

# ECOLOGICAL BENEFITS OF A POND & FRESHWATER WETLAND ECOSYSTEM

## RIPARIAN BUFFER

## RIPARIAN BUFFER

### UPLAND

### FRESHWATER WETLAND

### OPEN WATER POND

### FRESHWATER WETLAND

### UPLAND

Freshwater wetlands are areas where water is present at or near the surface of the soil for varying periods of time during the year, creating a unique ecological condition that favors the growth of specially adapted vegetation, the continued development of wetland soils and supports diverse microbial communities.

Ponds are not functioning as wetlands. They are permanently flooded, still bodies of water surrounded by land and are typically <10% vegetated. These systems include biotic (living) plants, animals, and microorganisms, as well as abiotic (non-living) physical and chemical interactions. Ponds and shallow lakes typically have almost all their entire bottom surfaces exposed to light.



**WHITE TAILED DEER**  
*Odocoileus virginianus*



**GREAT EGRET**  
*Ardea alba*



**BARKING TREEFROG**  
*Dryophytes gratosius*



**NORTH AMERICAN BEAVER**  
*Castor canadensis*



**LOBLOLLY PINE**  
*Pinus taeda*



**TULIP POPLAR**  
*Liriodendron tulipifera*



**CHINESE PRIVET**  
*Ligustrum sinense*



**BALD CYPRESS**  
*Taxodium distichum*



**WINTERBERRY**  
*Ilex verticillata*



**CUTLEAF CONEFLOWER**  
*Rudbeckia laciniata*



**NETTED CHAIN FERN**  
*Woodwardia areolata*



**JAPANESE SILTGRASS**  
*Microstegium vimineum*  
\*Non-native species



**WHITE CUTGRASS**  
*Leersia virginica Willd.*



**LEATHERY RUSH**  
*Juncus coriaceus*



**CANADIAN GOOSE**  
*Branta canadensis*



**BELTED KINGFISHER**  
*Megaceryle alcyon*



**TUNDRA SWAN**  
*Cygnus columbianus*



**AMERICAN BLACK DUCK**  
*Anas rubripes*



**PROTHONOTARY WARBLER**  
*Protonotaria citrea*



**BALD EAGLE**  
*Haliaeetus leucocephalus*



**MALLARD DUCK**  
*Anas platyrhynchos*



**WILD TURKEY**  
*Meleagris gallopavo*



**VIRGINIA OPOSSUM**  
*Didelphis virginiana*



WHAT ELSE HAVE YOU SEEN?

**OSPREY**  
*Pandion haliaetus*

Tundra swans use large bodies of water where submerged aquatic vegetation and underwater tubers are plentiful.

In Winter, their diet transitions to use mollusks, grass, and agricultural grain crops and they sleep in open water.

Will nest in standing dead trees typically in flooded river bottoms and forested wetlands, but some suitable nesting habitat is found along the edges of ponds.



WHAT ELSE HAVE YOU SEEN?



**ATLANTIC COAST SLIMY SALAMANDER**  
*Plethodon chlorobryonis*



**RIVER BIRCH**  
*Betula nigra*



**RED MAPLE**  
*Acer rubrum*



**BLACK GUM**  
*Nyssa sylvatica*



**MARSH MARIGOLD**  
*Caltha palustris var. palustris*



**TREE OF HEAVEN**  
*Ailanthus altissima*  
\*Non-native species



**SWAMP JACK**  
*Arisaema pusillum*



**HORNWORT**  
*Ceratophyllum demersum*



**DUCKWEED**  
*Lemna minor*

As open water is exposed to high amounts of sunlight and is also often high in nutrients, it encourages rapid growth of submerged aquatic vegetation (SAV). SAV will utilize the available oxygen resulting in daily decreases in oxygen availability. Furthermore, as overgrown vegetation decays, the dissolved oxygen levels decrease.



**NORTHERN WILD RICE**  
*Zizania aquatica*  
Fewer species of herbaceous plants are adapted to stagnant waters of open ponds and often would have been found in dense populations in the high-quality wetlands that were flooded by impoundments.



WHAT ELSE HAVE YOU SEEN?



**FILAMENTOUS ALGAE**  
*Spirogyra spp.*



**AMERICAN EEL**  
*Anguilla rostrata*

Dams obstruct eel's upstream and downstream migrations, which limits their reproduction. American eels use habitats around ponds to feed on insects, worms, crayfish, small frogs, and fishes.

Open water ponds have reduced structural diversity (snags, trees, plant masses, wetland vegetation, etc.) and can make eels more vulnerable to predators. Eels are sensitive to poor water quality typical of impoundments which limit population size and health.



**BLUEBACK HERRING**  
*Alosa aestivalis*

Anadromous fish that need to move between the ocean and inland areas cross over dams and do not thrive in ponds unless they are stocked.

200 YEAR FLOODPLAIN

POND WATER LEVEL

STORMWATER CAPACITY

Dammed, shallow ponds typically have poor water quality, such as low amounts of dissolved oxygen and higher water temperatures. High dissolved oxygen is essential in supporting aquatic life (fish, insects, worms, snails, etc.) and higher water temperatures cause dense aquatic vegetation that hinders boating, fishing, and swimming opportunities.

Compared to wetlands, ponds have a reduced potential to capture stormwater as the permanently flooded condition already occupies much of the storage capacity. Water is more likely to rise above the floodplain in high storm events.

# ECOLOGICAL BENEFITS OF A FRESHWATER & TIDAL WETLAND ECOSYSTEM

## RIPARIAN BUFFER

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### UPLAND

### FRESHWATER WETLAND

### TIDAL WETLAND

### FRESHWATER WETLAND

### UPLAND

Freshwater wetlands are areas where water is present at or near the surface of the soil for varying periods of time during the year, creating a unique ecological condition that favors the growth of specially adapted vegetation and the development of wetland soils and diverse microbial communities.

Tidal wetlands occur along the Lower James where daily tidal inundation is unrestricted by levees or channel alteration. Its habitats are influenced by lunar tides while freshwater flows from upstream keep salinity levels low. Their dynamic nature supports a wide range of wildlife, particularly birds and fish, many of whom depend on unique tidal wetland conditions to reproduce.



**DOUBLE-CRESTED CORMORANT**  
*Phalacrocorax auritus*



**WHITE-THROATED SPARROW**  
*Zonotrichia albicollis*



**YELLOW-BELLIED SAPSUCKER**  
*Sphyrapicus varius*



**CANADIAN GOOSE**  
*Branta canadensis*



**BLACK AND WHITE WARBLER**  
*Mniotilta varia*



**RED-WINGED BLACKBIRD**  
*Agelaius phoeniceus*



**BELTED KINGFISHER**  
*Megasceryle alcyon*



**TUNDRA SWAN**  
*Cygnus columbianus*

Tundra swans over-wintering in the Chesapeake Bay from autumn-early spring feed almost exclusively on clams they dislodge from the mud in tidal wetlands. They also eat dried seeds from wetland grass and agricultural grain.

#### STREAM CHANNEL



**OSPREY**  
*Pandion haliaetus*

#### STREAM CHANNEL



**PROTHONOTARY WARBLER**  
*Protonotaria citrea*



**WILSON'S SNIPE**  
*Gallinago delicata*



**BALD EAGLE**  
*Haliaeetus leucocephalus*



**DARK EYED JUNCO**  
*Junco hyemalis*



**COMMON GRACKLE**  
*Quiscalus quiscula*



**WILD TURKEY**  
*Meleagris gallopavo*



**WHITE TAILED DEER**  
*Odocoileus virginianus*



**BARKING TREEFROG**  
*Dryophytes gratiosus*



**NORTH AMERICAN BEAVER**  
*Castor canadensis*



**LOBLOLLY PINE**  
*Pinus taeda*



**TULIP POPLAR**  
*Liriodendron tulipifera*



**VIRGINIA PENNYWORT**  
*Obolaria virginica L.*



**BALD CYPRESS**  
*Taxodium distichum*



**WINTERBERRY**  
*Ilex verticillata*



**CUTLEAF CONEFLOWER**  
*Rudbeckia laciniata*



**NETTED CHAIN FERN**  
*Woodwardia areolata*



**BIG CORDGRASS**  
*Spartina cynosuroides*



**HORNWORT**  
*Ceratophyllum demersum*



**NORTHERN WILD RICE**  
*Zizania aquatica*

A major food source for songbirds and waterfowl. Wild rice thrives in tidal marshes with water depths from 0.5 - 3 feet. The thick beds trap sediment from receding waters allowing for greater nutrient availability.



**RICE CUTGRASS**  
*Leersia oryzoides (L.) Sw.*



**ATLANTIC COAST SLIMY SALAMANDER**  
*Plethodon chlorobryonis*



**VIRGINIA OPOSSUM**  
*Didelphis virginiana*



**RIVER BIRCH**  
*Betula nigra*



**RED MAPLE**  
*Acer rubrum*



**BLACKGUM**  
*Nyssa sylvatica*



**SWAMP LOOSEWORT**  
*Pedicularis lanceolata*



**MARSH MARIGOLD**  
*Caltha palustris var. palustris*



**WHITE CUTGRASS**  
*Leersia virginica Willd.*



**LEATHERY RUSH**  
*Juncus coriaceous*



**AMERICAN EEL**  
*Anguilla rostrata*

A catadromous species that spends much of its adult life in rivers and estuaries but migrates out to the ocean to spawn and die. Free-flowing streams allow eels to move further inland where they play a critical role in dispersing the larvae of freshwater mussels.

