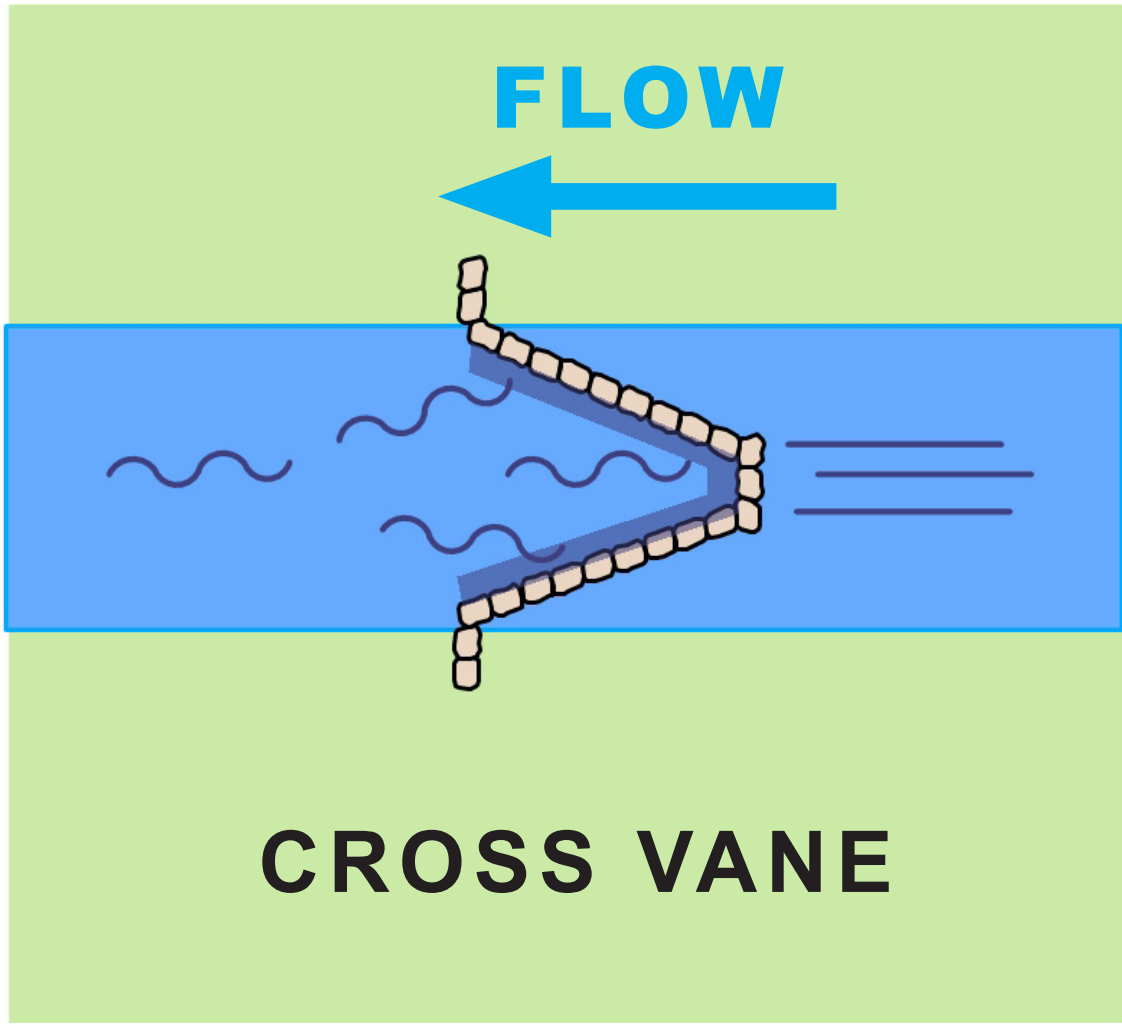


PROPOSED STREAM RESTORATION STRATEGIES



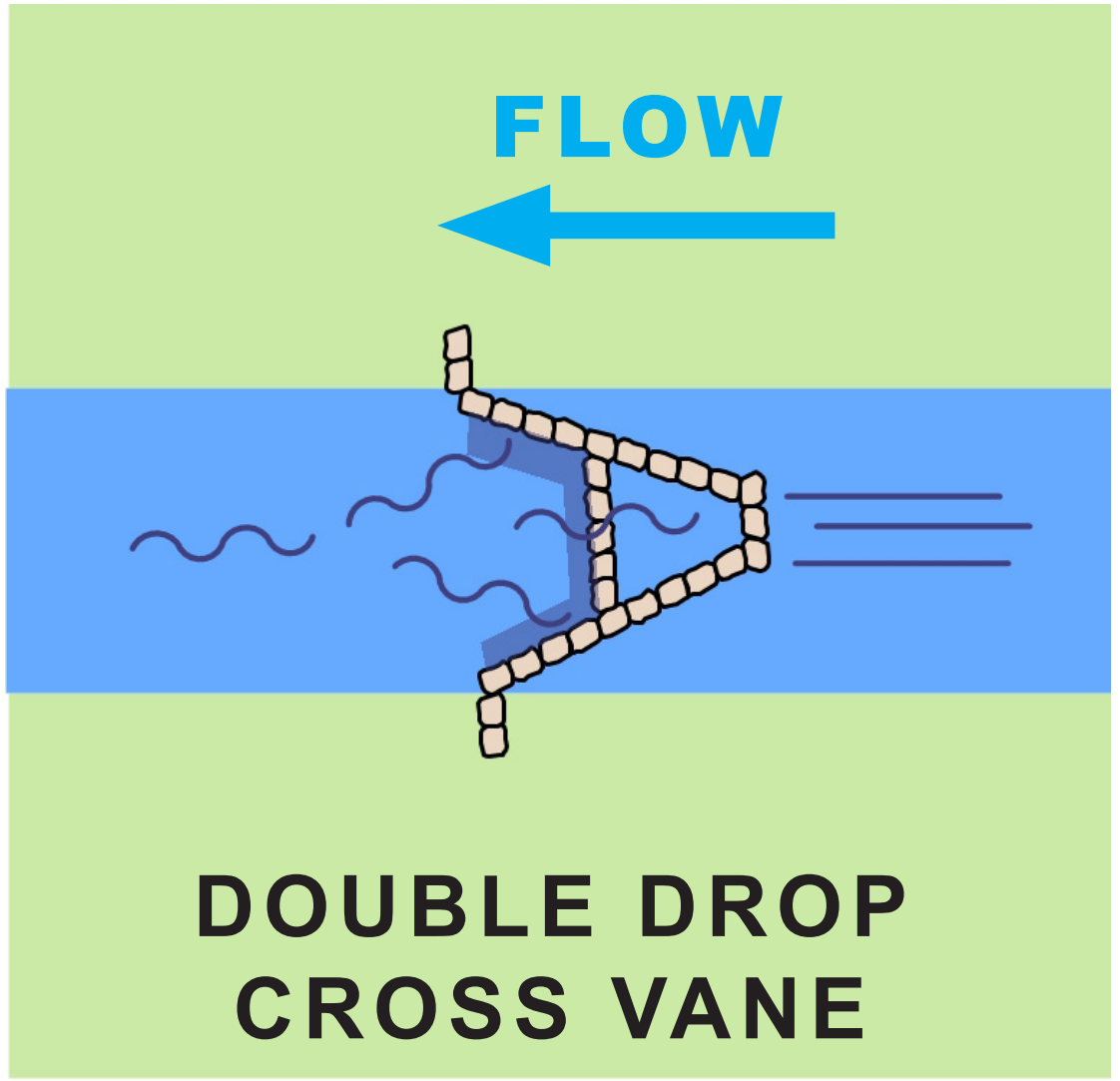
