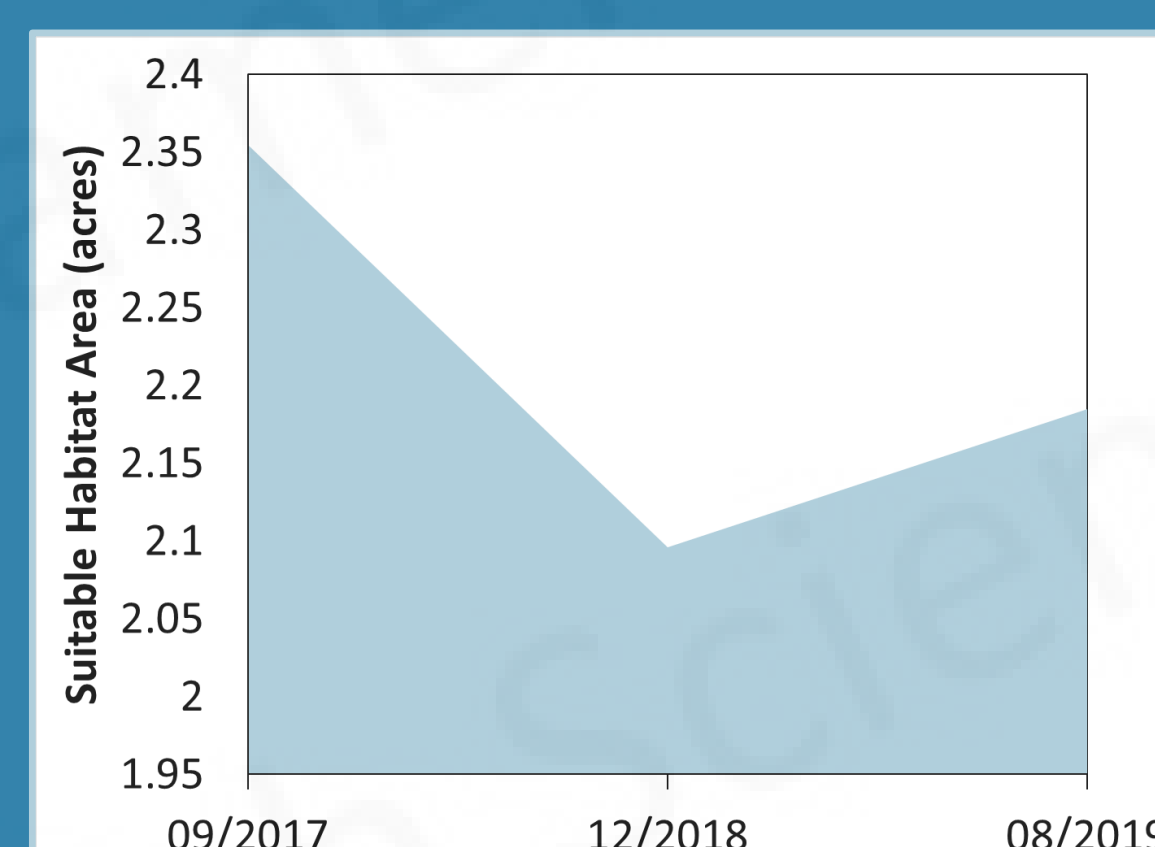
- Epoch 1 (pulses) produced net deposition in side channel (90 tons)
- Epoch 2 (sustained release) produced net erosion in side channel (-540 tons)
- The utility of flow regime management and physical habitat restoration is likely limited unless a sediment budget is developed that is synchronous with flow.

HABITAT SUITABILITY

- Geomorphic change shifted rearing habitat through time
- Suitable rearing habitat area in August 2019 remained 93% of as-built conditions.

LARGE WOODY DEBRIS

- Large woody debris placed during restoration was exported from the site, reducing salmonid cover.
- Recruitment did not balance export.



MANAGEMENT IMPLICATIONS

- Sediment and woody debris budgets, synced with flow regime, are needed to maintain the investments of physical habitat restoration over time.

We have a booth! (201)
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