In the lower coastal plain, eels prefer wetlands rich in crustaceans and bivalves with undisturbed, structurally diverse sediments offering abundant shelter.



**WHITE PERCH**  
*Morone americana*



**GIZZARD SHAD**  
*Dorosoma cepedianum*



**BLUEGILL**  
*Lepomis macrochirus*



**BLUEBACK HERRING**  
*Alosa aestivalis*

An anadromous species that spends its adult life in saltwater & returns to freshwater to reproduce multiple times throughout its life.

In spring, herring migrate from the tidal zone to undammed rivers to spawn. Newly hatched herring spend the summer in freshwater before migrating back to the ocean.

200 YEAR FLOODPLAIN

HIGH-TIDE  
LOW-TIDE

STORMWATER CAPACITY



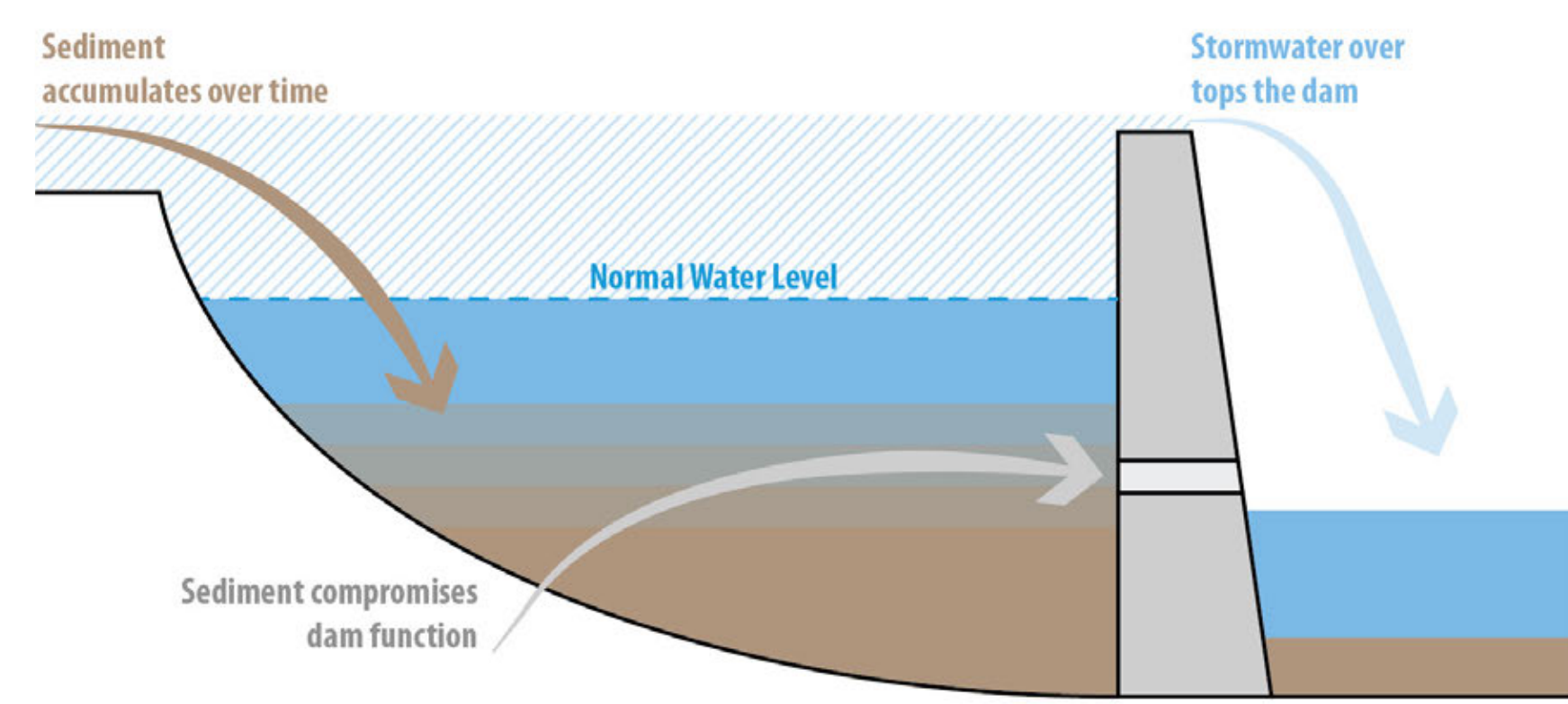
Dissolved oxygen is primarily regulated by daily water exchange between estuaries and wetlands, with oxygen levels rising on incoming tides and falling as tides recede.



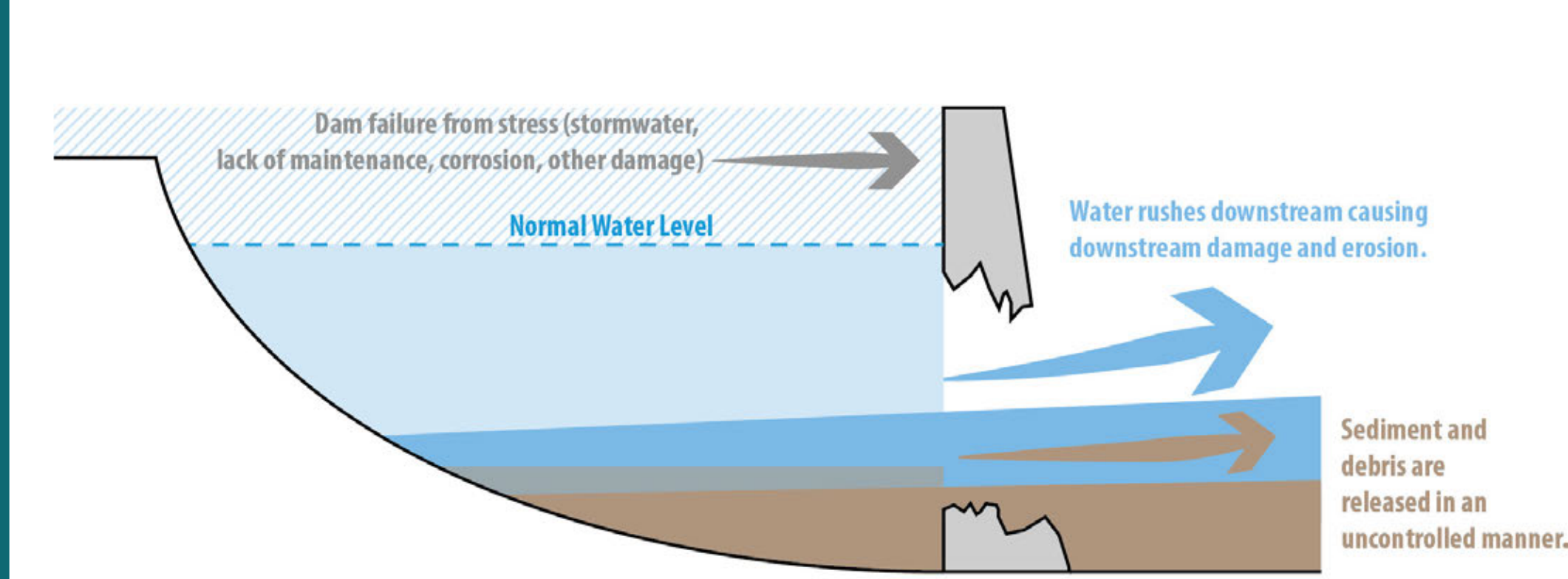
The dense vegetation in wetlands absorbs stormwater, which also allows for its absorption into the soil, ultimately reducing flow velocity. Vegetative cover in wetland habitats increases water uptake and the overall capacity for water storage.