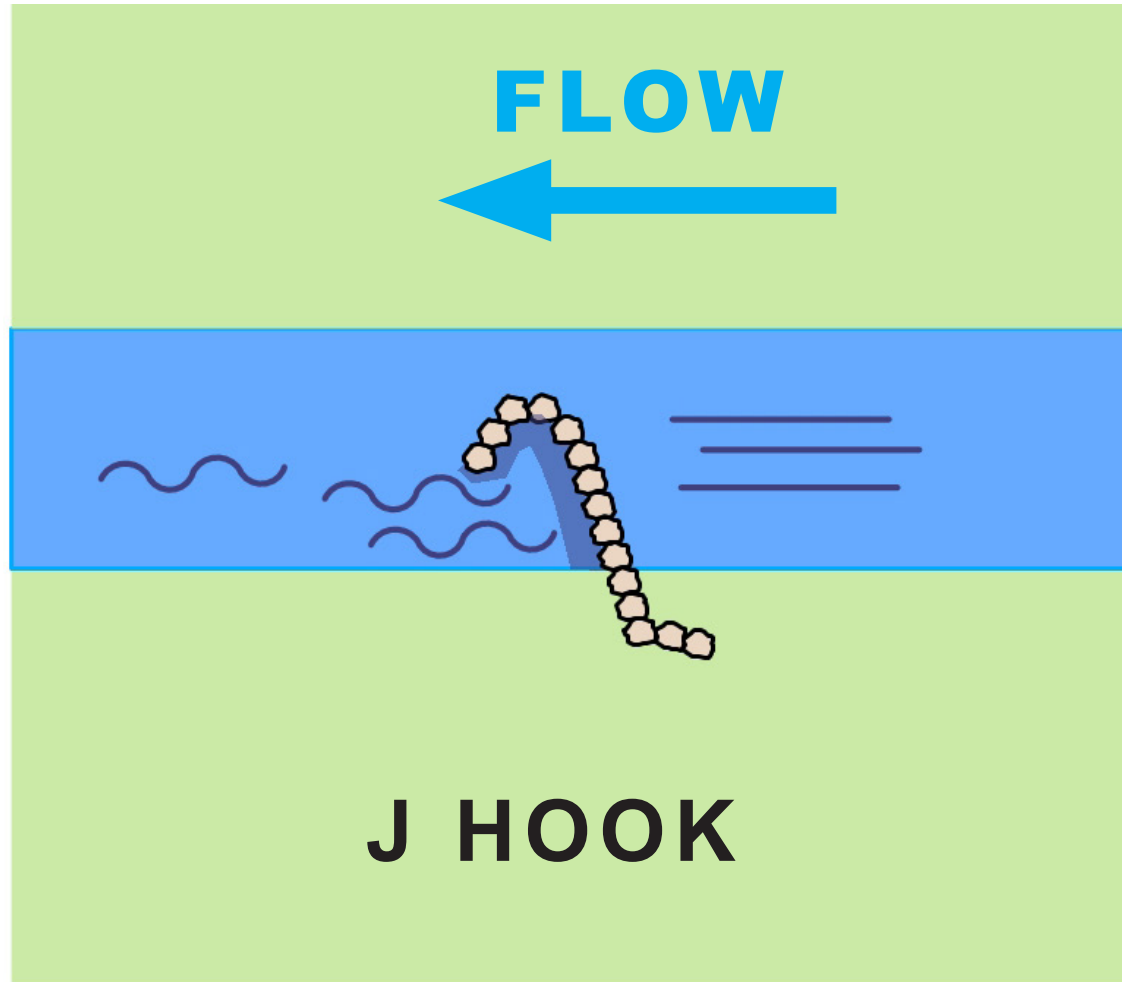
Benefits of Stream Restoration Structures:

