

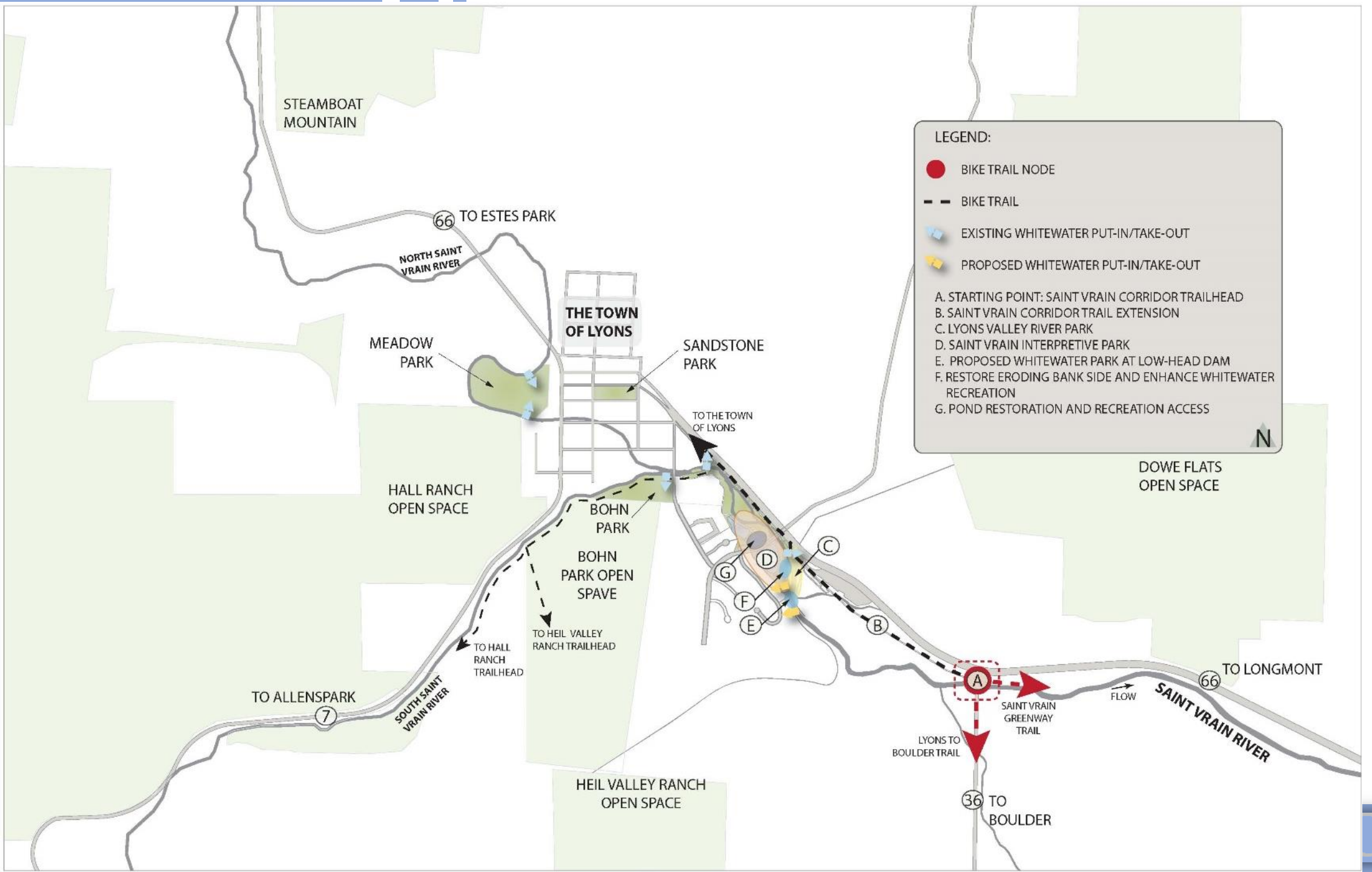
Disaster Recovery in Stages

Reconstructing Lyons River Corridor
St Vrain Creek and North/South Tributaries

No Name

Horseshoe Bend

Two Rivers





Damages:

- Over \$50 million in damage to the Town of Lyons Owned Infrastructure and Estimated \$70M in Private Property Damages
- \$19 million to Parks and Recreation facilities in Lyons, Colorado.
 - Every significant park except one was closed
 - In stream recreation and fish structures are Town Owned
- Entire Town Evacuated for 2 Months
 - Town bridges were closed or destroyed, DOT Bridges damaged
 - No public facilities (power, water, sewer, gas)
 - National Guard and County Sherriff Controlled Access

Prioritize River and Parks Work

- Priority 1—get people home
 - The Lyons Temporary Emergency Channel Project
 - Temporary infrastructure including above ground water and sewer systems
 - Temporary bridges and roadways
 - Re-purposed Wastewater Treatment Plant facilities
 - Town Meetings held in neighboring community

Prioritize River and Parks Work

- Priority 2—assessment, planning, patches
 - Damage assessments
 - Long range recovery planning (Lyons Recovery Action Plan = LRAP)
 - Watershed and Town-scale master planning – St Vrain Creek Master Plan
 - Infrastructure Re-Building for Hardest Hit Neighborhoods
 - Meadow Park phases 1 & 2
 - The re-creation of a park that accommodates the town’s festivals and visitors, Phase 1 serving an immediate need for outdoor space and camping