# SUNKEN MEADOW POND | FUTURE SCENARIOS

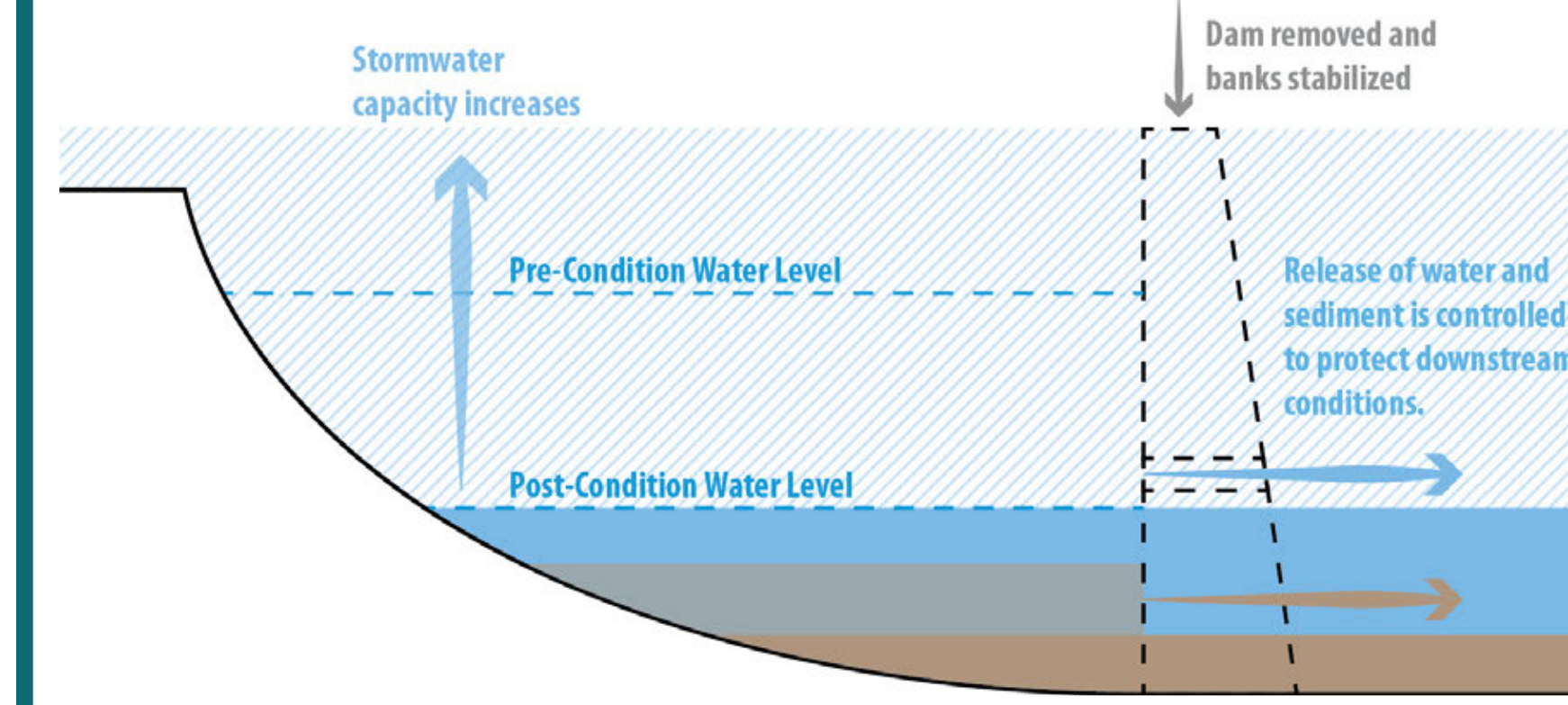
## POND SILTATION



## DAM FAILURE



## WETLAND RESTORATION



TIME

PRE CONDITION

IN PROGRESS

POST CONDITION

WHAT CONCERNS OR QUESTIONS DO YOU HAVE ABOUT THESE POTENTIAL FUTURE SCENARIOS?

# MITIGATION PROCESS

## ONGOING PROGRAM OBLIGATION

## ONGOING PROGRAM COLLABORATION



DCR PARKS  
**LAND TRUSTS**  
NGOs  
PUBLIC LANDS DWR  
local PARTNERSHIPS  
governments

**VIRGINIA**  
STREAM AND WETLAND  
MITIGATION PROGRAM



## PRELIMINARY PROJECT PLANNING (6 - 12 MONTHS)

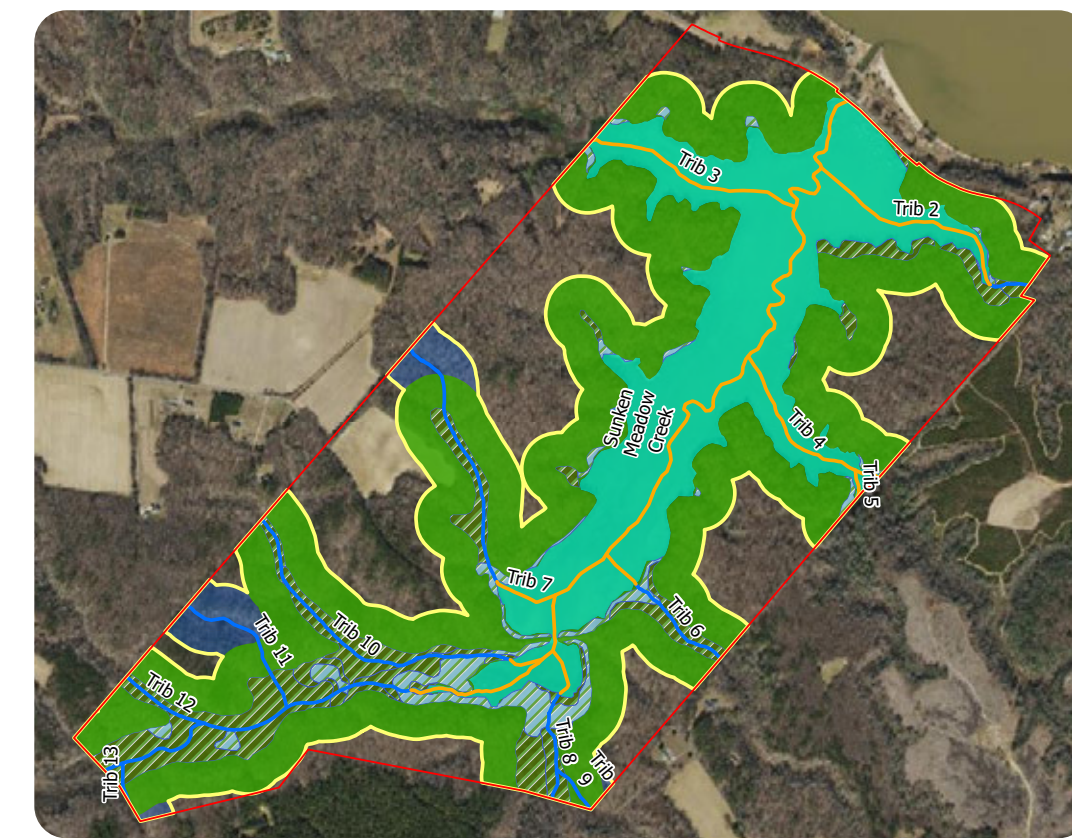
## PROJECT DEVELOPMENT (12 MONTHS - 2 YEARS)

### COORDINATION & ASSESSMENT



Once a potential project is identified, TNC coordinates with state and federal agencies to assess suitability through initial cultural and ecological reviews using best available data to determine the potential benefit and uplift of the project.

### CONCEPTUAL PLAN & PUBLIC NOTICE



A high-level concept map outlines potential restoration and conservation activities and is submitted to regulatory agencies. The Corps will issue a public notice prior to initial funding approval. Approved funds support early project activities, including surveying and land acquisition.

### CONTINUED PLANNING WITH SCIENTISTS & ENGINEERS



TNC works with wetland and environmental scientists to conduct surveys for species of concern, invasive species, and existing wetlands and stream condition. This information is the first step in guiding a restoration plan.



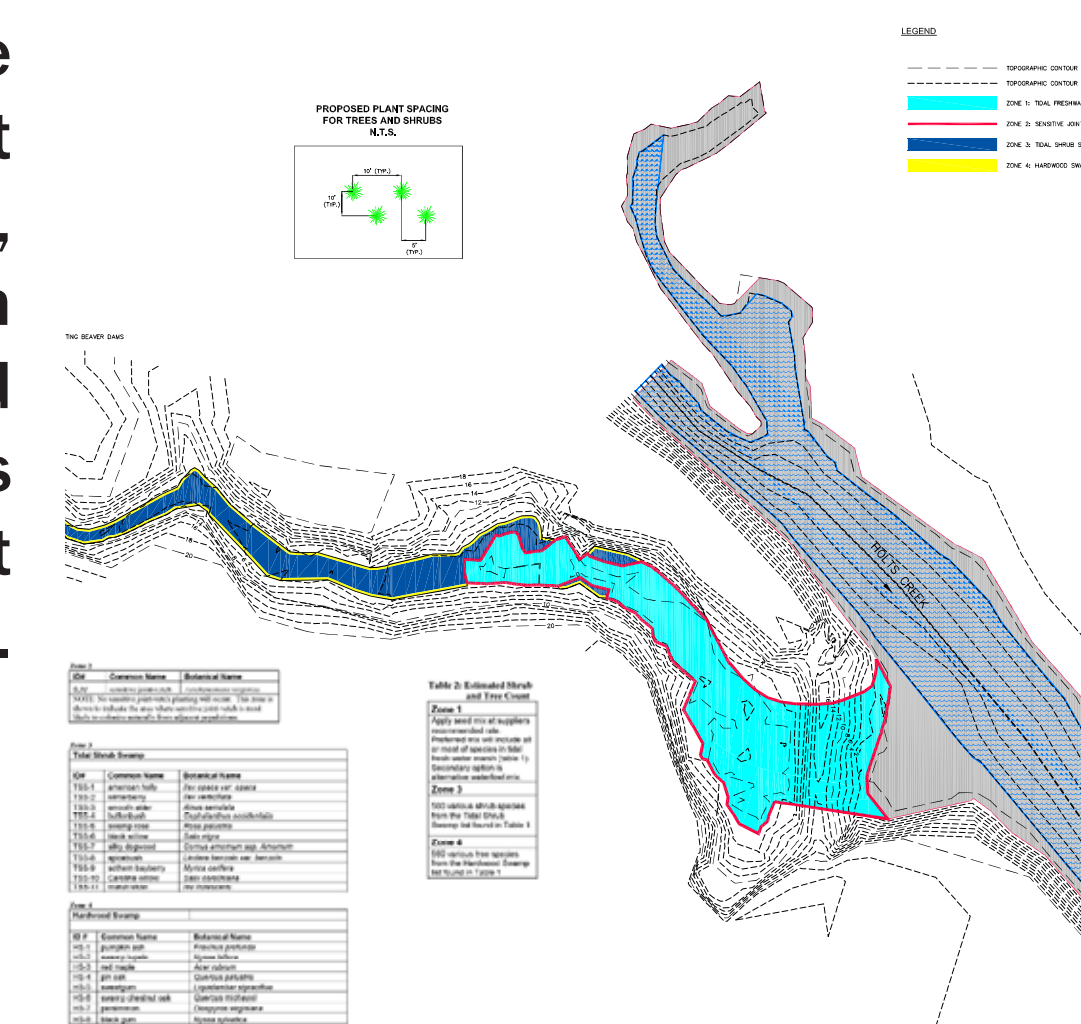
TNC engages qualified engineers to develop design plans for restoration using detailed surveys and hydrologic modeling that account for varying types of storm events, including the 100-year flood.