Redirect flow back to the center of the channel or to the deepest part of the channel, the thalweg, to minimize erosion on the banks and to center the water during low flow.

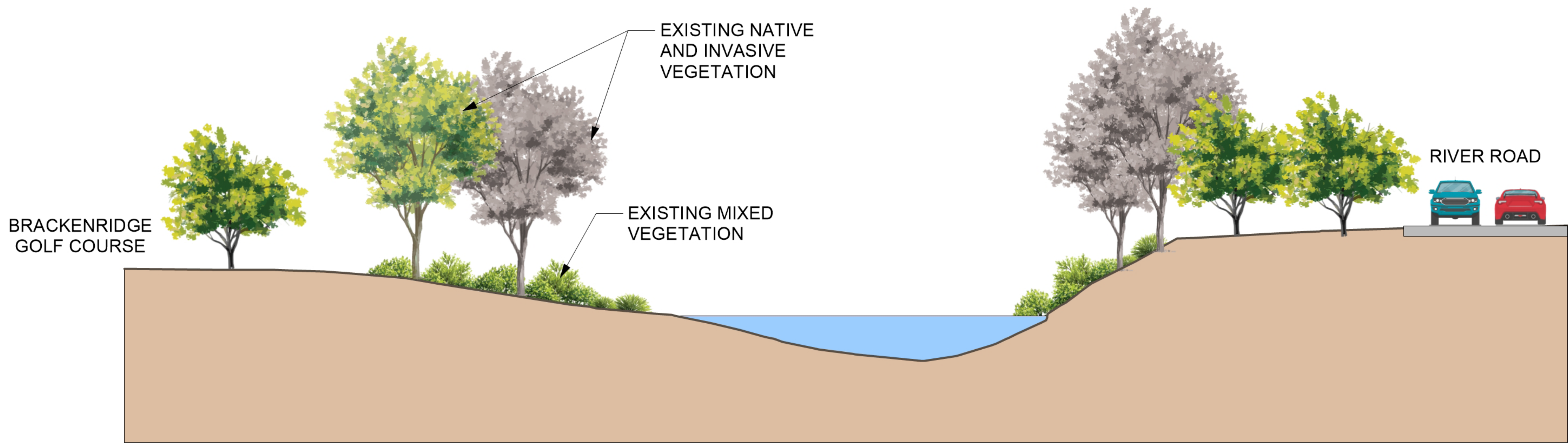
Create pools which are spaced about 200 feet apart on average in this design.

Pools and structures slow down the velocity of the river and reduce the erosive force that is created during high flow events like flash flooding.

