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FUSS & O'NEILL, INC.

From 'Wild and Wonderful' to the 'Downtown Riverwalk'

TAILORING STREAM RESTORATION APPROACHES TO THE
DEGREE OF URBANIZATION IN THE ADJACENT LANDSCAPE



PRESENTATION OVERVIEW

SETTING THE STAGE

DAM REMOVAL: UNIFYING GOALS & IDEALS

CLIMATE as CONTEXT

LANDSCAPE as KEY CONTEXTUAL LIMITATION

CASE STUDIES & APPROACHES

URBAN → SEMI-URBAN → RURAL

EMBRACING COMPLEXITY/ENCOURAGING ACCESS

ADAPTIVE PERMITTING for ADAPTIVE MANAGEMENT



UNIFYING GOALS AND IDEALS

FREE THE RIVER

DAM REMOVAL IS A PUBLIC GOOD

PROMOTE HUMAN CO-BENEFITS WHERE APPROPRIATE

PROCESS-BASED RESTORATION

SLOW THE FLOW

HABITAT & HYDRAULIC CONNECTIVITY

DAM REMOVAL SAVES MONEY

ELIMINATE THREAT OF FAILURE

RIVER ACCESS & NATURE EDUCATION

COST-EFFECTIVE CONSTRUCTION

LET NATURE DO THE WORK

SELF-SUSTAINING

REDUCE PEAK FLOWS / MITIGATES STORM DAMAGES

REDUCE STREAMBANK EROSION

REDUCE DOWNSTREAM FLOODING RISK



CLIMATE ADAPTATION

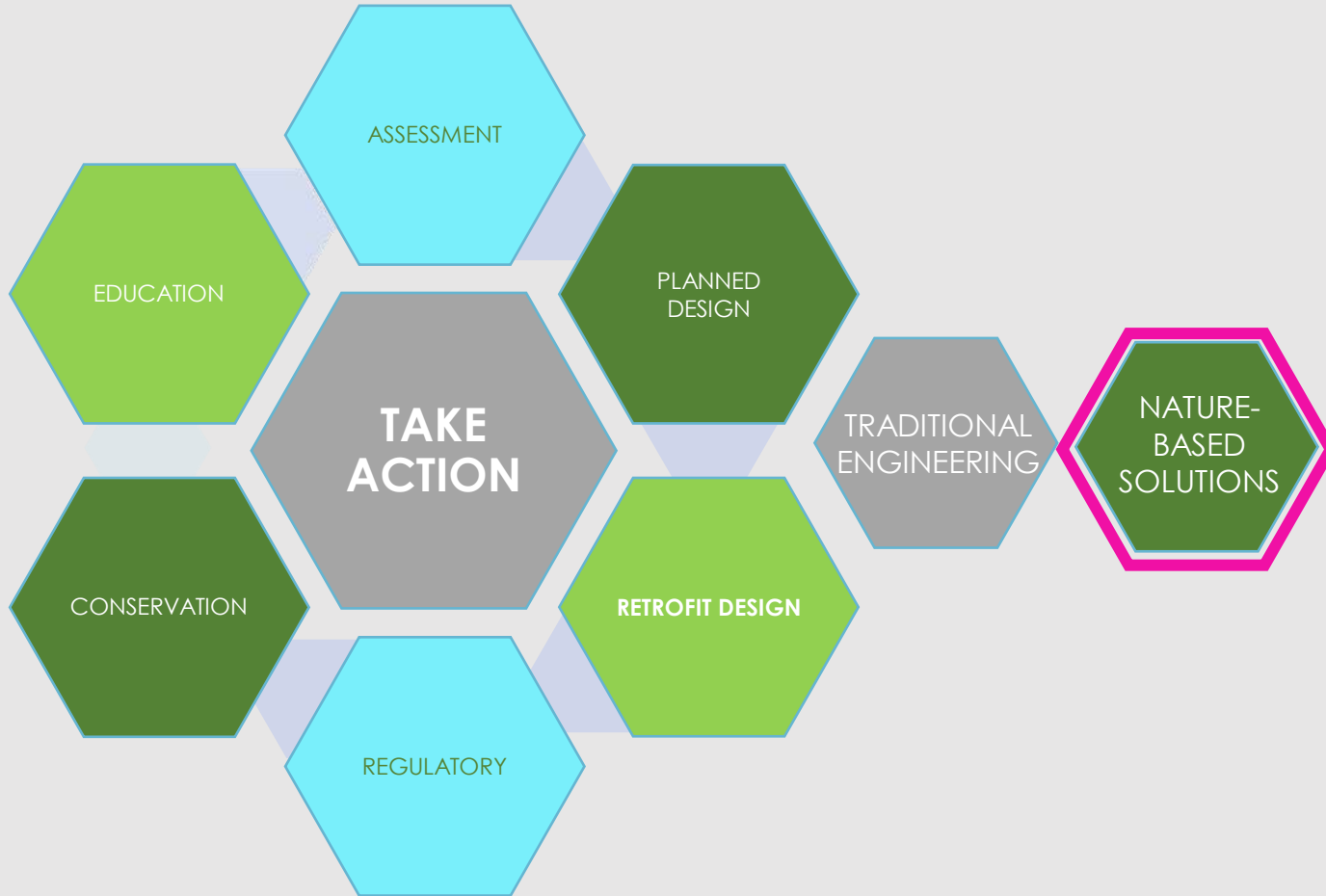


Photo courtesy of MADER

MASSACHUSETTS MVP PROGRAM

DAM REMOVAL: CONTINUUMS

LANDSCAPE CONDITIONS

HIGHLY CONSTRAINED
URBANIZED/DEVELOPED
HEAVY PUBLIC INTERACTION
CONTAMINATION

UNCONSTRAINED SETTING
UNDEVELOPED/RURAL
NATURALIZED
CLEAN SITE



RESTORATION APPROACHES

FORMED CHANNEL
ONE-AND-DONE
HIGHLY ENGINEERED
HEAVY-TOUCH

SELF-DIRECTED RESTORATION
ONGOING MONITORING/TWEAKS
PROCESS-BASED RESTORATION
LIGHT-TOUCH

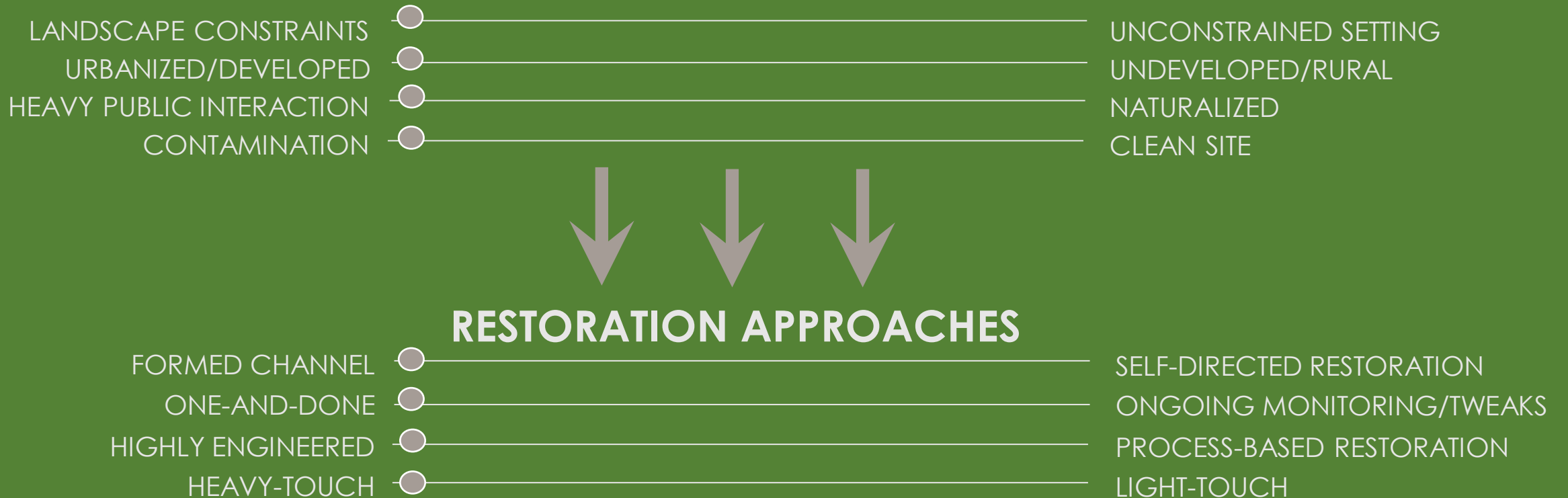
LITTLE RIVER DAM REMOVAL HAVERHILL, MA

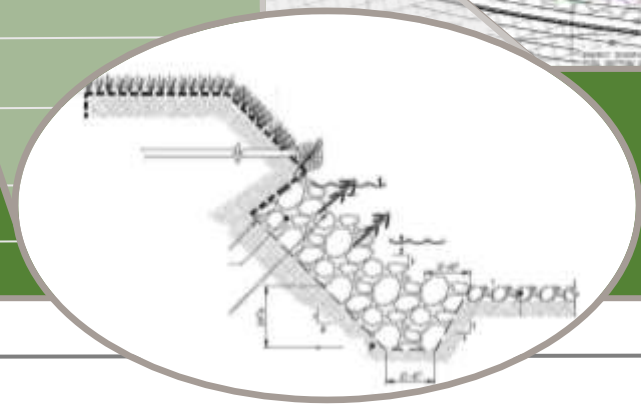
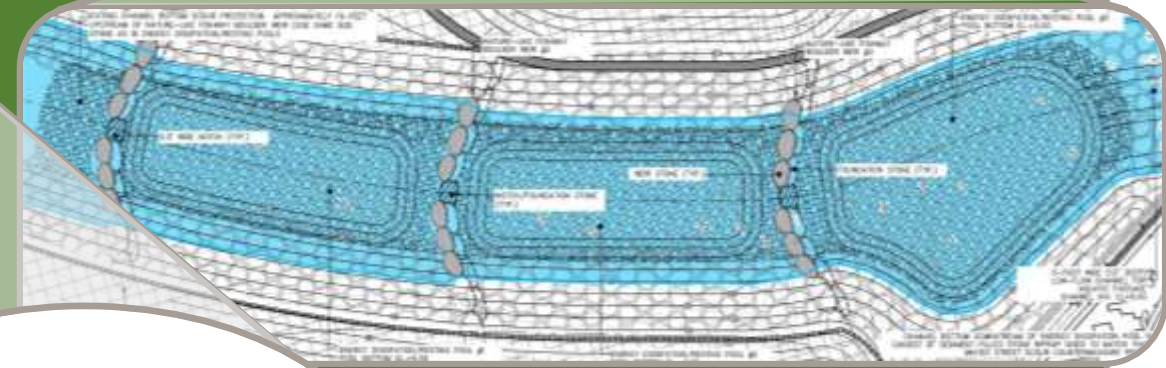
— BETWEEN A **ROCK** (RAIL LINE) & A **HARD PLACE** (HOUSES) —