## COORDINATION & APPROVALS WITH REGULATORY AGENCIES

All stages of project development are coordinated with regulatory agencies. The final design and management plan must be approved by the permitting agencies prior to implementation.

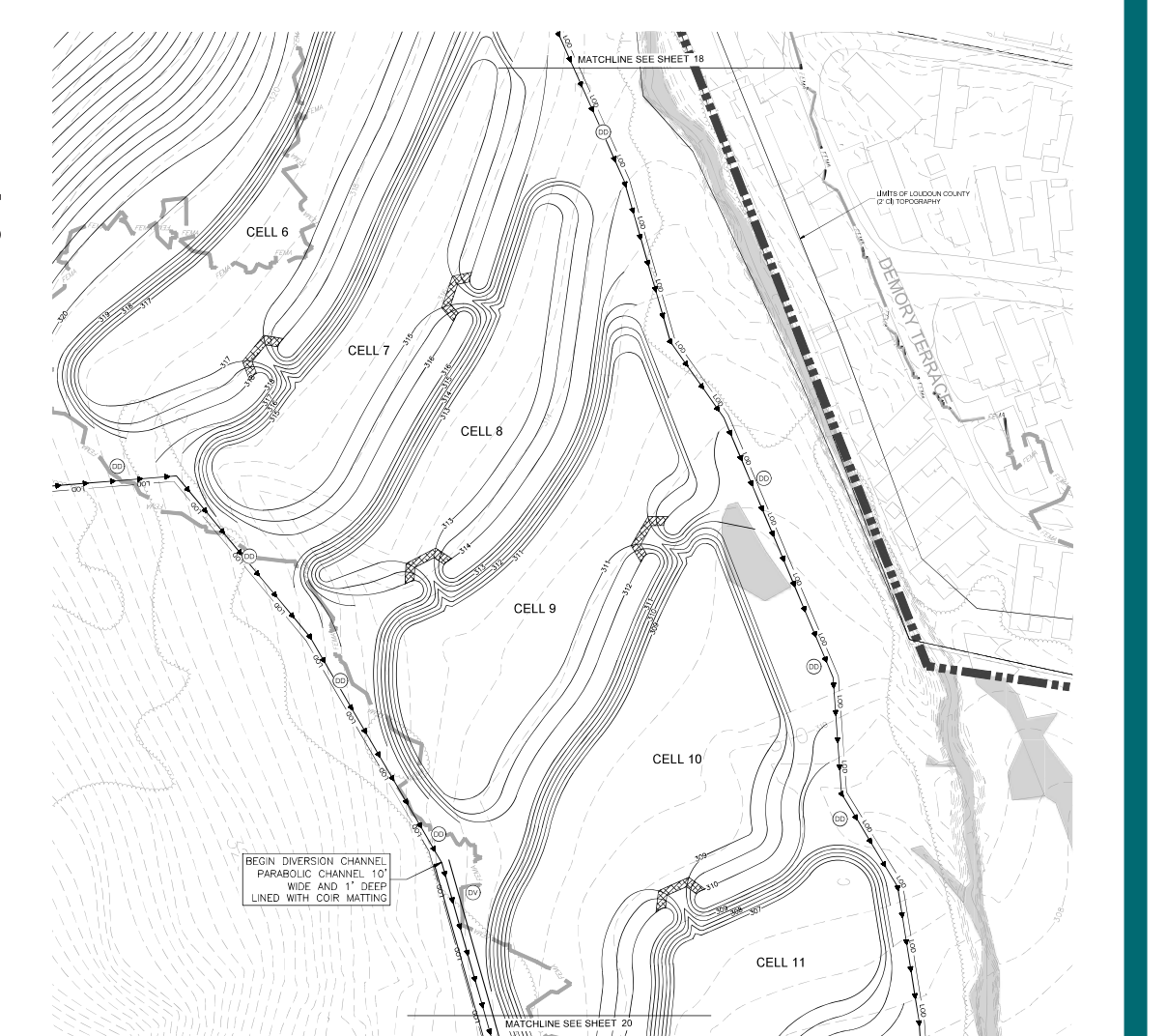


The plans might include time avoidance windows to prevent impacts to sensitive species, designated construction staging areas, and required planting windows. All plans include erosion and sediment control measures.



## DEVELOP DESIGN & MANAGEMENT PLAN

TNC and consultants prepare the design and management plans for the site by synthesizing all environmental and engineering information into a construction document and management plan for the site.



## PERMITTING & CONSTRUCTION (6 - 12 MONTHS)

### EARTHWORK & STABILIZATION



During active restoration work various activities can be anticipated. This includes using heavy machinery to excavate soil, restructure stream channels, and dig out filled wetlands. Exposed soil is sloped to stable gradients and secured with plants and seeds.

### EROSION & SEDIMENT CONTROL



Erosion and sediment control plans are permitted and utilized. Silt fencing and other sediment control practices reduce soil loss until permanent vegetation is established.

### PLANTING & INVASIVE CONTROL



Native trees, shrubs, grasses, and perennials are all selected to thrive in the restored habitat and planted as live bareroot trees, live stakes, plugs, and/or seed. Undesired invasive plants are controlled through mechanical and/or chemical methods to allow the native vegetation to establish and flourish.

# MITIGATION PROCESS

## MONITORING & MAINTENANCE (7 - 10 YEARS)

### VEGETATION, HYDROLOGY & STABILIZATION MONITORING



Stream and wetland restoration projects must meet performance standards based on plant survival and growth, hydrology and soils, and streambank stability which is measured regularly over 7-10 years post-construction.

### INVASIVE SPECIES MANAGEMENT & SUPPLEMENTAL PLANTING



Informed by the data gathered during monitoring, invasive species are controlled and replanting takes place if needed. This continues over 7-10 years to ensure the performance standards are met.