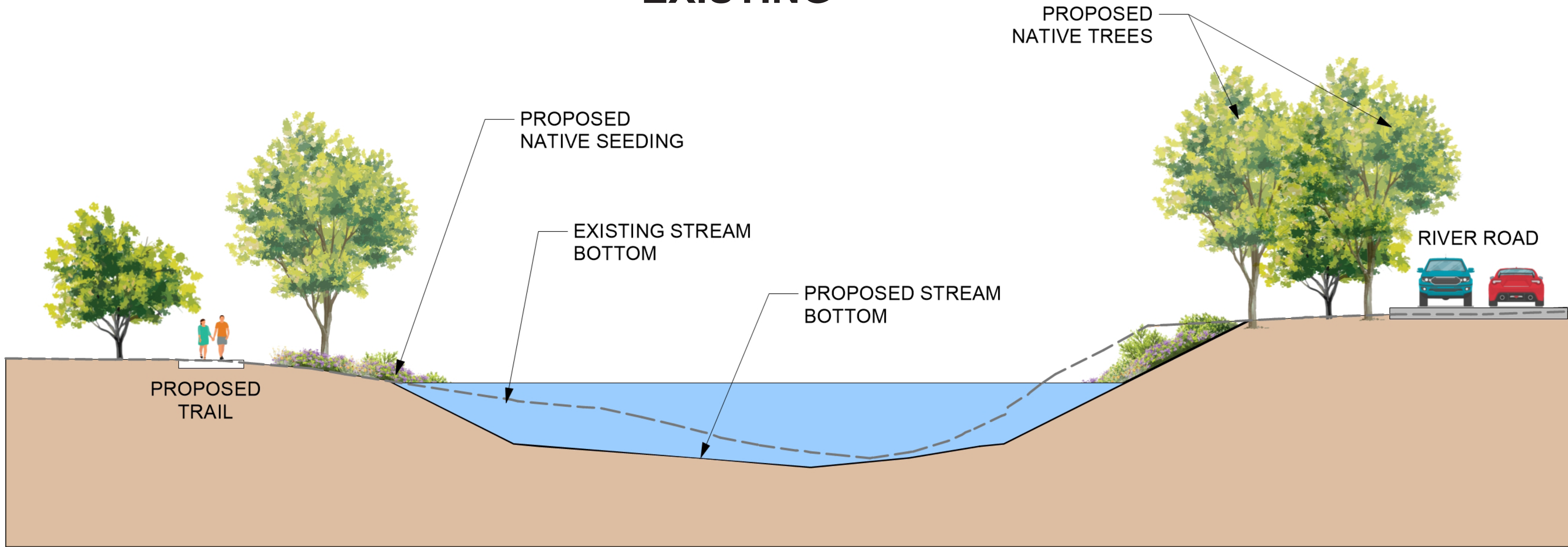
Create habitat diversity for fishes and other wildlife and provide an opportunity for aquatic species to take refuge from fast moving water.



EXISTING AND PROPOSED SECTIONS



EXISTING



PROPOSED



US Army Corps
of Engineers®



River Road Stream Restoration





Conceptual View - Does Not Represent Final Design

Proposed Bridge #1
River Road Stream Restoration



Conceptual View - Does Not
Represent Final Design

Proposed Bird Watching Area
River Road Stream Restoration



Conceptual View - Does Not
Represent Final Design

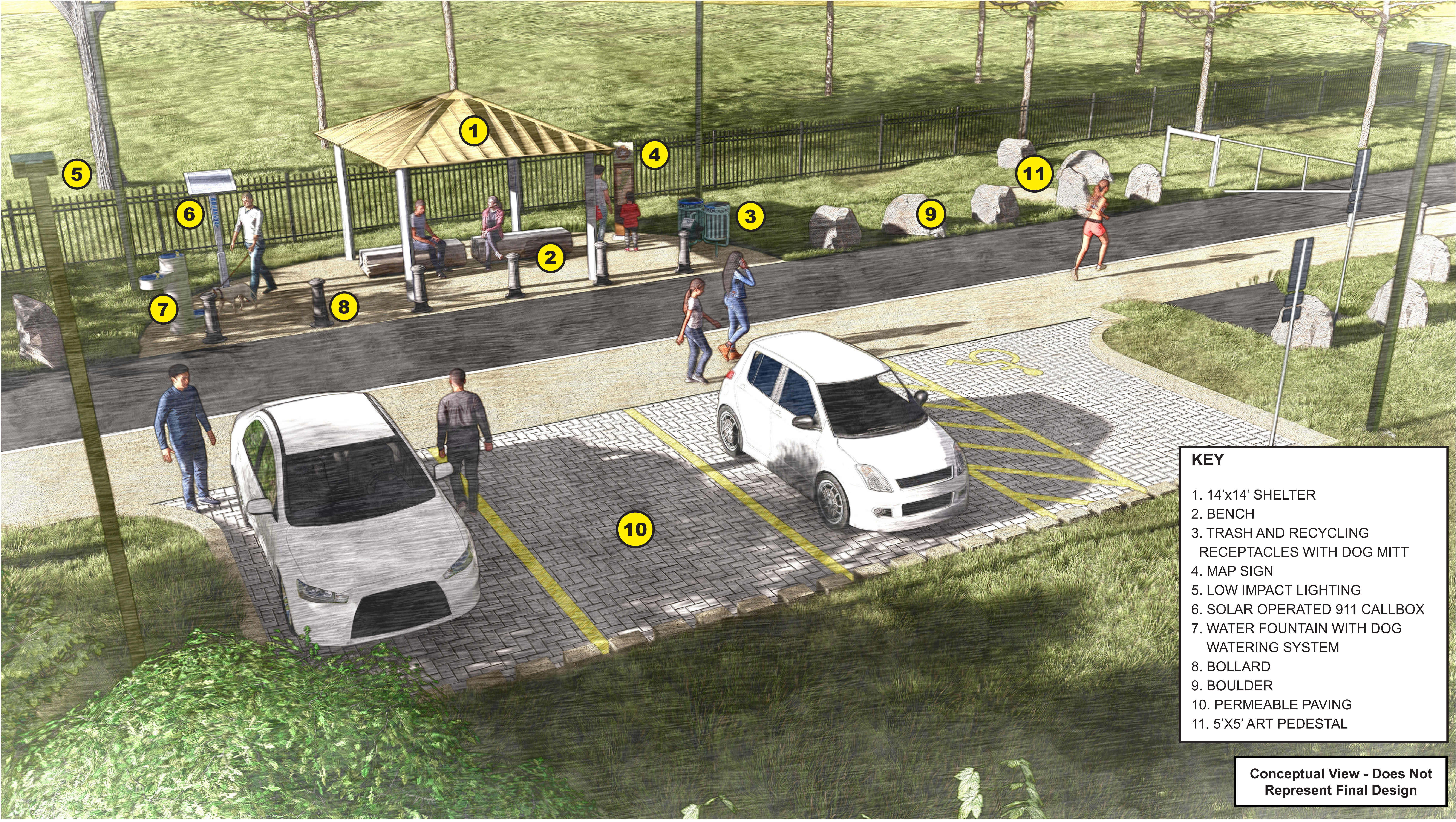
Proposed Fishing Pier #1
River Road Stream Restoration