SITE BACKGROUND AND CONTEXT

LITTLE RIVER: HIGHLY URBANIZED





KEY APPROACHES

STONE TOE PROTECTION

SCOUR PROTECTION for INFRASTRUCTURE

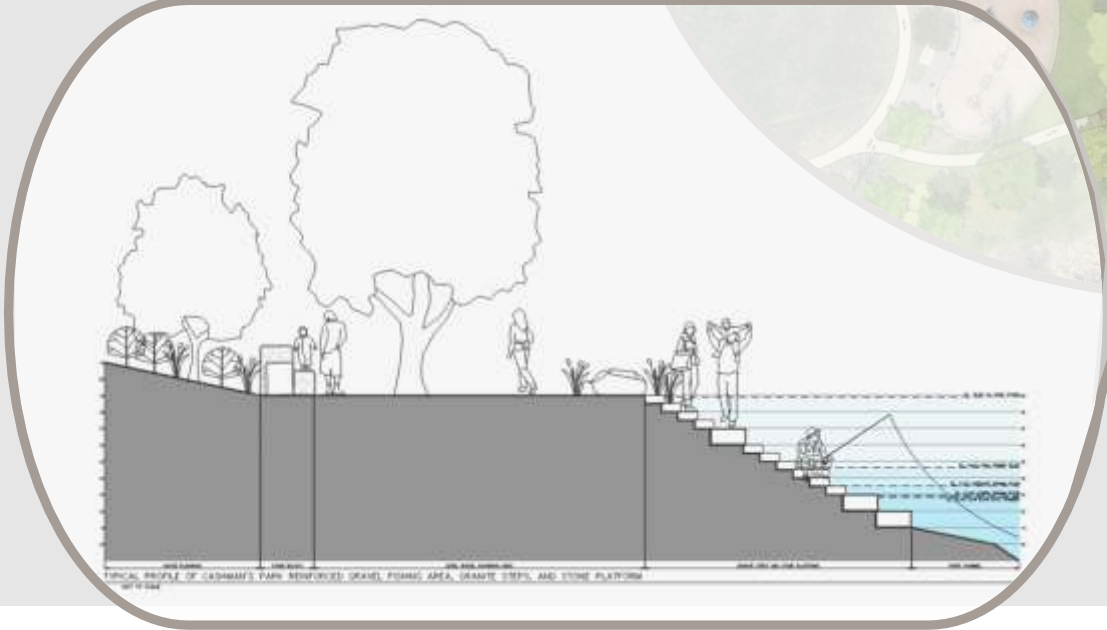
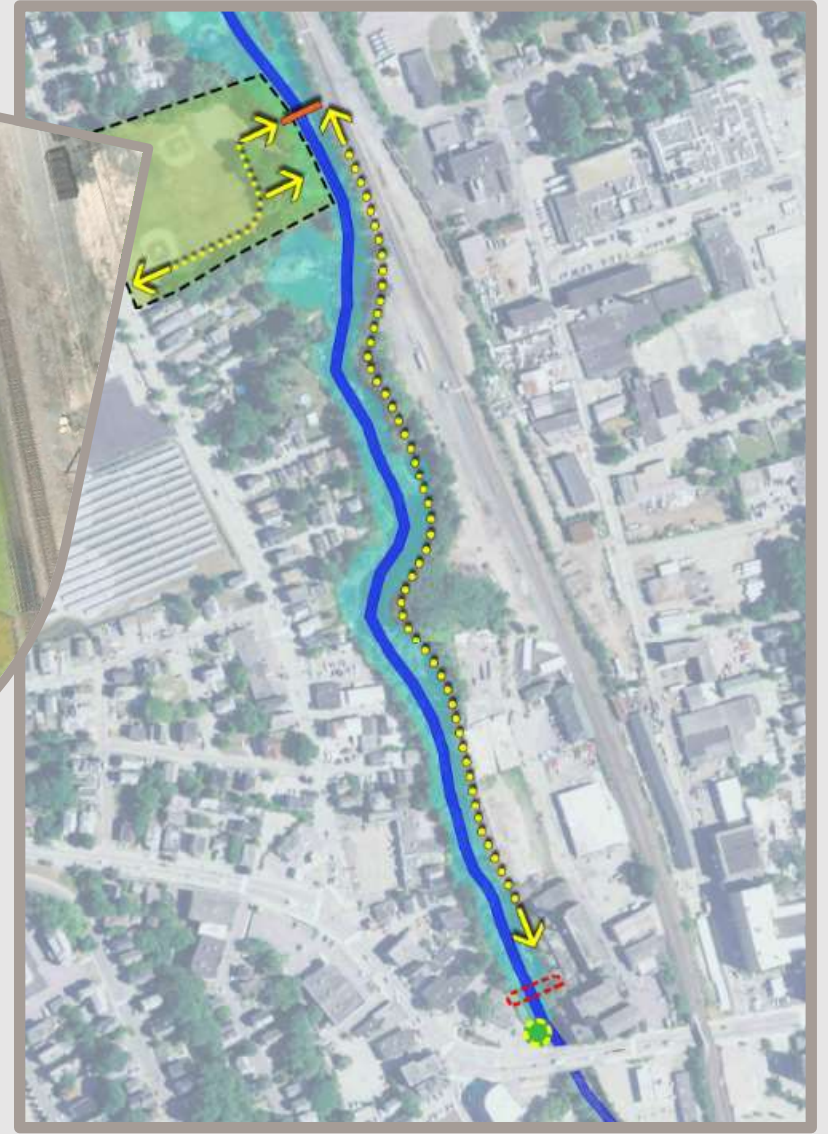
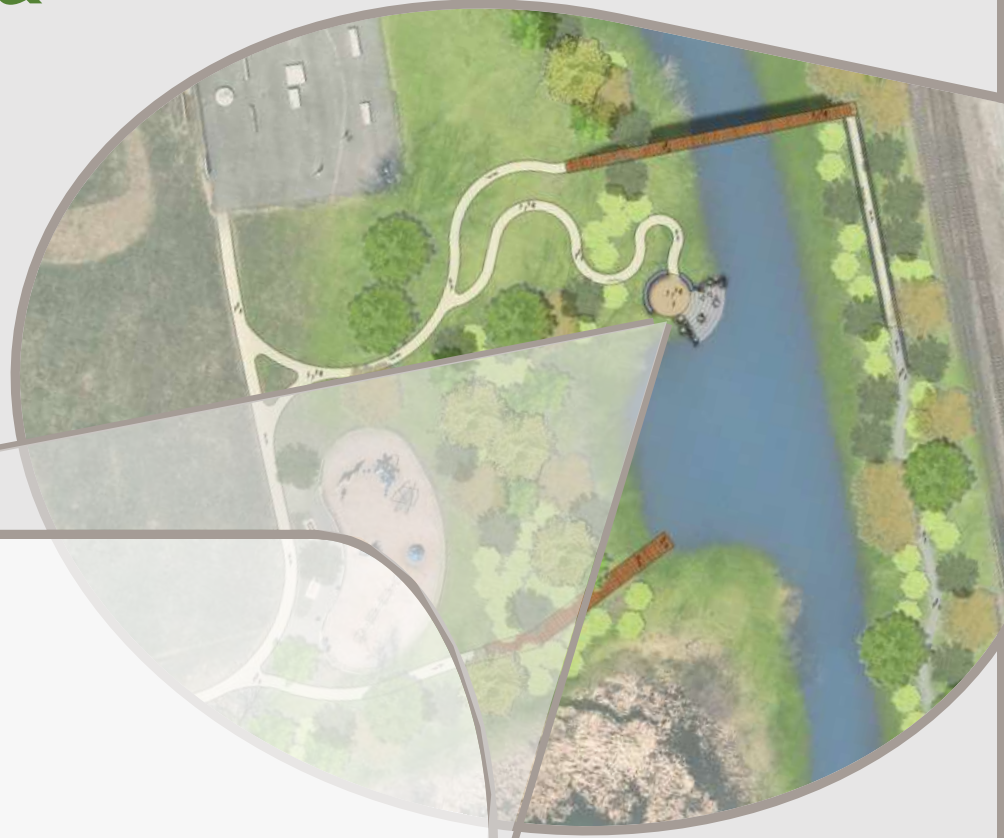
FORMAL PUBLIC ACCESS → CRITICAL for BUY-IN

MODIFIED FISHWAY → CANOE/KAYAK PASSAGE

PROJECTING SIDE CHANNEL "FINGERS"