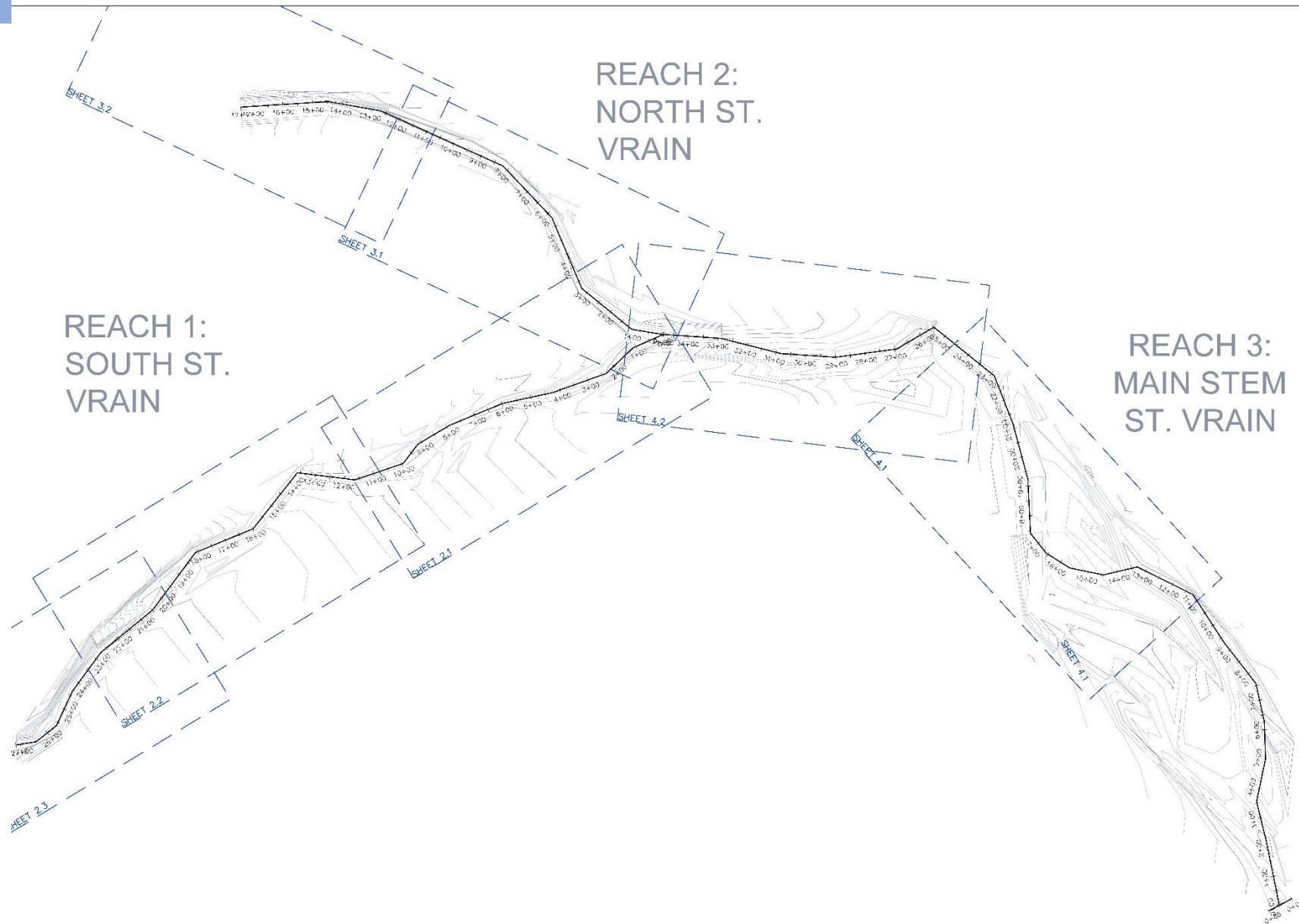
Prioritize River and Parks Work

- Priority 3—resilient projects that meet the town’s objectives
 - Public process
 - Long range recovery planning
 - Master planning
 - Habitat
 - Resiliency
 - Decrease flood risk
 - Stimulate economy

Example Project: The Flood Channel

- Objective 1: design a channel that will carry the 1 in 5 year flood
 - 20% chance flood event
- Objective 2: allow families to return home with a level of comfort by putting river in pre-flood channel enhanced with temporary protective measures.
- Limited funding parameters
 - Heavy armoring only in particular places
 - Given standard details by army corps of engineers
 - Told that if we exceeded mandate, project would not be funded
- Short timeline
 - Project needed to be completed by spring run-off

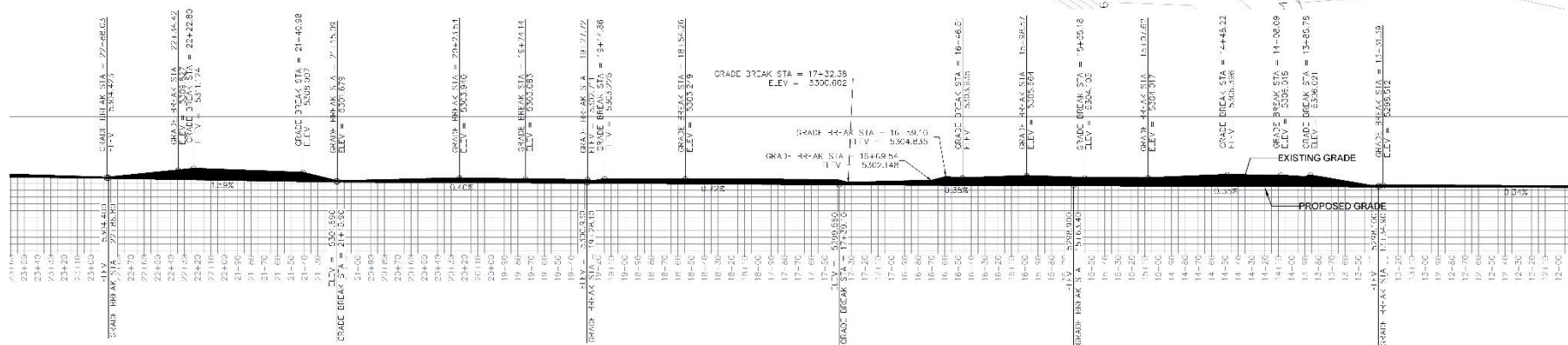
REBUILDING LYONS





MAIN STEM ST. VRAIN RIVER PLAN VIEW

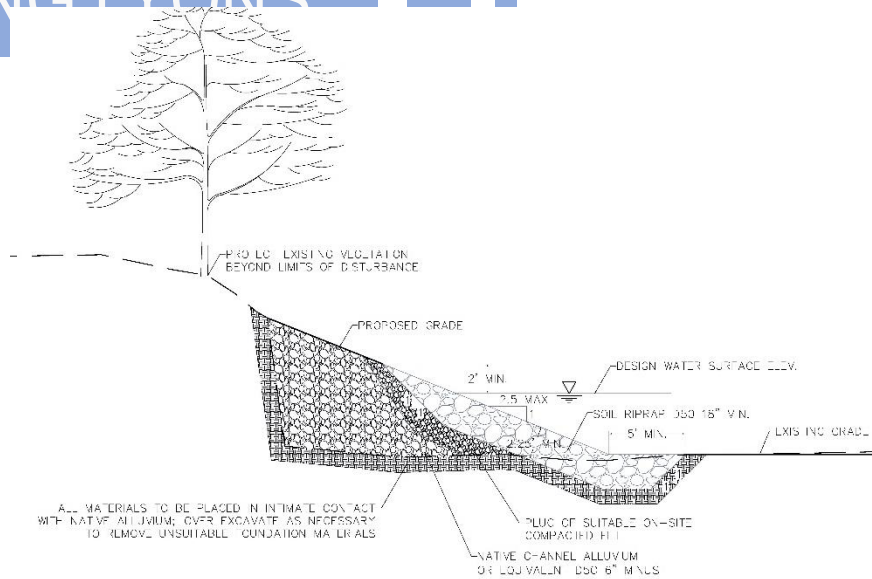
SCALE: 1"=40'