Conceptual View - Does Not
Represent Final Design

Proposed Fishing Pier #2
River Road Stream Restoration



- KEY**
- 1. 14'x14' SHELTER
 - 2. BENCH
 - 3. TRASH AND RECYCLING RECEPTACLES WITH DOG MITT
 - 4. MAP SIGN
 - 5. LOW IMPACT LIGHTING
 - 6. SOLAR OPERATED 911 CALLBOX
 - 7. WATER FOUNTAIN WITH DOG WATERING SYSTEM
 - 8. BOLLARD
 - 9. BOULDER
 - 10. PERMEABLE PAVING
 - 11. 5'X5' ART PEDESTAL

Conceptual View - Does Not Represent Final Design

Proposed Trailhead
River Road Stream Restoration

Four Post
Square



Monoslope



Two Post
Hip



Concrete
Pergola



Concrete Tree
(Public Artist)



Trailhead Shade Structure Options

Sawn Limestone Bench

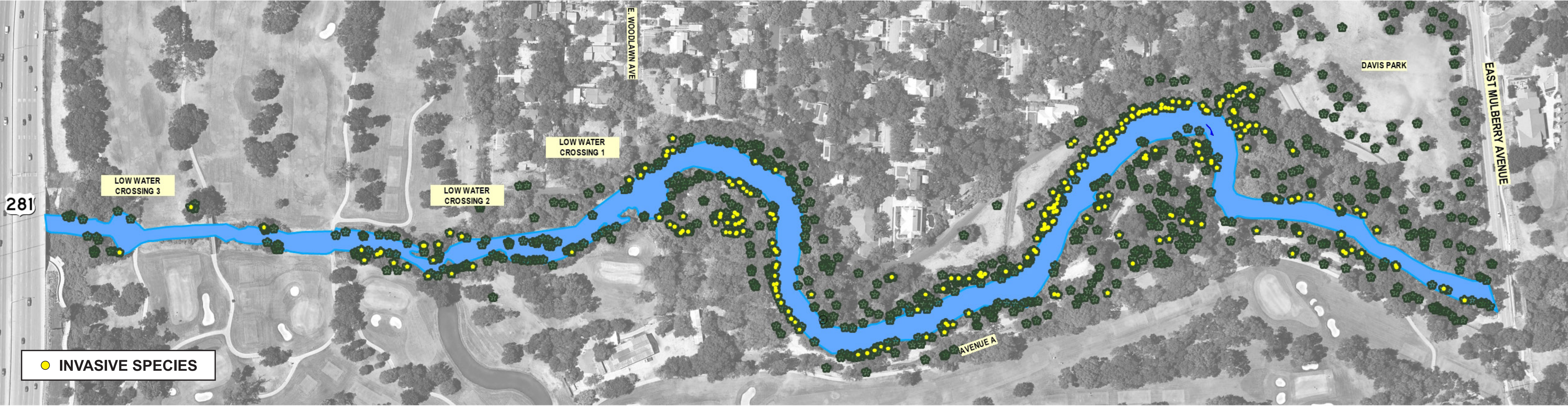


City of San Antonio Standard - Black Metal



Bench Options

INVASIVE SPECIES REMOVAL



What Is an Invasive Species?

An invasive species is non-native to the ecosystem in consideration and causes or is likely to cause economic or environmental harm or harm to human health (EO13112).

Sometimes you will see invasive species referred to as exotic, alien, or non-indigenous species. The problem with these names is that they only refer to the non-native part of the definition above. Many exotic or alien species do not cause harm to our economy, our environment, or our health. In fact, the

vast majority of “introduced” species do not survive and only about 15% of those do go on to become “invasive” or harmful.