RETAINING WALL ALONG MILL

PUBLIC ACCESS & RECREATIONAL AMENITIES



TITUS POND SOUTH HADLEY, MA

— SEMI-URBAN OPEN SPACE —



TITUS POND/ QUEENSVILLE DAM

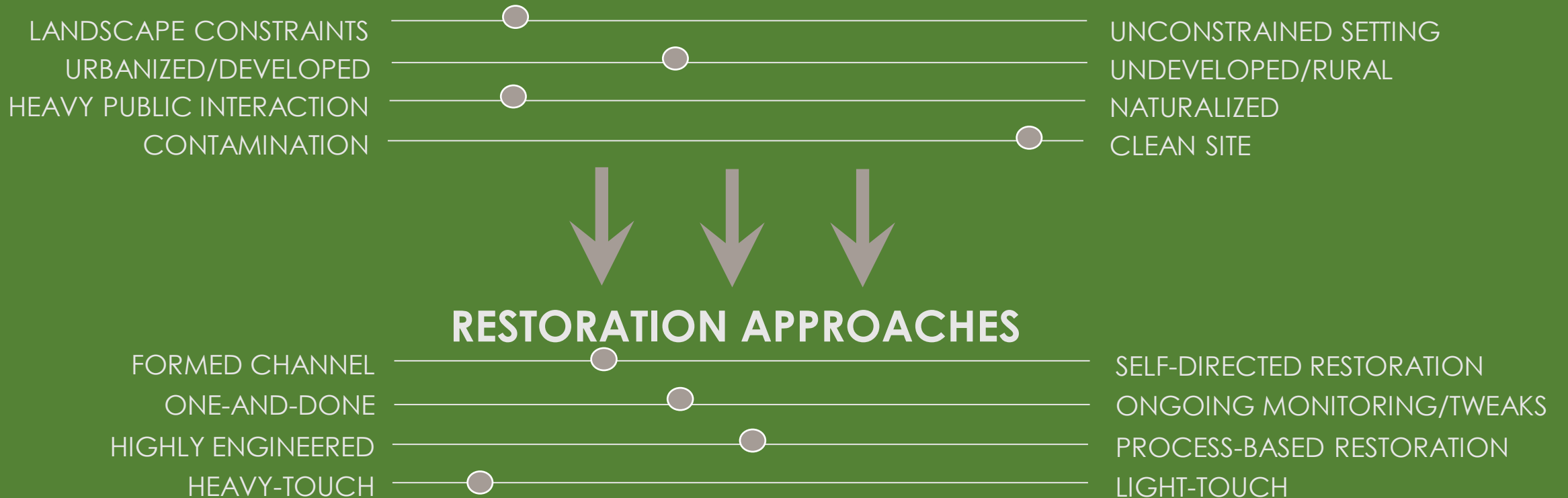
DAM SUPPORTS STATE ROUTE

1.5 ACRE IMPOUNDMENT

UNDERUTILIZED CONSERVATION AREA

WATER QUALITY CONCERNS

TITUS POND: SUBURBAN OPEN SPACE



NATURE-
BASED
SOLUTIONS

PROJECT GOALS

ELIMINATE JURISDICTIONAL STATUS

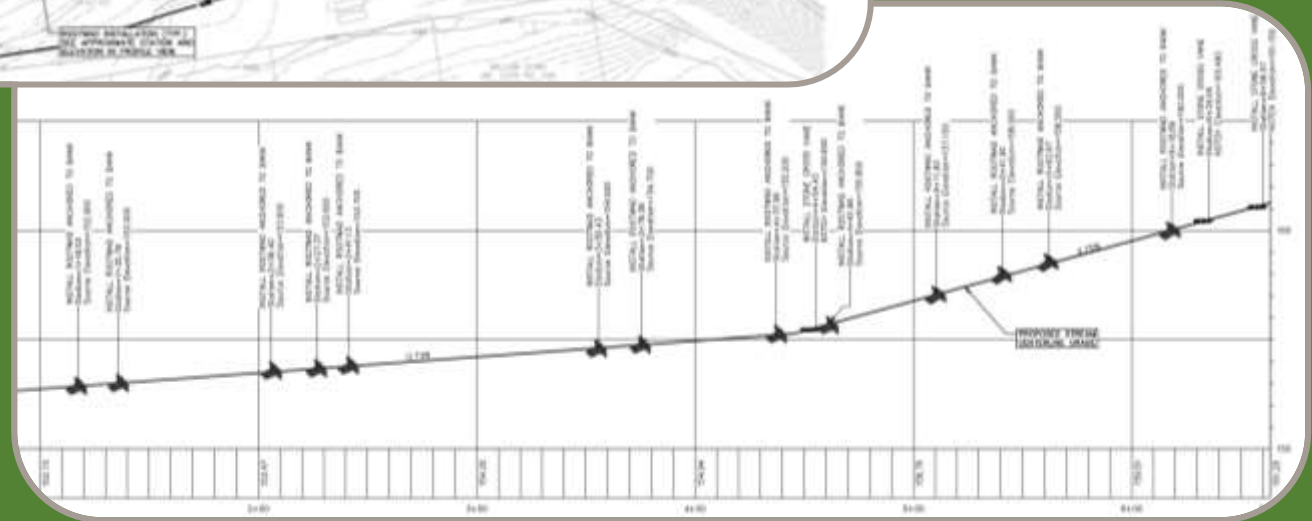
ADDRESS WATER QUALITY ISSUES

CREATE AN IMPROVED
CONSERVATION AREA

MANAGE STORMWATER

REDUCE DOWNSTREAM FLOODING
RISK AND EROSION





KEY APPROACHES

CAREFULLY PLANNED GRADES → DEFINE MAX. STORAGE

NATURAL-FEEL GRADE CONTROLS

JUMP-STARTED PLANTINGS

TITUS POND RESTORATION CONCEPTUAL DESIGN



PLAN LEGEND

1. NEW OUTLET CONFIGURATION
2. RESTORED LOW FLOW BUTTERY BROOK STREAM CHANNEL
3. EXISTING LOW FLOW BUTTERY BROOK STREAM CHANNEL
4. CREATED MARSH WETLAND COMPLEX
5. CREATED SCRUB/SHRUB WETLAND COMPLEX
6. CREATED FORESTED WETLAND COMPLEX
7. TRAIL HEAD OVERLOOK BOARDWALK CONNECTION TO SIDEWALK AT ROUTE 116
8. BOARDWALK OVERLOOK WITH SEATING AND EDUCATIONAL SIGNAGE
9. BOARDWALK STREAM CROSSING
10. QUEEN CIRCLE TRAIL HEAD
11. NATURAL SURFACE LOOP TRAIL EXTENSION
12. IN STREAM GRADE CONTROL STRUCTURES CONSTRUCTED WITH NATURAL MATERIALS
- SUCH AS, NATIVE ROUNDED BOULDERS, LOGS, ROOTWADS, ETC.)
13. EXISTING RESIDENTIAL STRUCTURES