MAIN STEM ST. VRAIN RIVER PROFILE VIEW

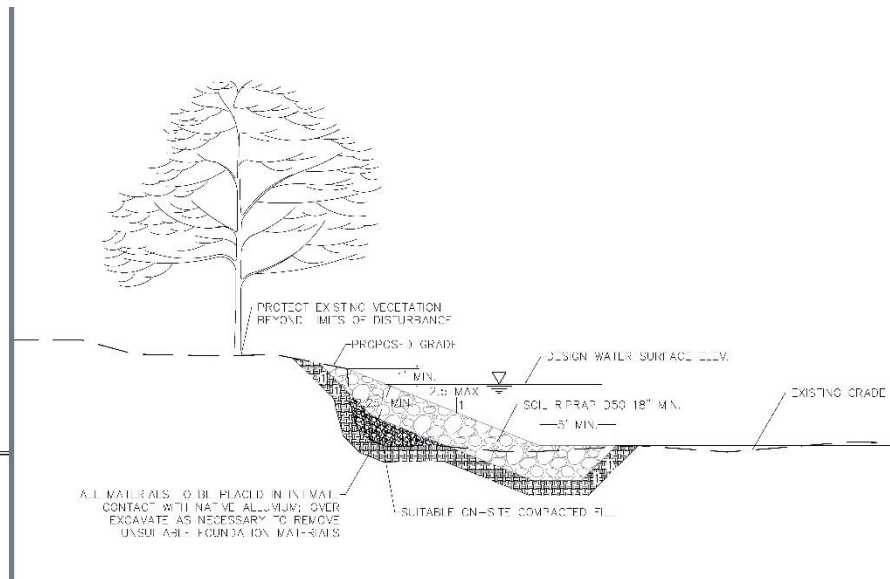


REBUILDING LYONS



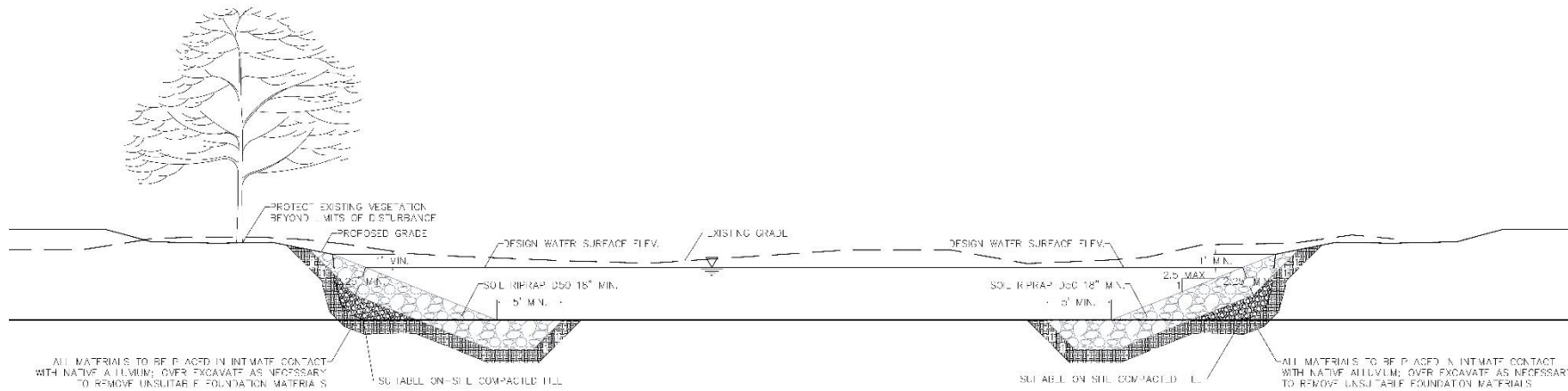
BANK ARMORING (CUT BANK) (TYP.)

SCALE: 1:144



BANK ARMORING (NORMAL BANK) (TYP.)

SCALE: 1:144



BANK ARMORING (FILL BANK) (TYP.)

SCALE: 1:144



REBUILD





Prioritize River and Parks Work

- Priority 2—assessment, planning, patches
 - Damage assessments
 - Mitigation projects as an add to damage assessments
 - Long range recovery planning
 - Watershed and town-scale master planning
 - Meadow park phases 1 & 2
 - The creation of a single park that accommodates the town's festivals and visitors