An invasive species grows/reproduces and spreads rapidly, establishes over large areas, and persists. Species that become invasive succeed due to favorable environmental conditions and lack of natural predators, competitors and diseases that normally regulate their populations.

SOURCE: TEXAS INVADERS.ORG

What Invasive Species Are There Now?



Chinaberry tree
Melia azedarach



Chinese Privet
Ligustrum sinense



Giant cane
Arundo donax



Additional invasive species include:

- Bermudagrass** (*Cynodon dactylon*)
- Elephant ear** (*Colocasia* spp.)
- Bastard cabbage** (*Rapistrum* spp.)
- Lantana** (*Lantana camara*)

How Will They be Removed?

The removal of non-native invasive species will utilize an integrated pest management approach. Most species will be cut down at the base and the stump will be treated with an aquatic labeled (approved for use in and adjacent to aquatic habitats) herbicide approved by the EPA and the USFWS.

Certain species will be sprayed with an aquatic approved labeled herbicide in a foliar application. The invasive species control methodology will depend on the invasive species.

PROPOSED MATERIAL PALETTE



Decomposed Granite Path with Stabilizer
Bird Watching Area and Fishing Pier #2 Path



Concrete Pedestrian Trail



Composite Decking at Fishing Piers



Boulders used as Crossvanes, J Hooks within stream



Sawn Limestone Bench (Option)



Large Boulders as Bollards Near Trailhead



Weathered Steel Pedestrian Bridge

PROPOSED PLANT PALETTE - TREES AND SHRUBS

Canopy Trees



Cedar Elm
Ulmus crassifolia



Bald Cypress
Taxodium distichum



Pecan
Carya illinoensis



Black Willow
Salix nigra

Understory Trees



Texas Redbud
Cercis canadensis var. texensis



Ashe Juniper
Juniperus ashei



Texas Mountain Laurel
Sophora secundiflora



Mexican Plum
Prunus mexicana

Shrubs and Groundcover



Texas Sage
Leucophyllum frutescens



Buttonbush
Cephalanthus occidentalis



Little Bluestem
Schizachyrium scoparium



Texas vervain
Verbena halei



The plant species highlighted here are only a few of the **dozens** of native species being evaluated for this project.

PROPOSED PLANT PALETTE - SEED MIXES

Native Grass Seed Mix



Little Bluestem
Schizachyrium scoparium



Silver Bluestem
Bothriochloa laguroides



Sideoats Grama
Bouteloua curtipendula



Green Sprangletop
Leptochloa dubia



Maximilian Sunflower
Helianthus maximiliani



Purple Prairie Clover
Dalea purpurea



Shortspike Windmillgrass
Chloris x subdolichoshatchya



Indian Blanket
Gaillardia pulchella



The plant species highlighted here are only a few of the **dozens** of native species being evaluated for this project. Species have been selected for adaptability and success on similar stream restoration projects

Developed by the Lady Bird Johnson Wildflower Center, **Habiturf** simulates shortgrass prairies. Habiturf provides all the visual beauty of a uniform lawn with the drought-tolerance and low maintenance of native Texas grasses. Heartiness is achieved through the use of multiple species, but the uniformity of the leaves and color make for a lush, beautiful lawn. Habiturf has been observed to outperform Bermudagrass in terms of establishment rates, turf thickness, mowing rates, and weed resistance.