**BIRDSEYE VIEW FACING SOUTHEAST,
LOW-WATER CONDITION**



**BIRDSEYE VIEW FACING SOUTHEAST,
POOLED WETLAND CONDITION**



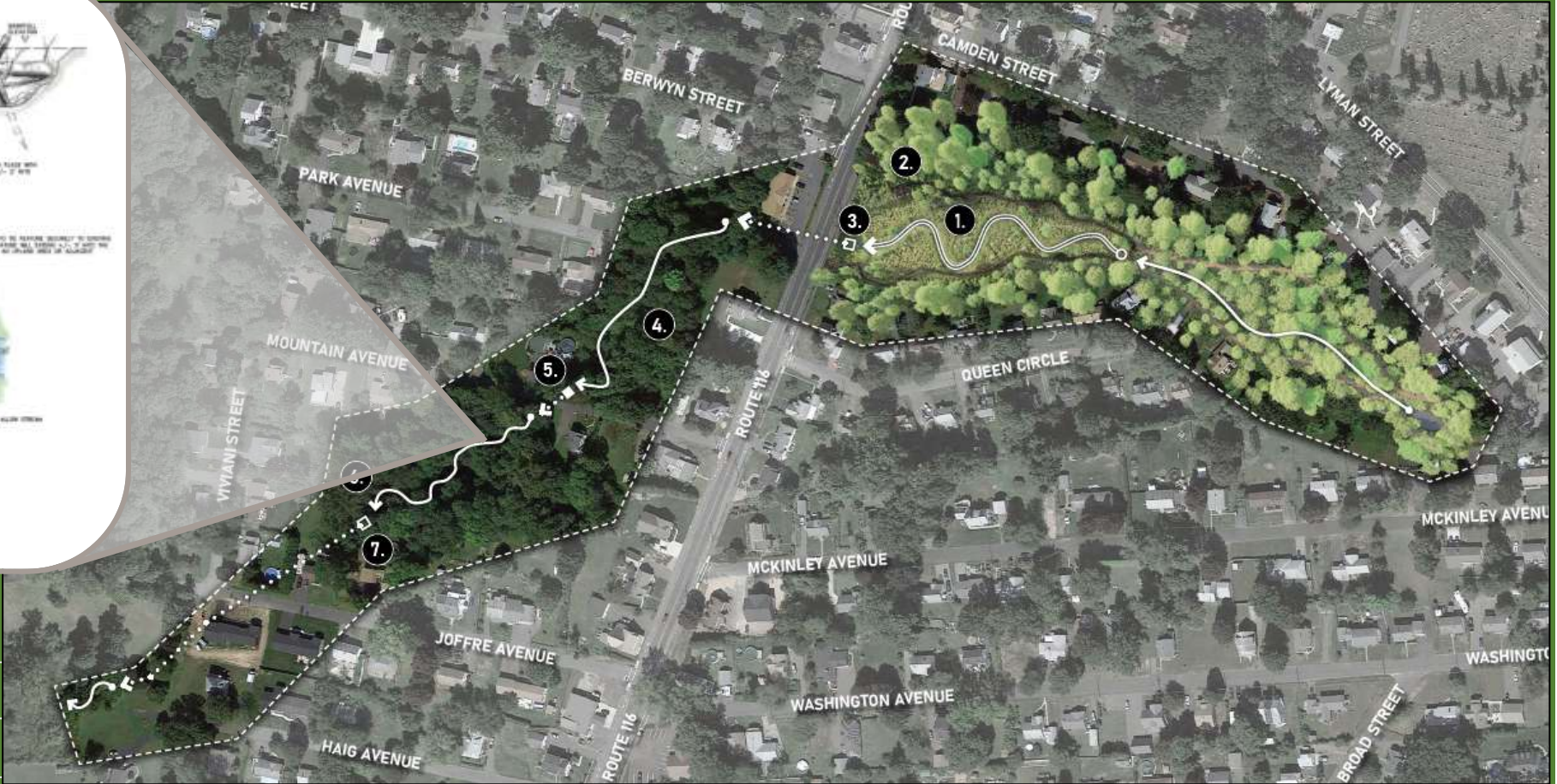
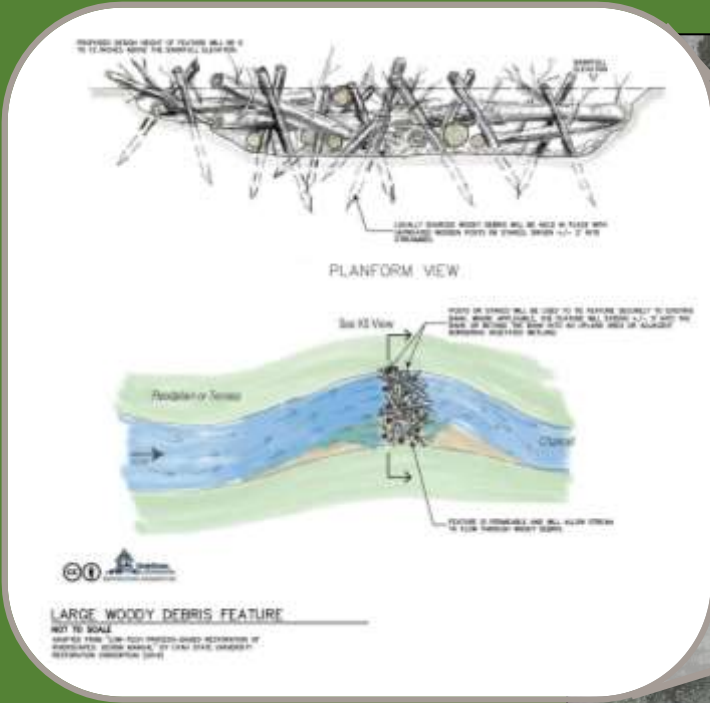
**BIRDSEYE VIEW FACING SOUTHEAST,
DURING LARGE STORM EVENT**



**PERSPECTIVE VIEW FACING WEST,
LOW-WATER CONDITION**

SCAN
FOR 3-D!