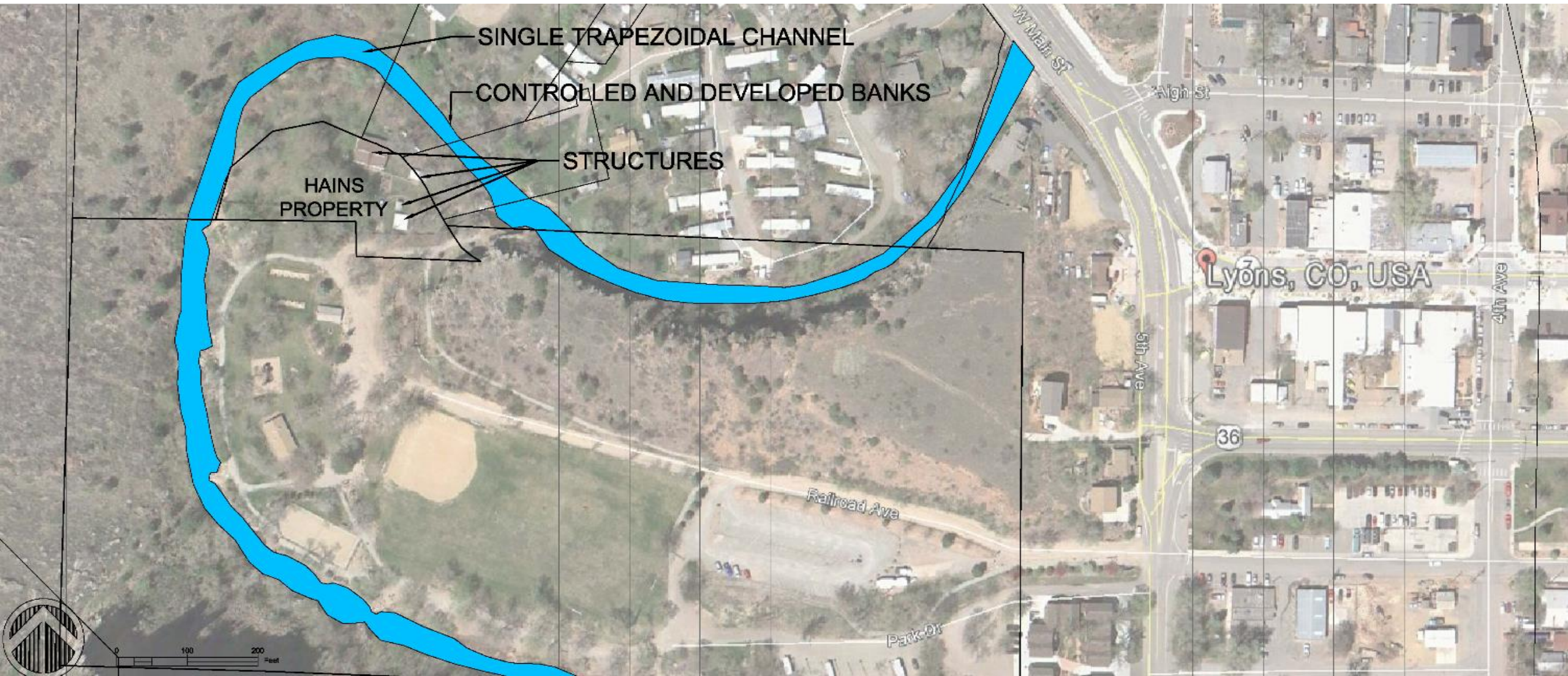
Damage Assessments

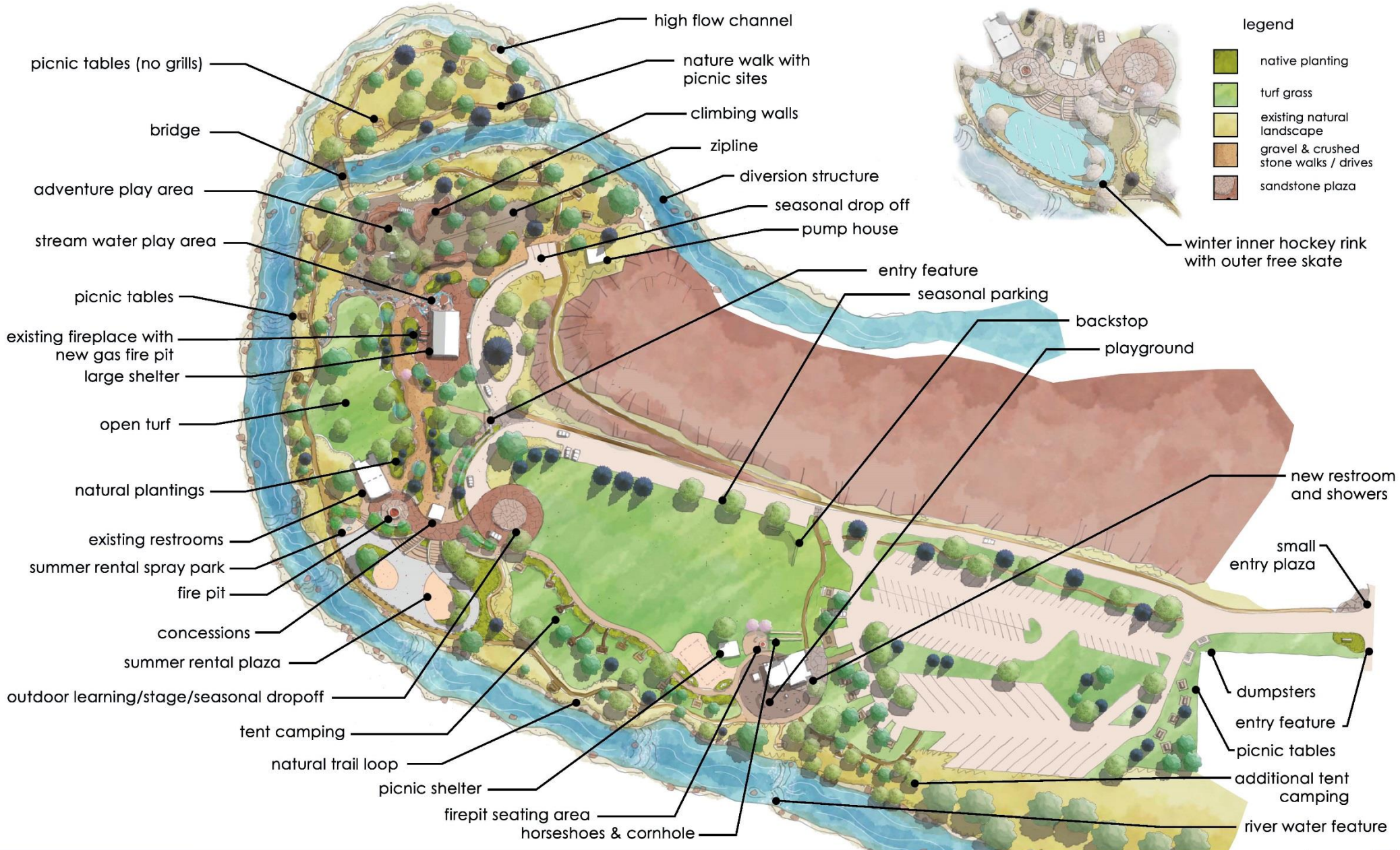
- Delineation of damages to create measurable replacements costs
- Negotiation with FEMA, Insurance, State
 - \$19 million in Parks Damages
- Fundraising
 - #1 priority from start—Fundraising to get matching costs from State
 - \$1 million GOCO grant

Public Process/Planning Process

- Long Range Recovery Process
 - Coordinated by FEMA
 - Defines metrics by which following projects are evaluated
- Watershed Masterplanning
 - Create a cohesive plan for the watershed
 - Define projects for now and future
 - Created continuing body to monitor watershed and works within the watershed.
- Parks Masterplanning
 - Create a cohesive and connected parks masterplan
 - Define Objectives within the parks corridor for each project
 - Avoid repetitive parks design

Example Project—Meadow Park, Phase 1 & 2





Prioritize River and Parks Work

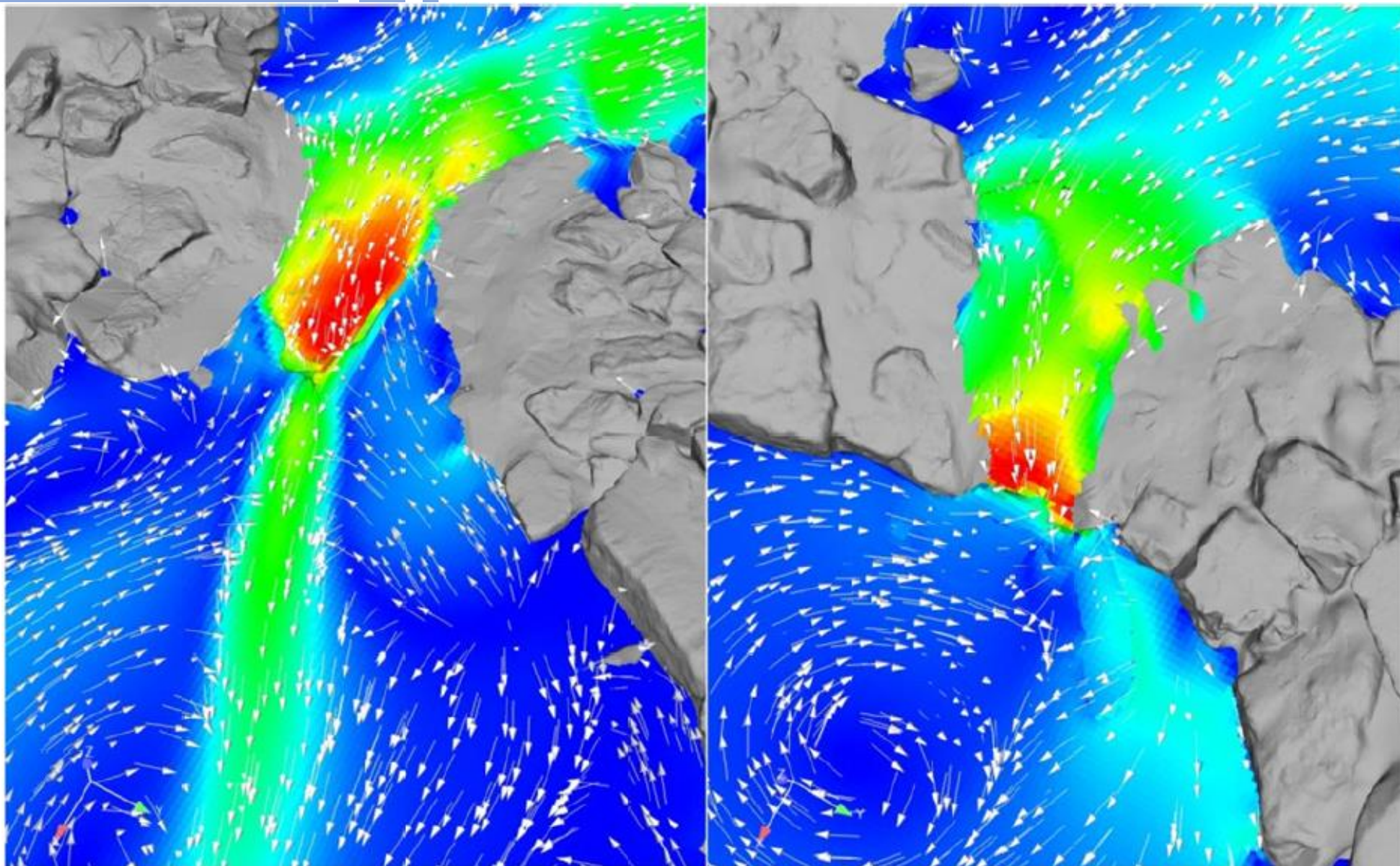
- Priority 3—resilient projects that meet the town’s objectives
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Designing a better Meadow Park