### CORRECTIVE ACTION & STEWARDSHIP

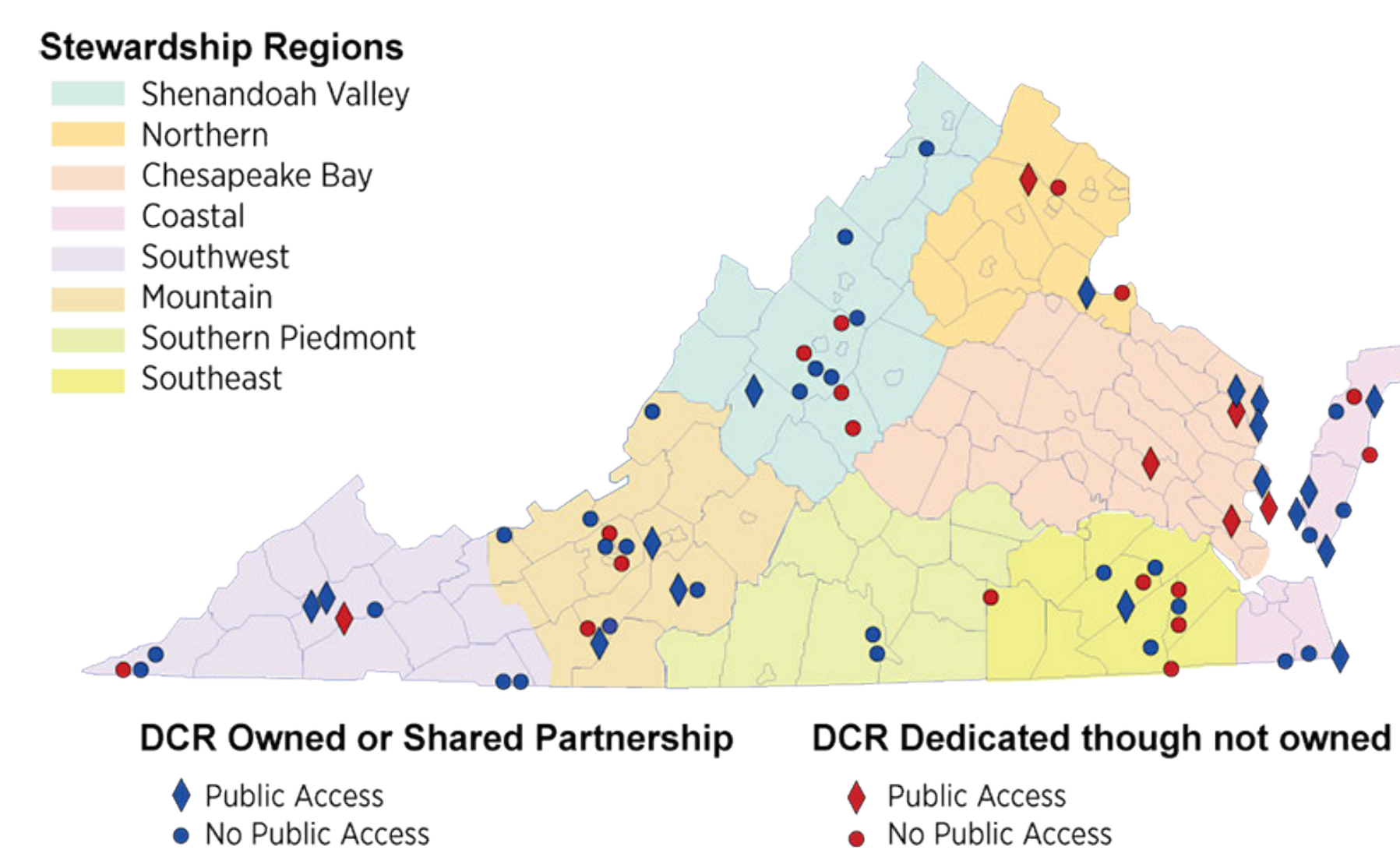


The land is closely monitored and TNC may pursue actions that improve the functioning of the site including trash clean-up, fence or structure repair, research activities, or other activities.

## LONG TERM PROTECTION & MANAGEMENT (PERPETUAL)

### ADDITIONAL PROTECTIONS

All projects are legally protected to meet TNC land protection and mitigation requirements. If the property is privately owned, a conservation easement is held by TNC or another qualified Virginia land trust. TNC-owned sites are protected through ownership and an agency-approved management plan. Conservation easements are recorded prior to any land transfer from TNC ownership, and some projects receive an additional deed protection, such as designation as a State Natural Area Preserve.



### ANNUAL VISITS & INSPECTIONS

Whether TNC is the owner of the land or not, TNC will conduct an annual visit to document that the property is continuing to be protected and the streams and wetlands are preserved.



## TRANSFER OR SALE OF PROPERTY



**Public Agency**  
Many completed restoration projects are transferred to Virginia state agencies (DCR or DWR) as natural area preserves or wildlife management areas, adding to permanently protected public lands such as Crow's Nest Natural Area Preserve and Chickahominy Wildlife Management Area. Public access may be established by the managing agency.



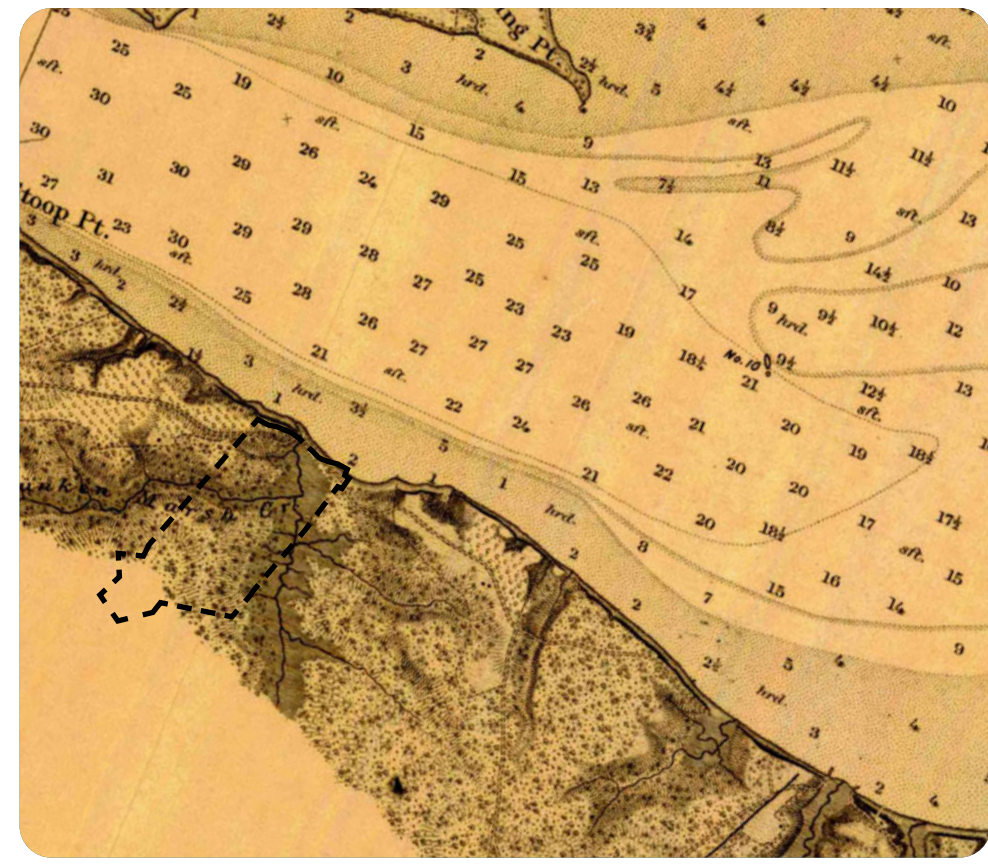
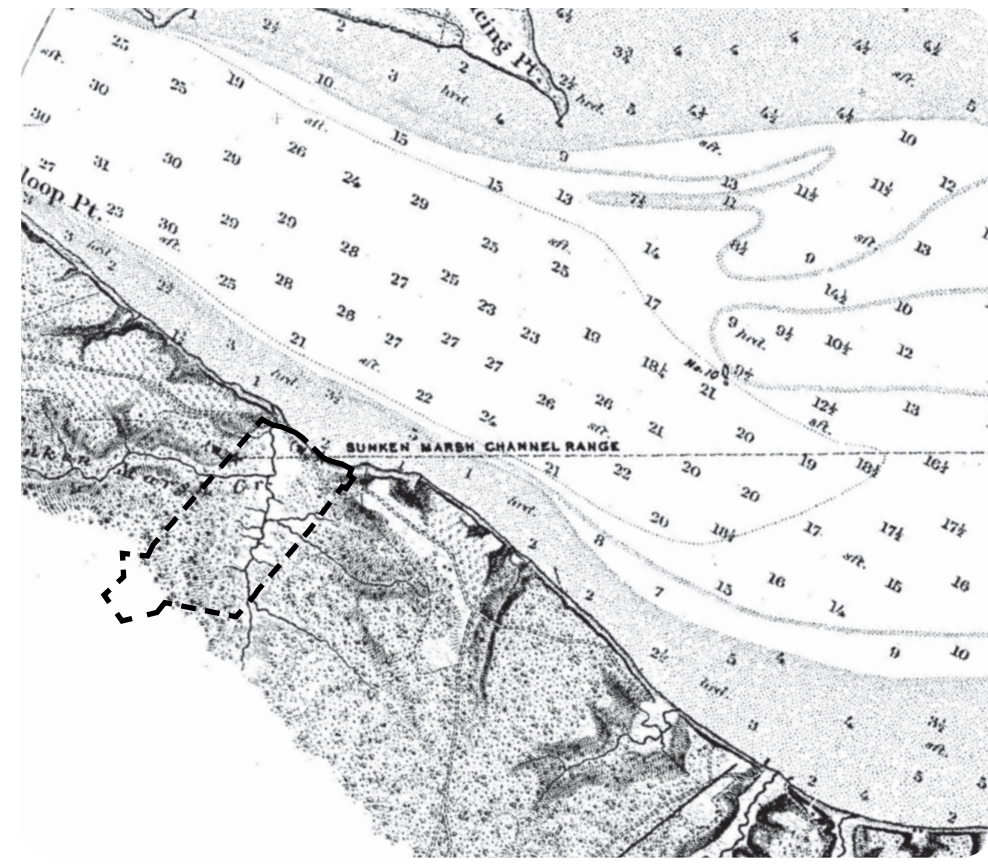
**Conservation Partner**  
TNC works with conservation partners across the state to steward land, with many projects transferred to local conservation groups, land trusts, and Tribal governments. Example of past partners include Friends of Dragon Run, Northern Neck Land Conservancy, and VCU. Programming and public access may be established by the partner organization.



**Private Owner**  
TNC may sell the property to a private buyer subject to a conservation easement. The owner may use the land for personal recreation and a limited building footprint but may not timber, develop, or otherwise impact the site's ecological value.

ARE THERE PARTS OF THIS PROCESS YOU'D LIKE TO LEARN MORE ABOUT OR AREAS WHERE ADDITIONAL INFORMATION WOULD BE HELPFUL?

# SUNKEN MEADOW | SITE HISTORY



**1620**

## INDIGENOUS LAND MANAGEMENT

The Quiyoughcohannock indigenous people inhabit the land of present-day Surry County.

## EARLY COLONIAL PLANTATION

Land passes through several hands including George Harrison and Arthur Allen. Land serves as a plantation.