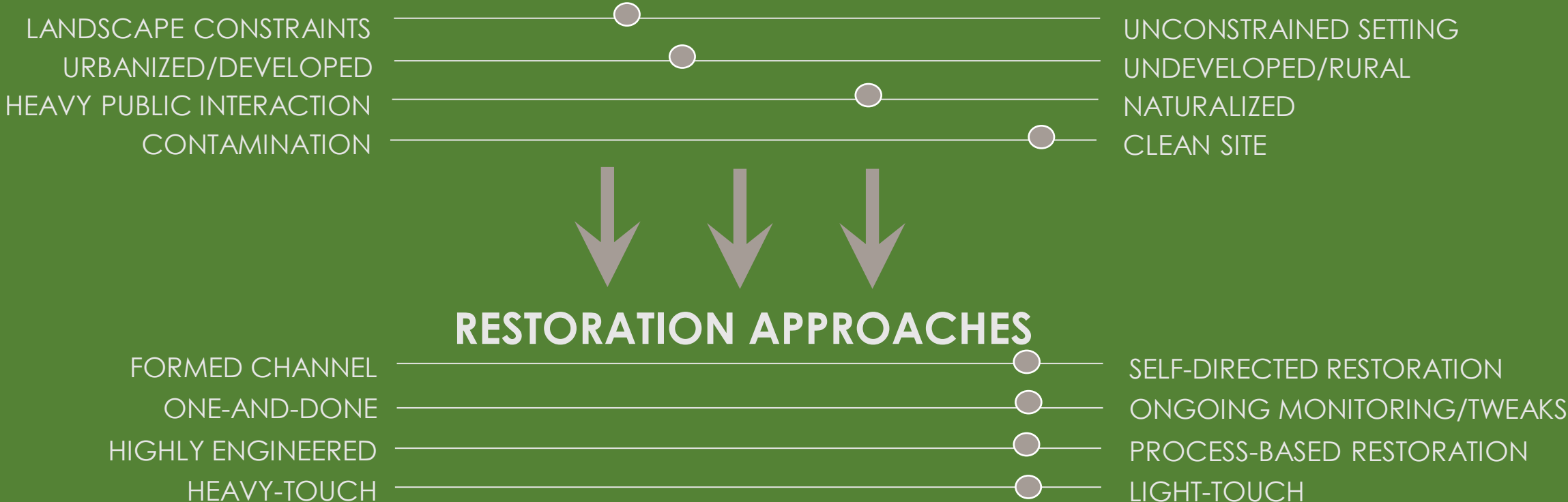




BEAVER-DAM ANALOGS
 LARGE WOOD
 CITIZEN SCIENCE/DIY

... LIGHTER TOUCH DOWNSTREAM

BUTTERY BROOK DOWNSTREAM: THE BACKYARD GULLY



HOME BREW DAM UXBRIDGE, MA

— ADAPTIVE PERMITTING for ADAPTIVE MANAGEMENT —
— AKA: PROCESS-BASED RESTORATION with A FAIL-SAFE PLAN —



SITE BACKGROUND AND CONTEXT



HOME BREW DAM/MEADOW BROOK

LANDSCAPE CONSTRAINTS
URBANIZED/DEVELOPED
HEAVY PUBLIC INTERACTION
CONTAMINATION

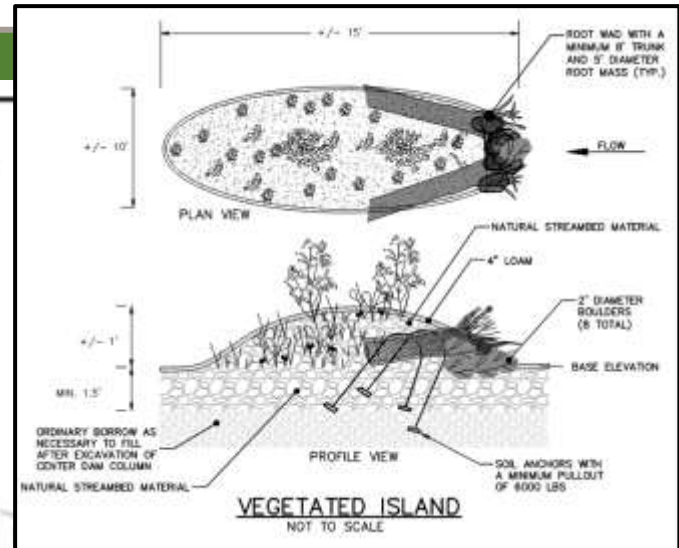
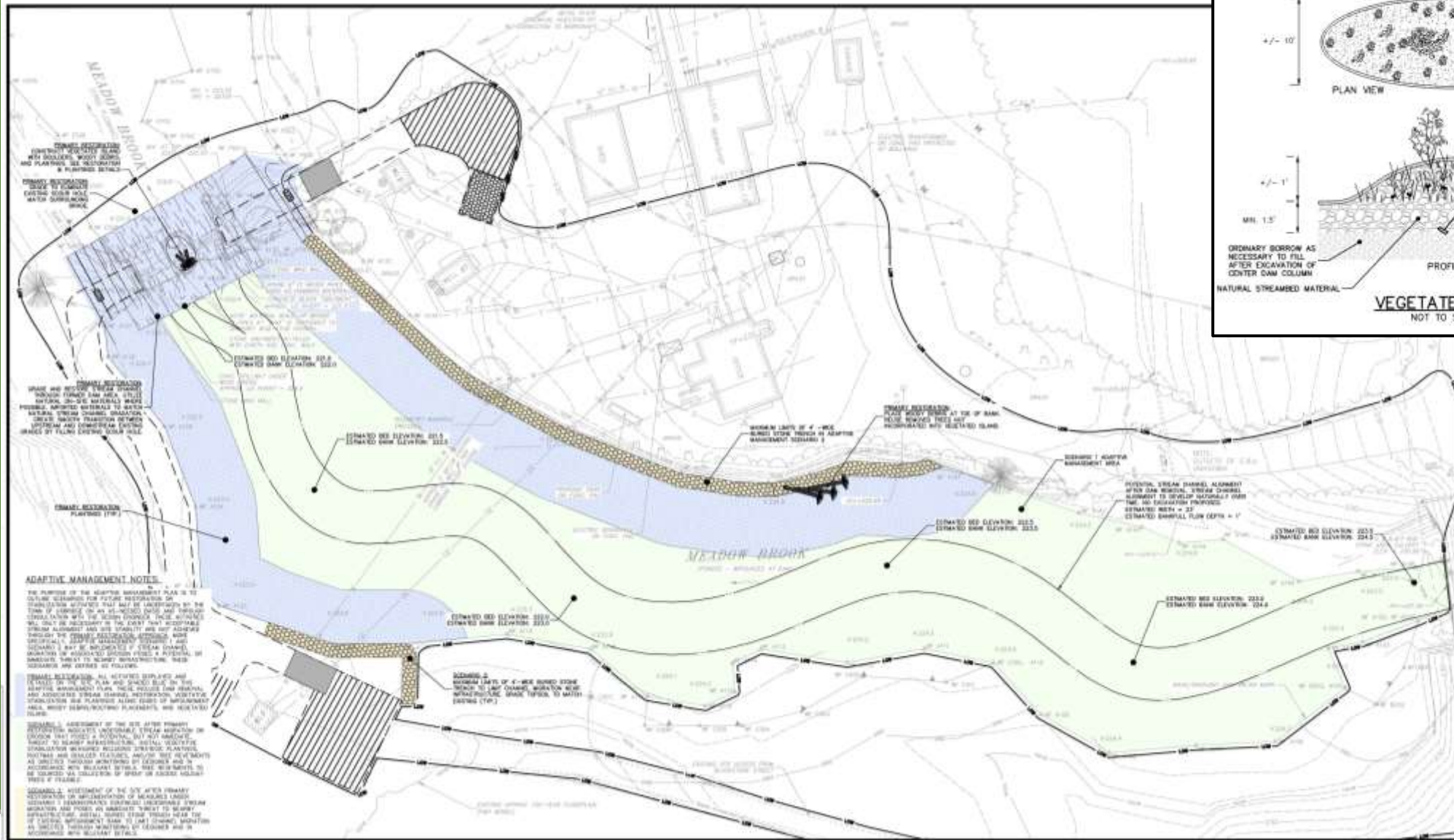
UNCONSTRAINED SETTING
UNDEVELOPED/RURAL
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CLEAN SITE