HabiTurf Native Lawn



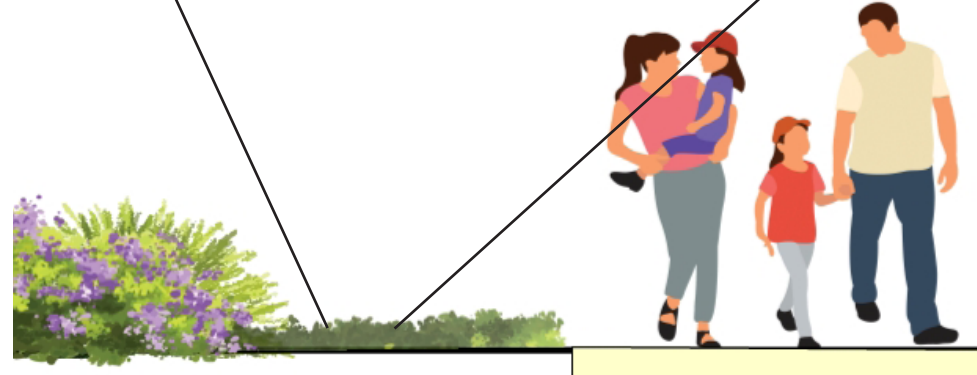
Buffalograss
Bouteloua dactyloides



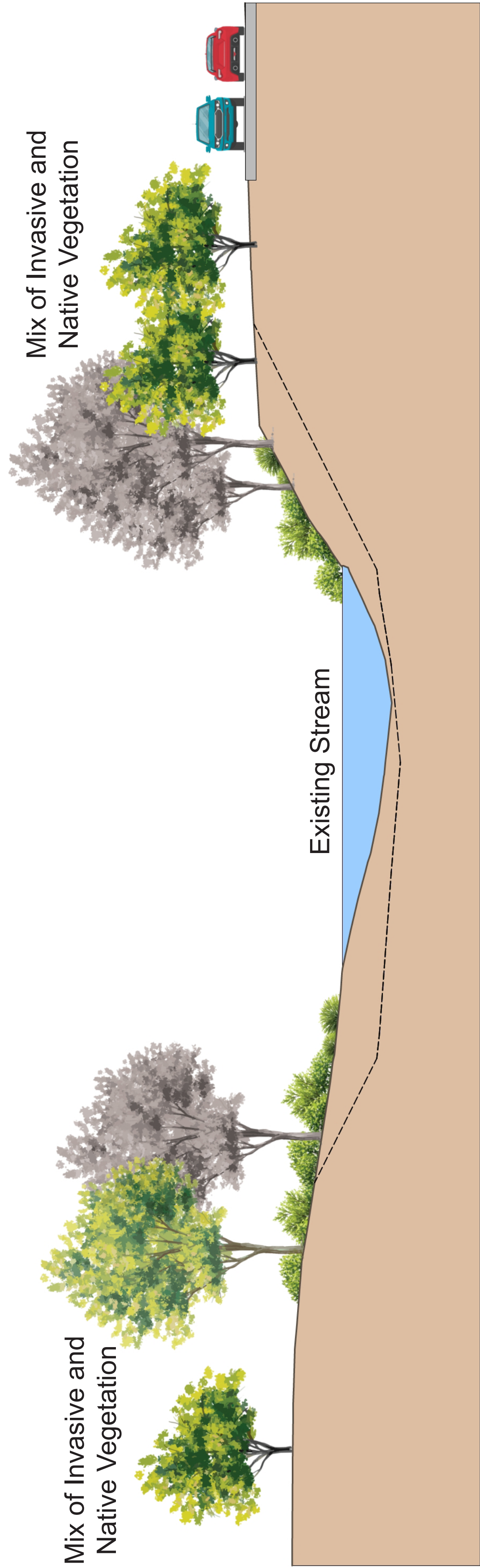
Blue Grama
Bouteloua gracilis



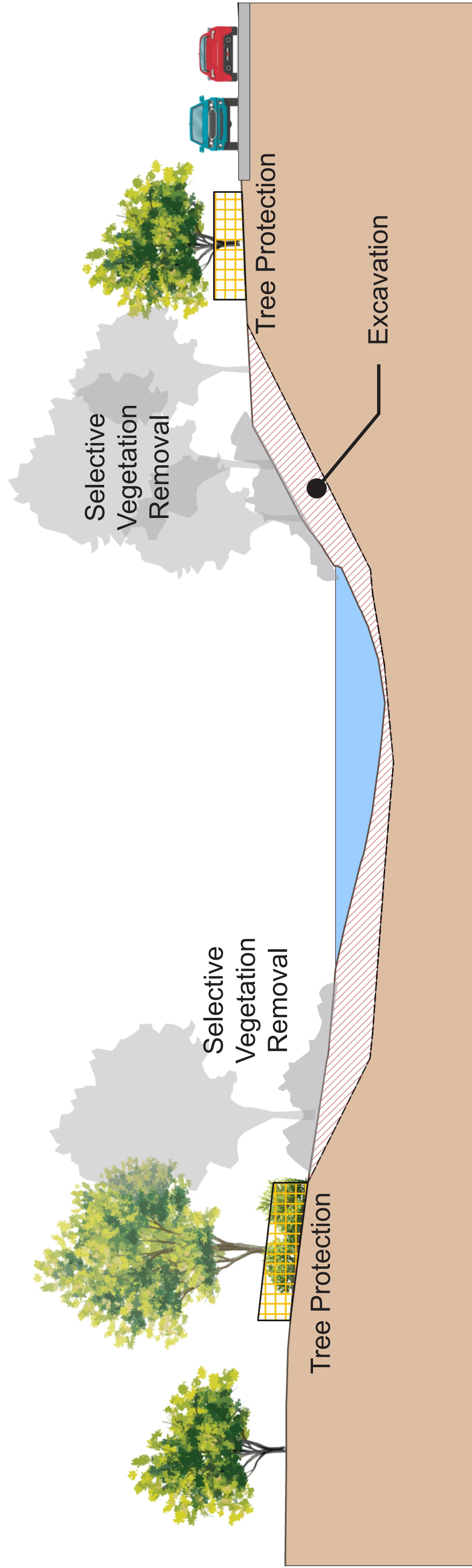