**1882**

## NEW COLONY REAL ESTATE

James River nautical maps detail extensive creeks and marshes at Sunken Meadow Marsh Creek

**1886**

Frank Mancha incorporates Claremont and advertises land sales with farms along Sunken Meadow Creek

**1912**

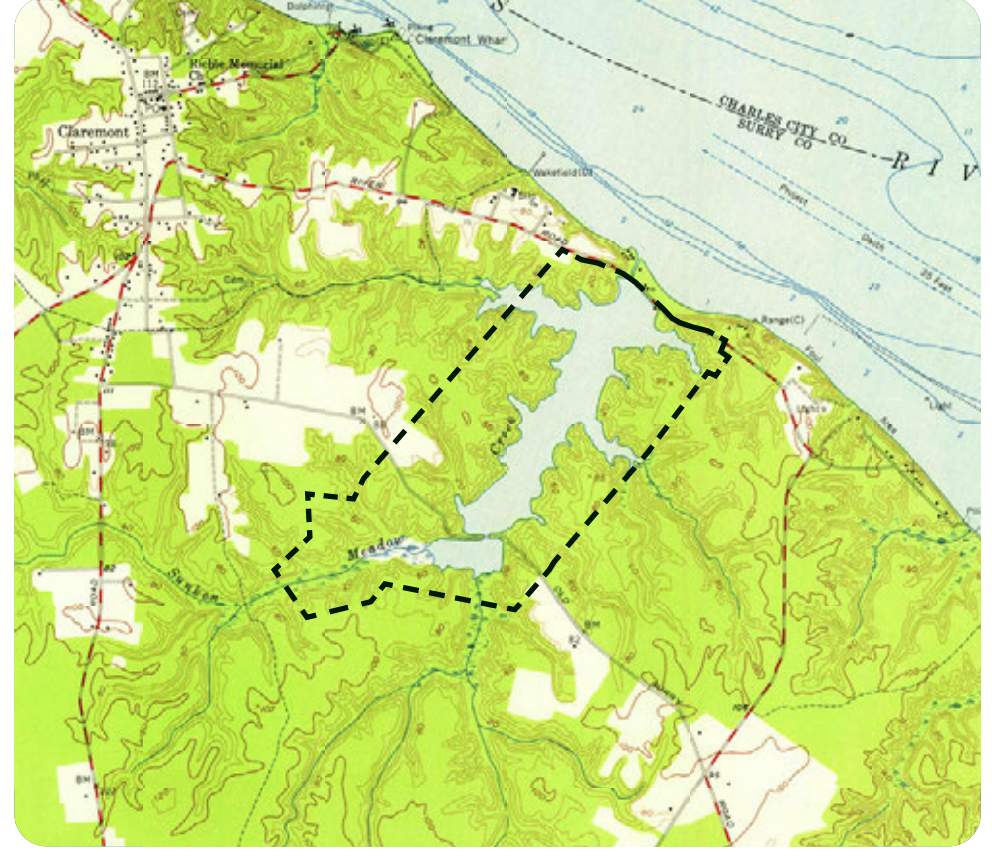
Mention of a Pond at Sunken Meadow first appears in the newspaper

**1920S**

## SUNKEN MEADOW BEACH RECREATIONAL COMMUNITY

Height of weekend vacationing and social events. A Dance hall, bath house, fishing club, and restaurant occupy the site.

Frequent storm damage to beach resort cottages.



**2025**

## TNC ACQUIRES LAND

The Nature Conservancy Virginia purchased Sunken Meadow from Davey Resources Group with intent to preserve the property and manage the property for critical habitat essential to the Chesapeake Bay and Virginia Pinelands, two priority conservation areas for TNC Virginia.

**2023**

## DAVEY PROJECT

Davey Resources Group acquires Sunken Meadow with the intent to remove the dam and establish a mitigation bank. To gather data, Davey temporarily drained the pond. Davey determined Sunken Meadow would not make a profitable mitigation bank and contacted TNC, since Davey was aware TNC was interested in purchasing the property for conservation.

**2003**

## HURRICANE ISABEL

Hurricane Isabel destroys the Sunken Meadow trailers, remaining cottages, and displaces residents.

**1990S**

## RECREATIONAL CAMP

Sunken Meadow is privately owned and the beach across the street continues to be used for recreation and housing.

In 1993, Surry County Waterfront access plan recommends state or local purchase of Sunken Meadow Pond and Beach to protect natural resources and preserve access.

**LATE 1960S**

## LAND IMPROVEMENTS

New jetties and embankments are constructed into the James River to expand the beach front. Campsite serves recreational trailers.

**1960**

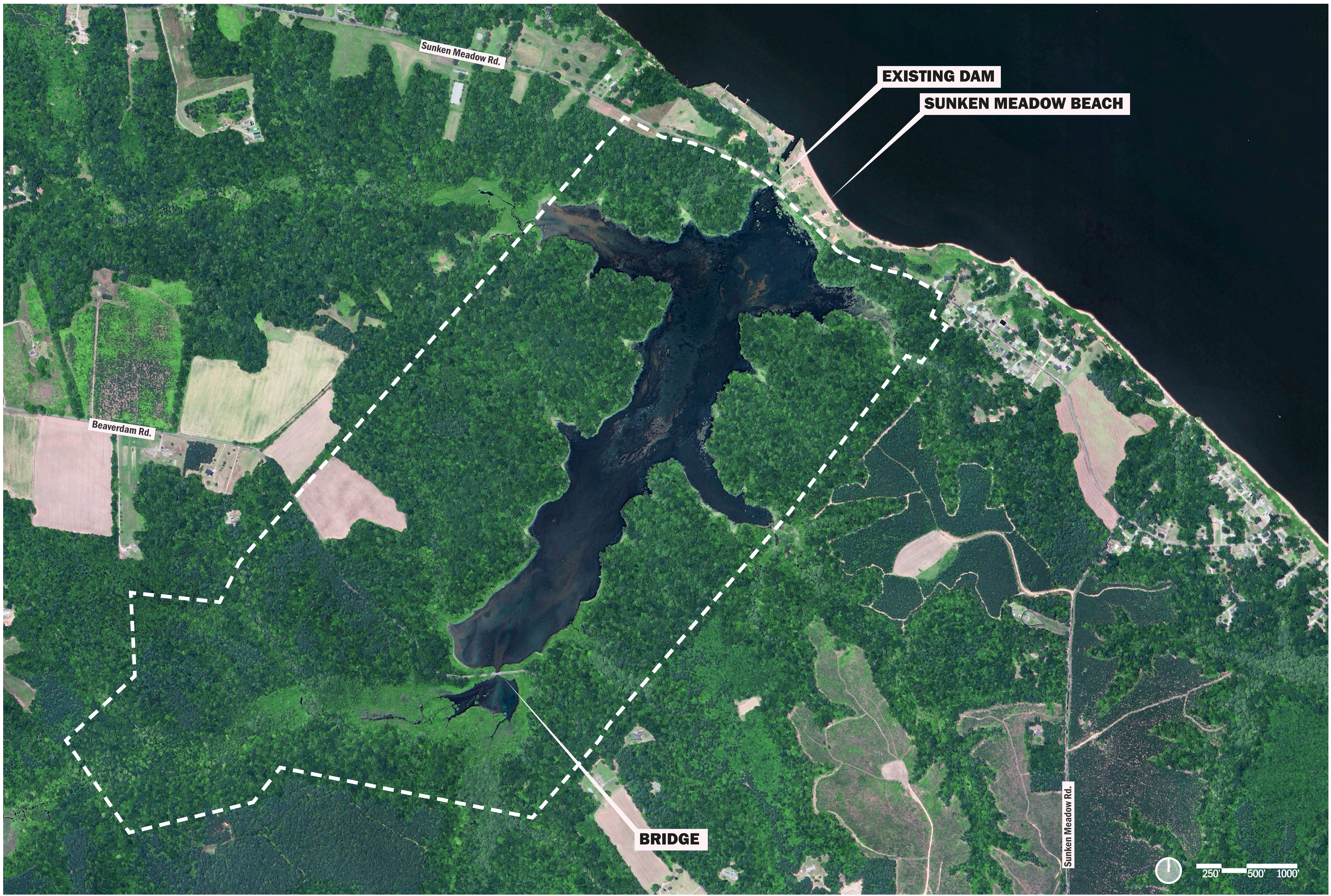
A new dam and road bridge is constructed at Sunken Meadow, changing the natural geomorphology and biological processes on site.