RESTORATION APPROACHES

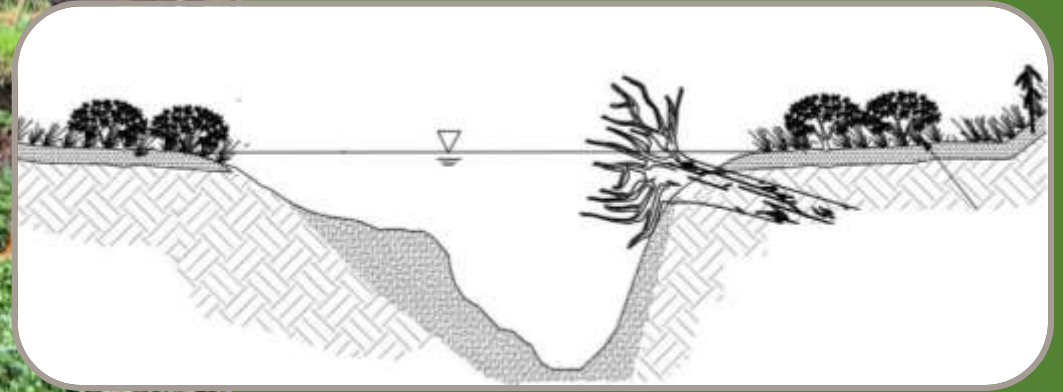
FORMED CHANNEL
ONE-AND-DONE
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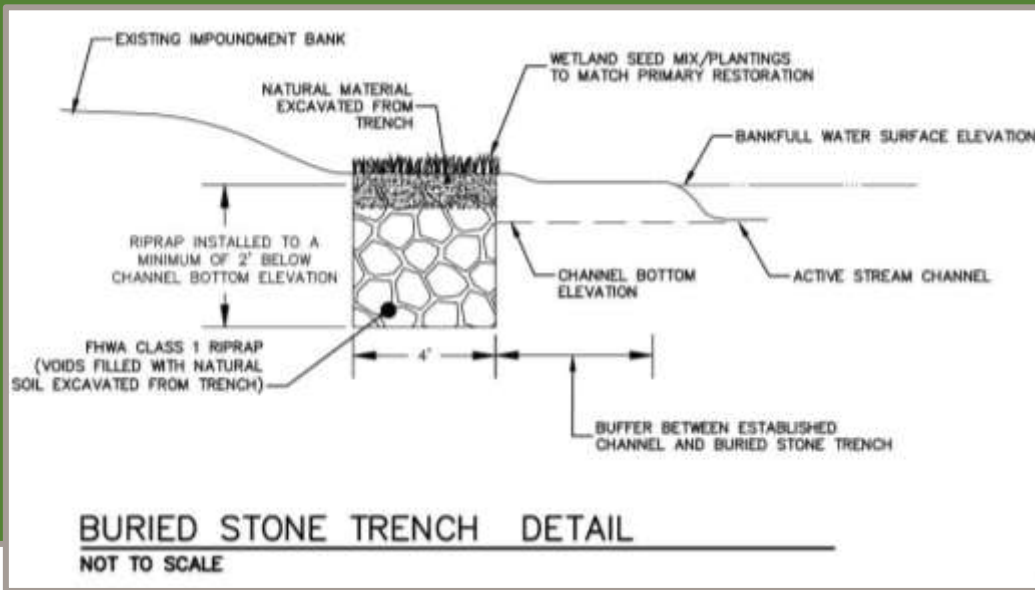