Curly Mesquite
Hilaria belangeri



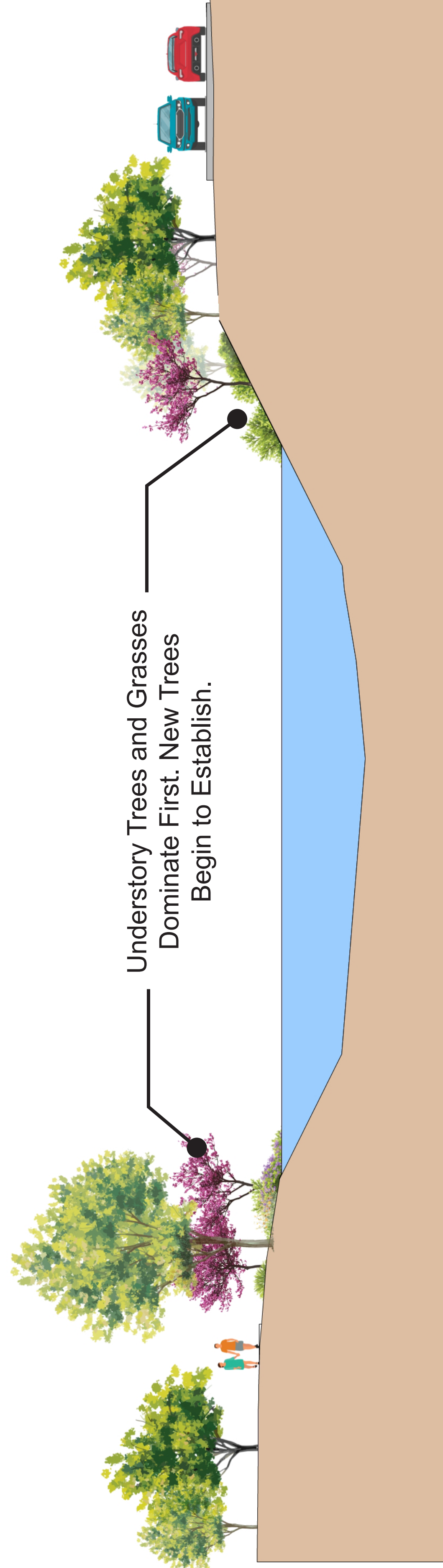
PLANT SUCCESSION



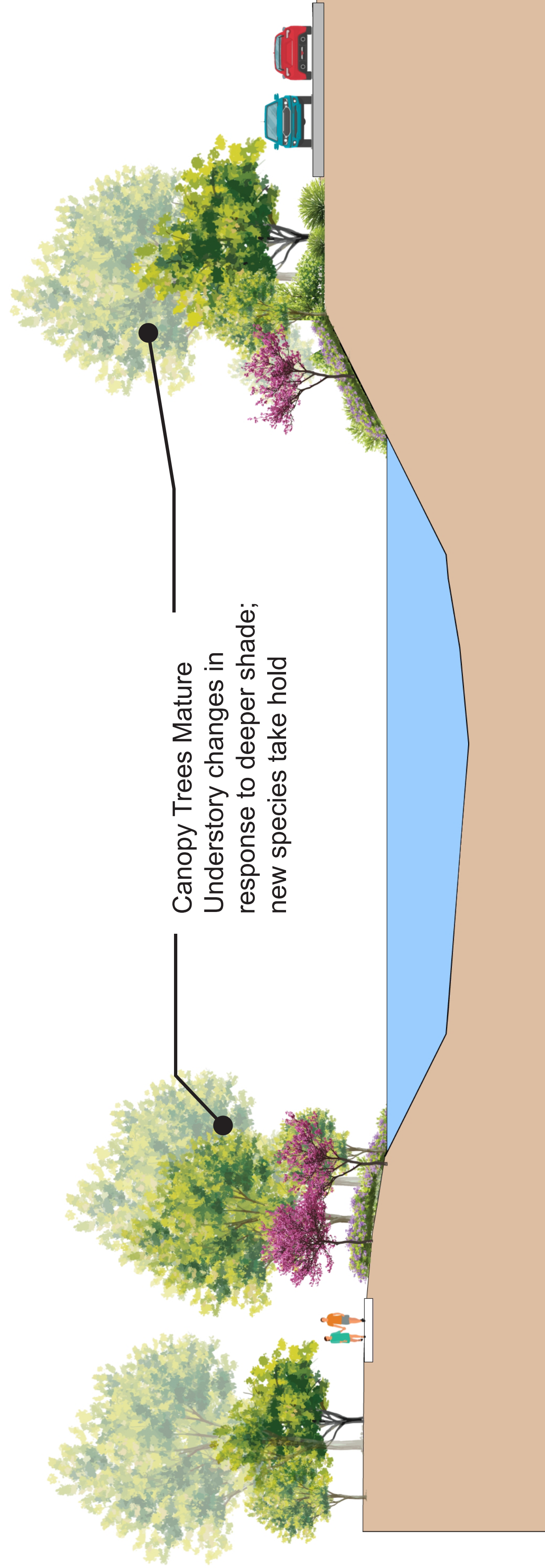
Existing Conditions



Construction



Post-Construction



Future