## EXISTING SITE PHOTOS

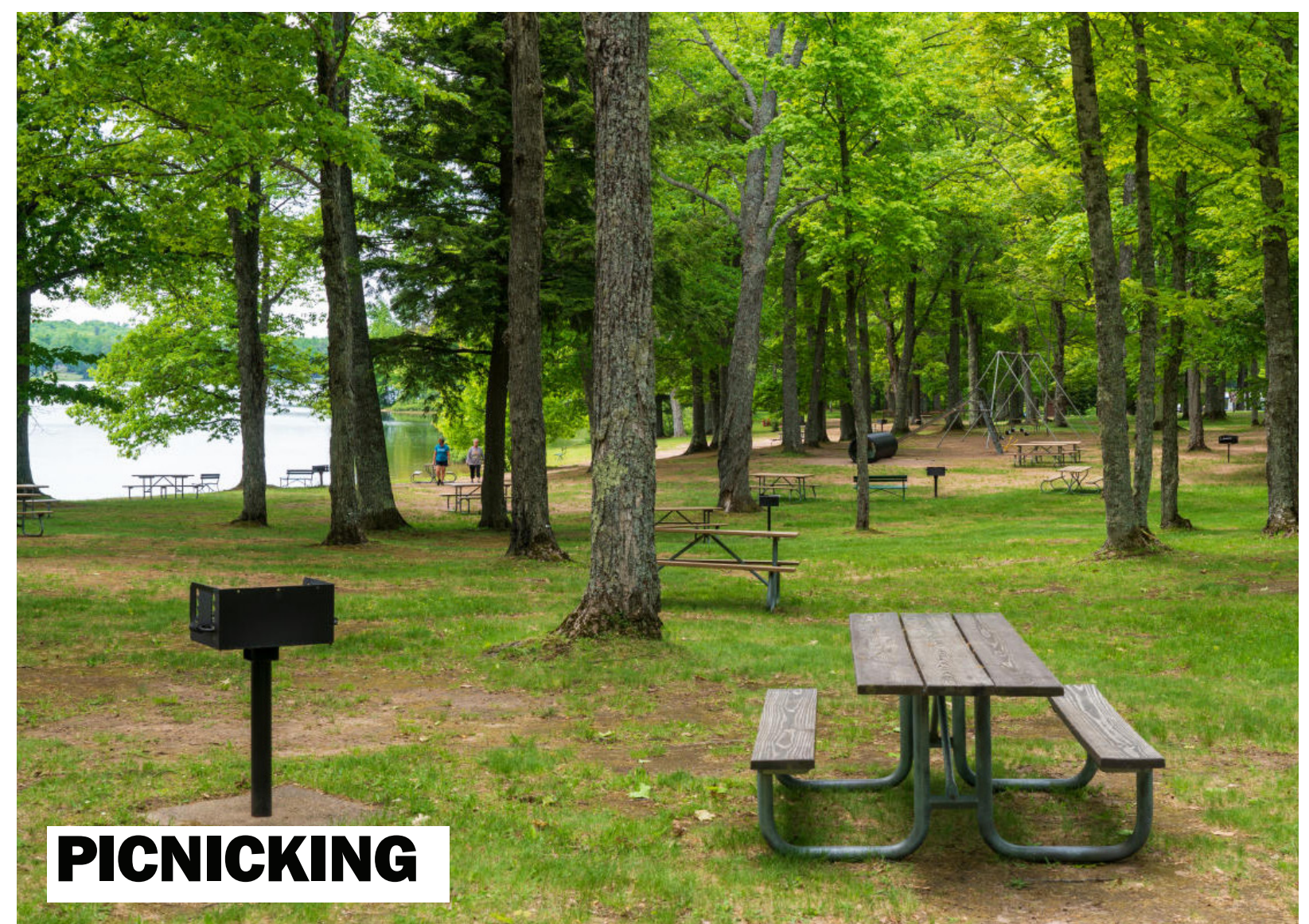
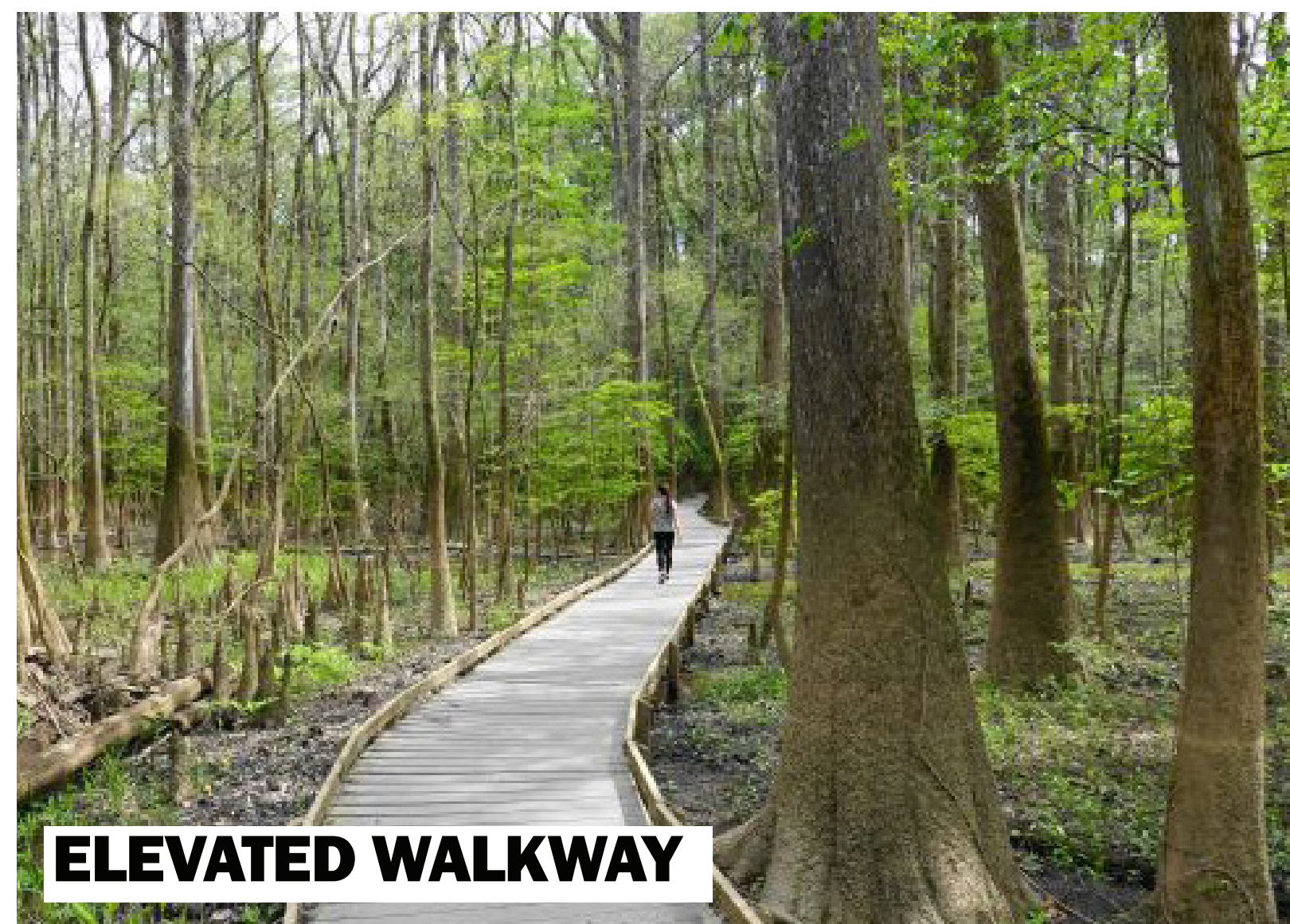
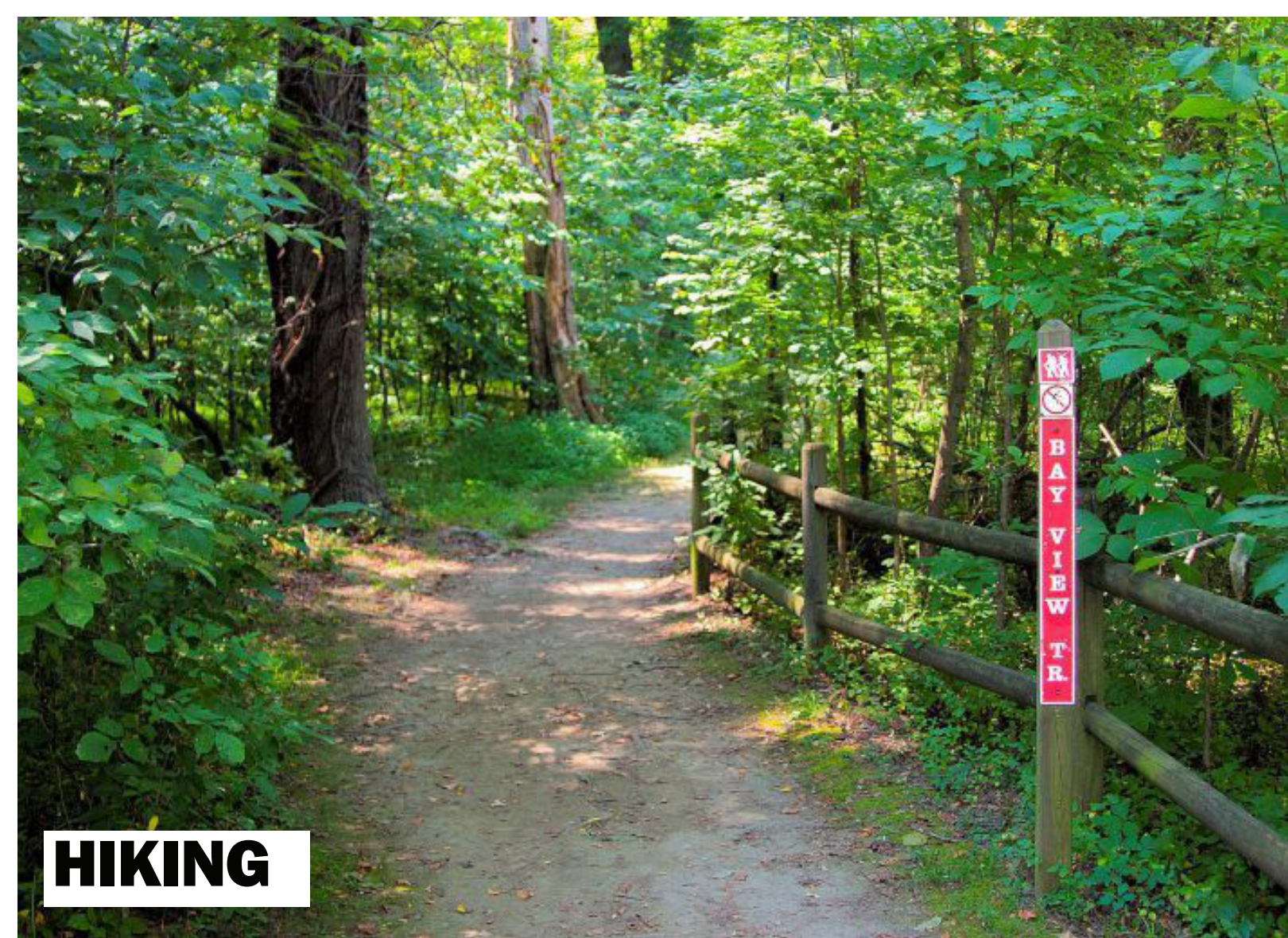