LEVEL 1

TREE REVETMENTS
ROOTWADS
BOULDERS



LEVEL 2



ADAPTIVE MANAGEMENT

PERMIT the WORST-CASE SCENARIO

ALLOW CHANNEL TO RE-FORM NATURALLY

MONITOR CHANNEL DEVELOPMENT

APPLY ADAPTIVE MANAGEMENT

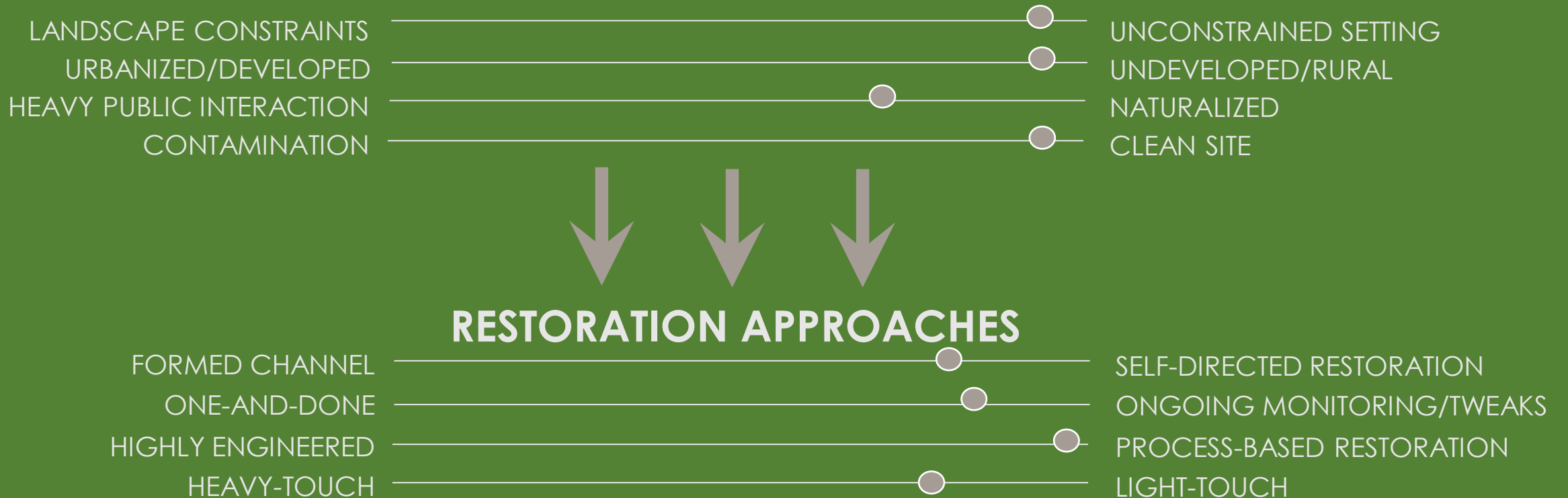
SCARBOROUGH BROOK BELCHERTOWN, MA

— BALANCING PUBLIC INTERESTS WITH FULL NATURALIZATION —



SITE BACKGROUND AND CONTEXT

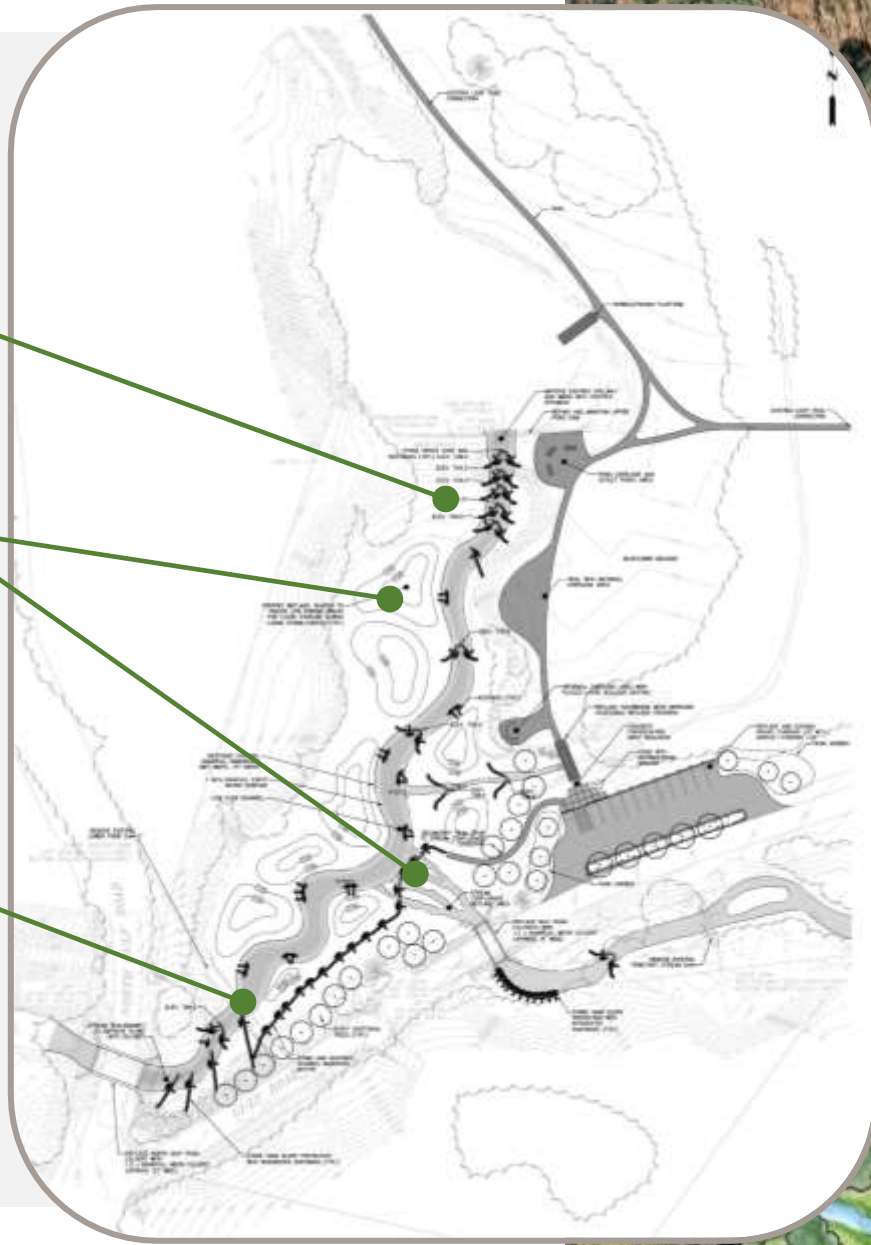
SCARBOROUGH BROOK



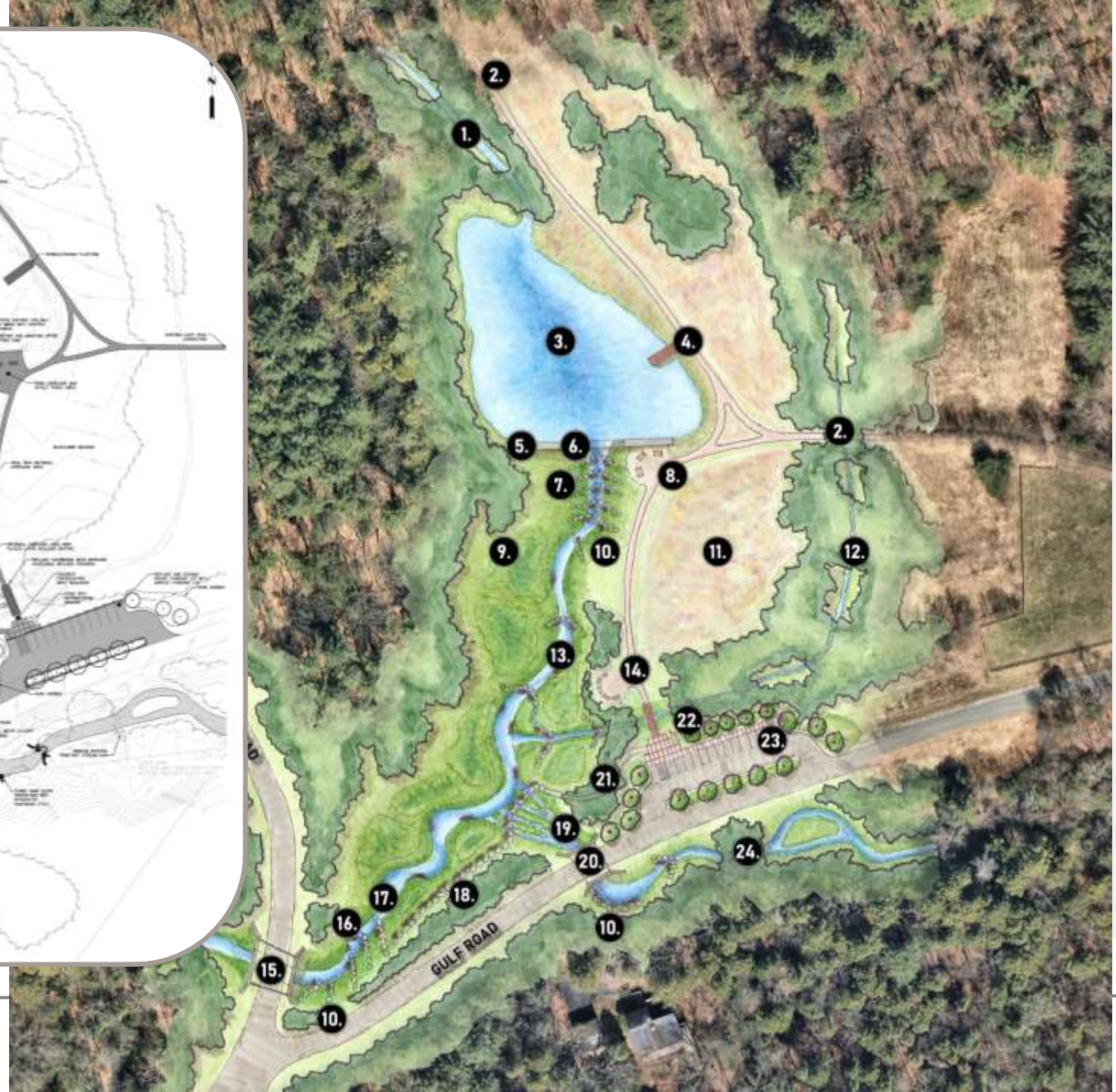
BOULDER
CROSS VANE
STEP-DOWN

LANDSCAPE
& HABITAT
DIVERSITY

CHANNEL
MIGRATION
BUFFER



TAILORING STREAM RESTORATION TO THE LANDSCAPE





TAKE-HOME LESSONS

ONE SIZE DOES NOT FIT ALL → LANDSCAPE CONTEXT IS KEY

SOME THINGS NEVER CHANGE → PUBLIC NARRATIVE/BUY-IN

LESS IS MORE... WHEN YOU CAN GET AWAY WITH IT

WHEN YOU CAN'T... BUILD ADAPTATION INTO YOUR PROJECT



MVP

Municipal Vulnerability
Preparedness

QUESTIONS?

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