- 3 studies conducted by Colorado Parks and Wildlife addressing impacts of whitewater parks conducted in Meadow Park
- Studies conducted pre-flood
- Relationship between parks designers and Parks and Wildlife typically combative
 - “Parks and Wildlife has opposed every Whitewater Park Project in the State of Colorado and they’ve all been built”

Designing a better Meadow Park

- S2o worked with Parks and Wildlife to address key issues identified in the Study
 - Commissioned a 3-D CFD study with a CWCB grant
 - Brainstormed and identified four separate geometries that were expected to perform better than pre-flood design
 - Designed a whitewater park that performed better by every metric identified in the study
 - Results applicable to similar sized parks



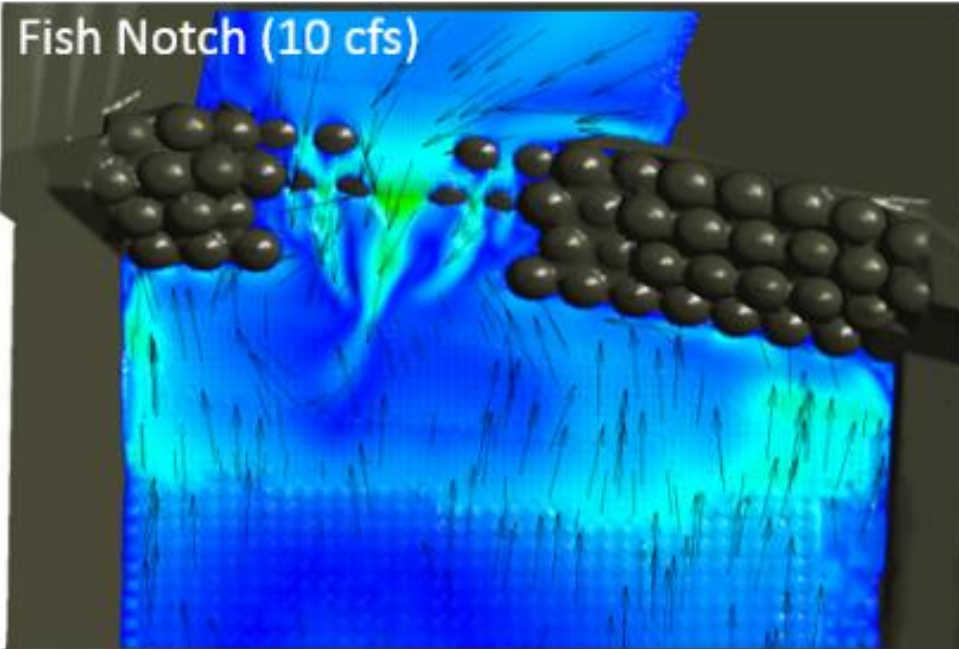
(A) WWP3

(B) WWP2

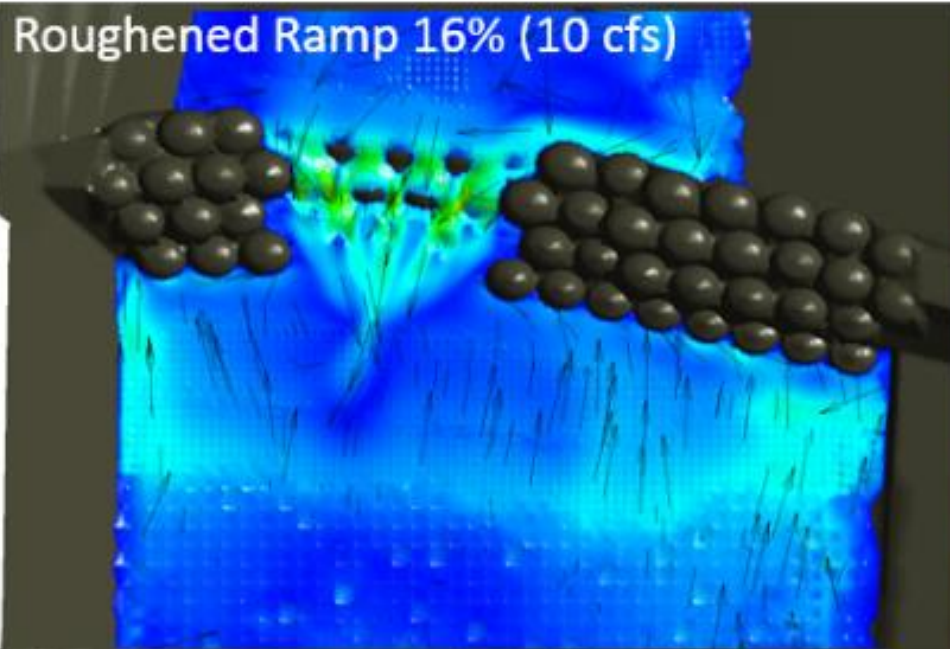
*Sections of
the flow
field (Fox,
2013, p.
69).*

REBUILDING LYONS

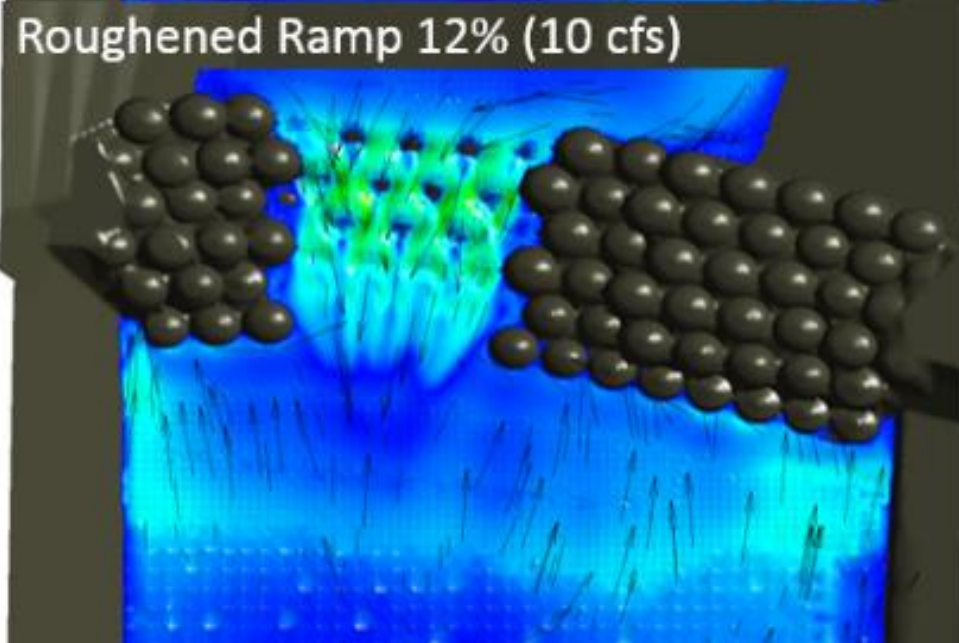
Fish Notch (10 cfs)



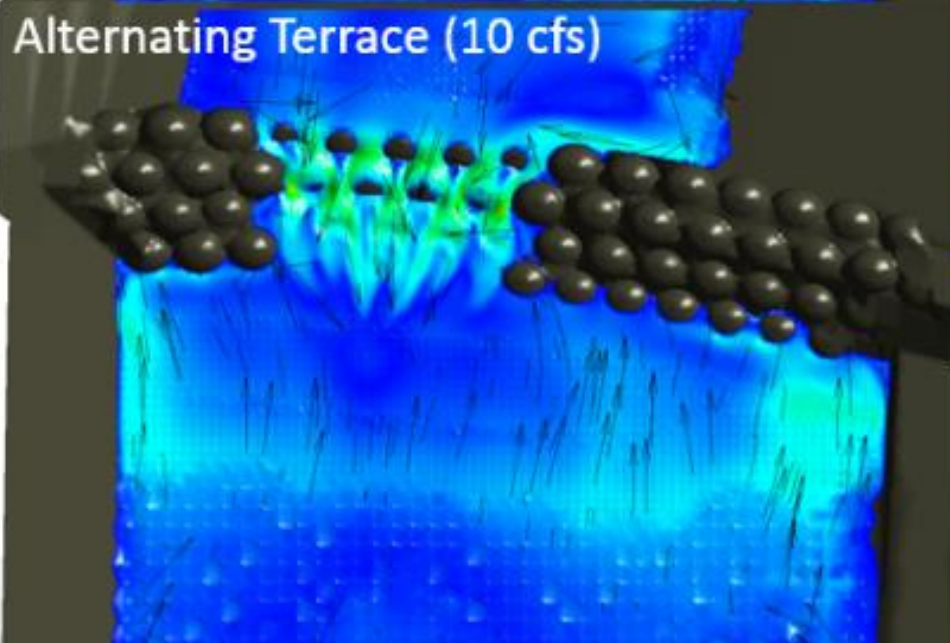
Roughened Ramp 16% (10 cfs)



Roughened Ramp 12% (10 cfs)



Alternating Terrace (10 cfs)



Water.Velocity

10.00

7.50

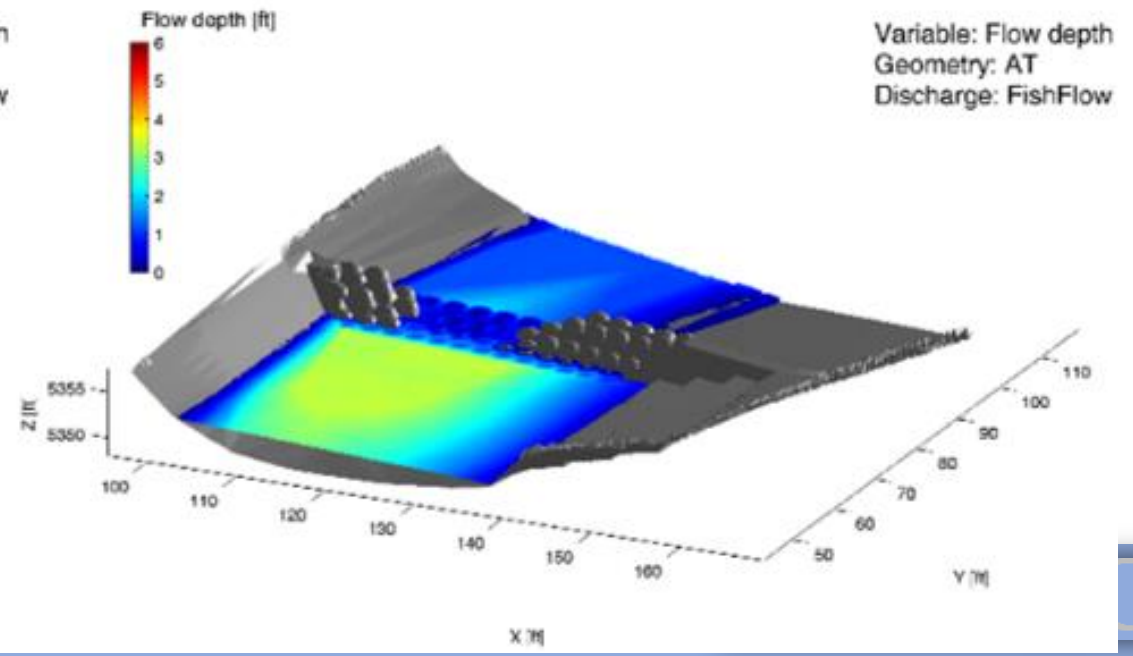
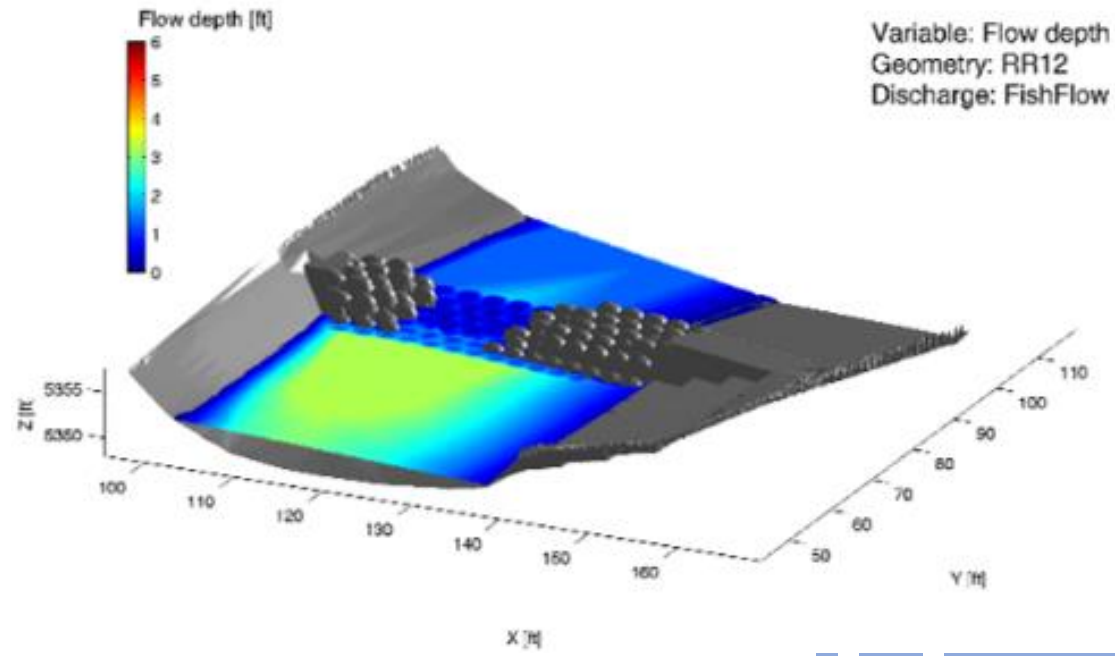
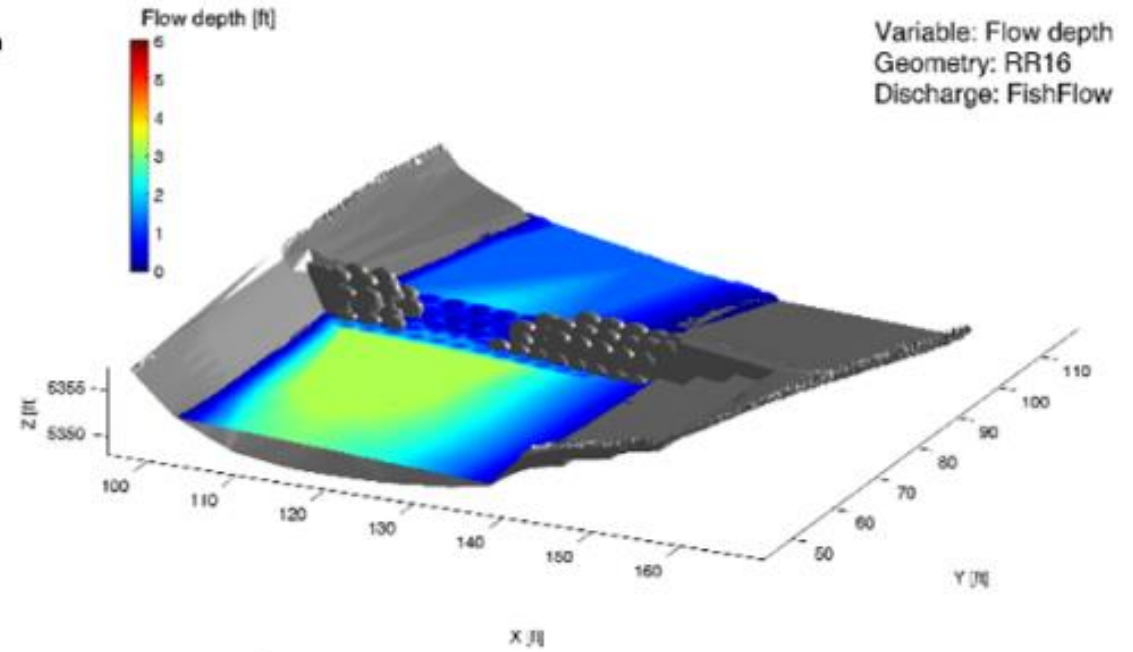
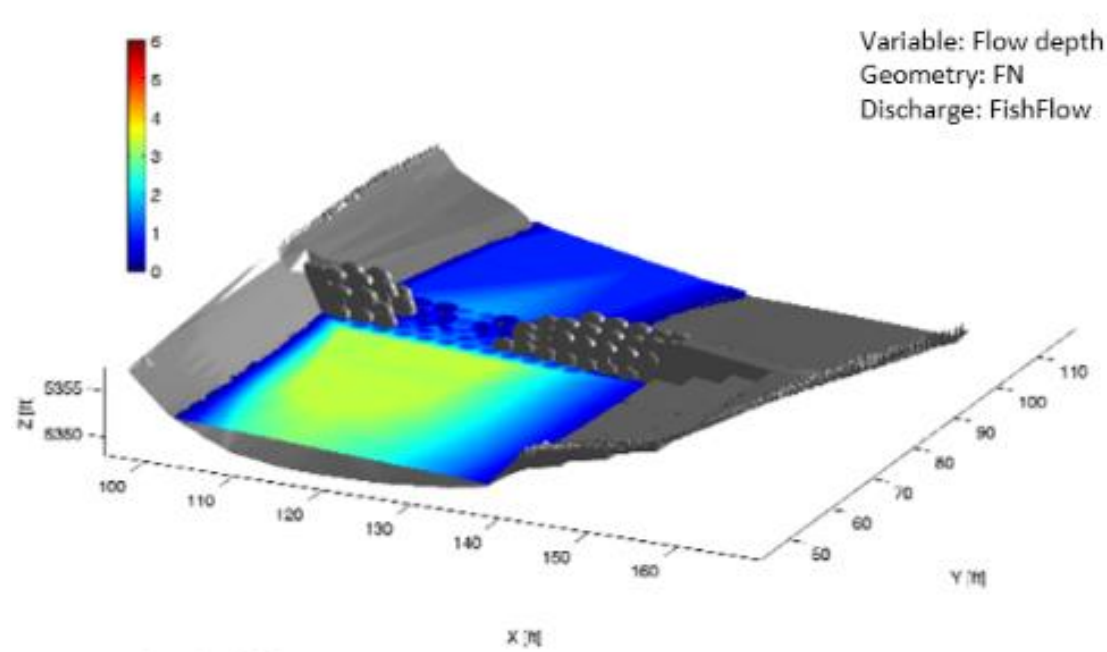
5.00

2.50

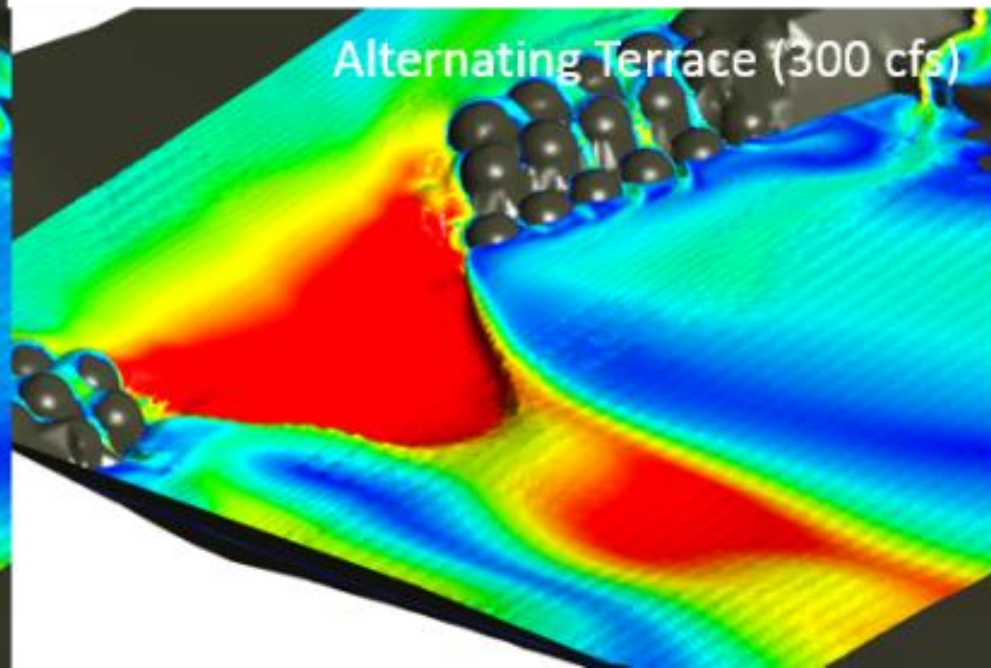
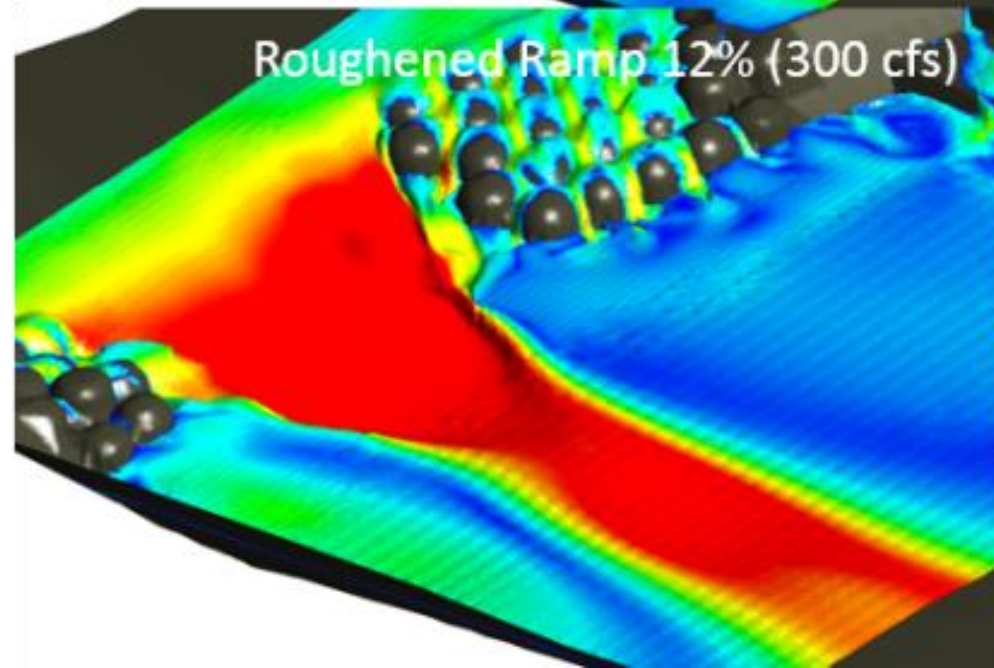
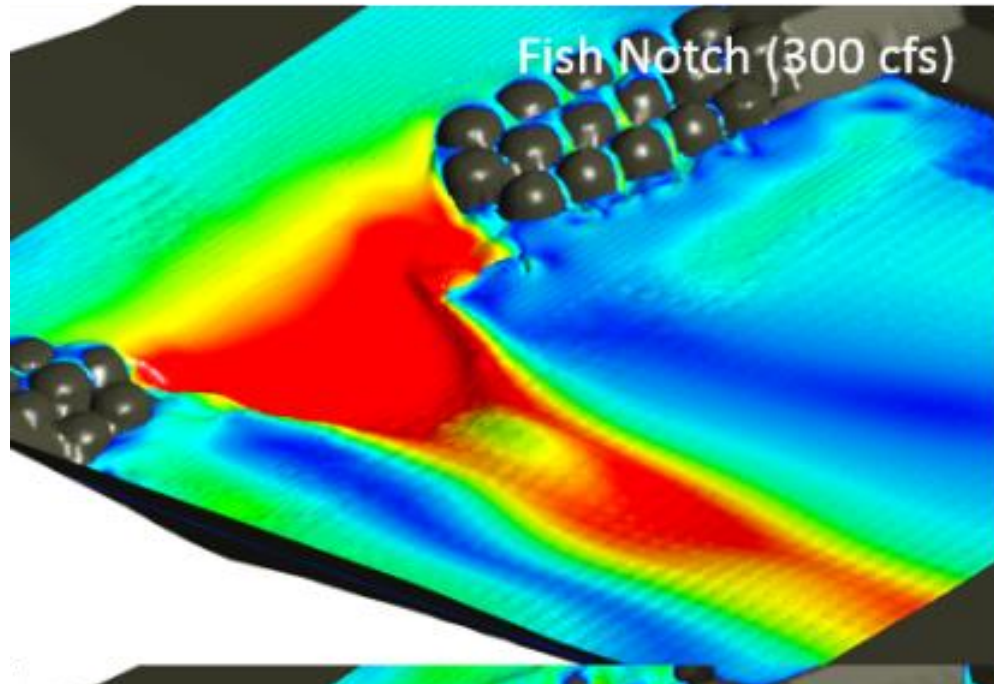
0.00

[ft s⁻¹]

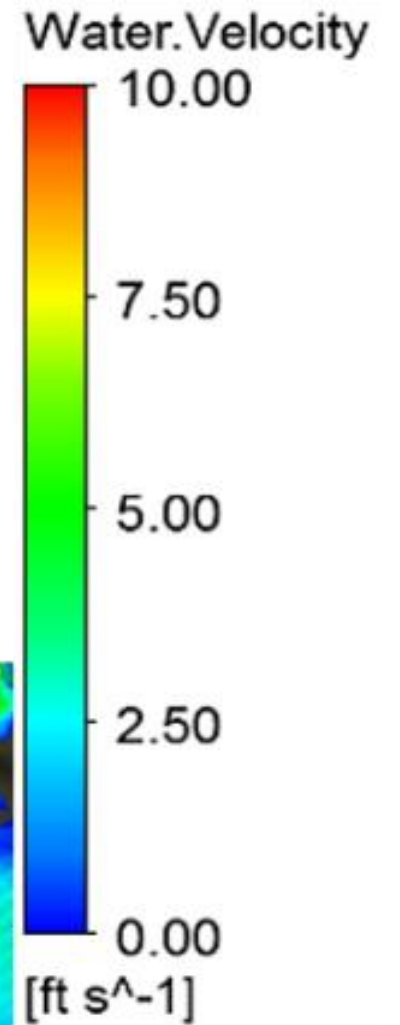
REBUILDING LYONS



REBUILDING LYONS



Roughened Ramp 16% (300 cfs)



Lessons Learned

- Chosen approach has proven to be successful
- Long range planning leads to better projects with better consensus
 - Can lead to short-term frustration
- Road to recovery has been long, but the result will be a better, more resilient, community that is more prepared for the next flood.
 - Better designed river corridor not just for next major flood, but in the river function on a yearly basis

Questions?



“Cancel My Four O’Clock”