## WHAT ELSE WOULD YOU LIKE TO CONSIDER?

# SUNKEN MEADOW | LOCAL RECREATION

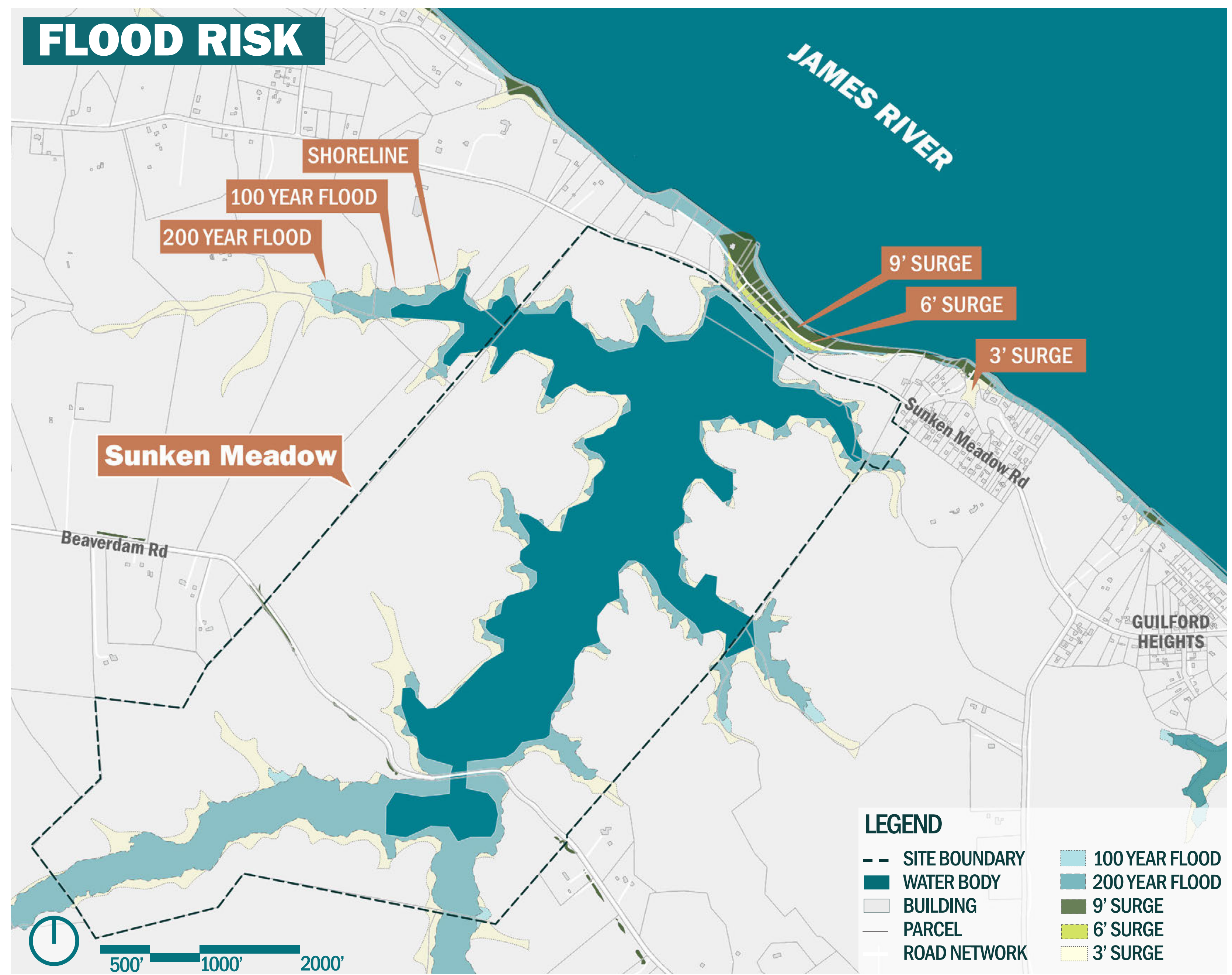
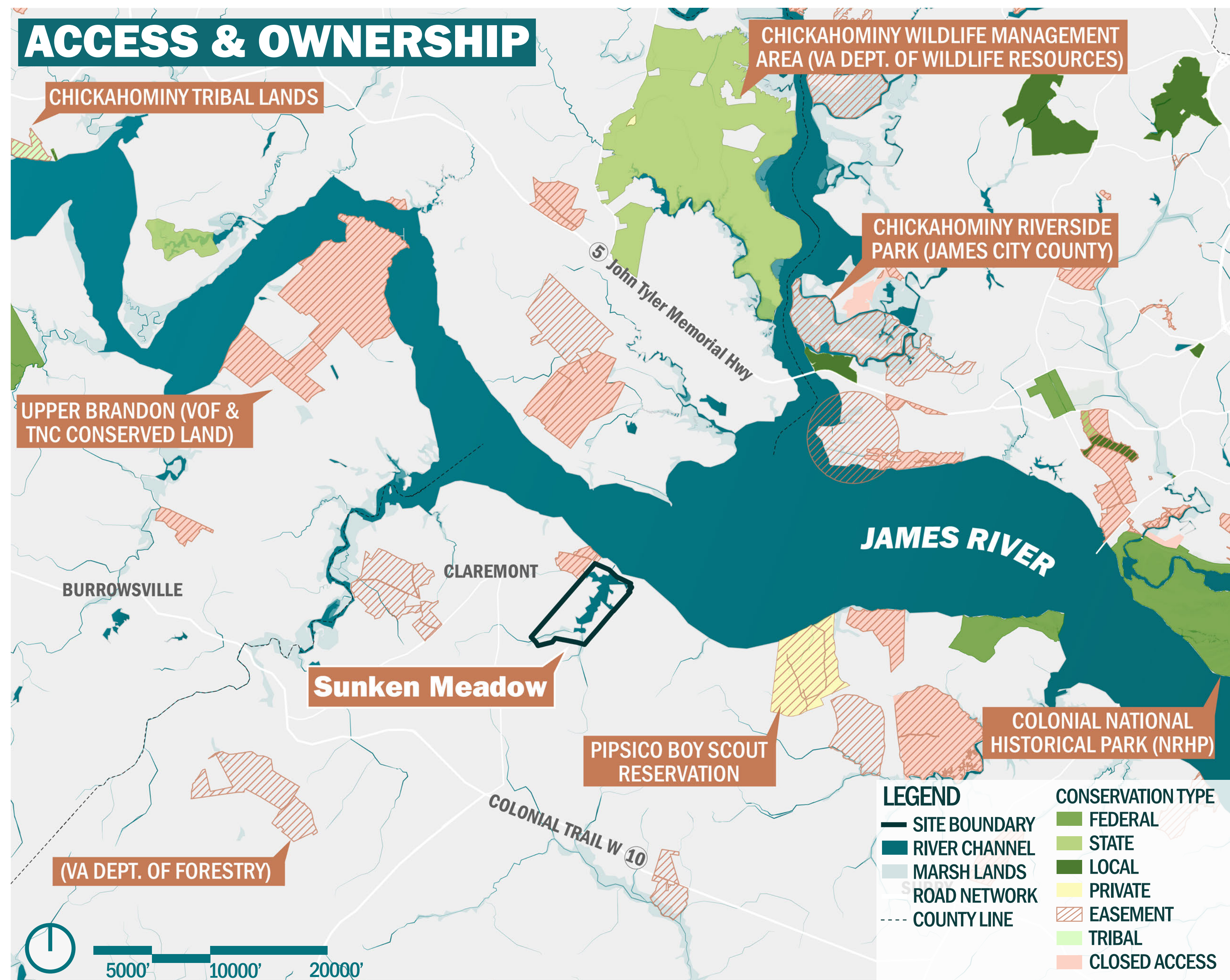


## RECREATION TYPES



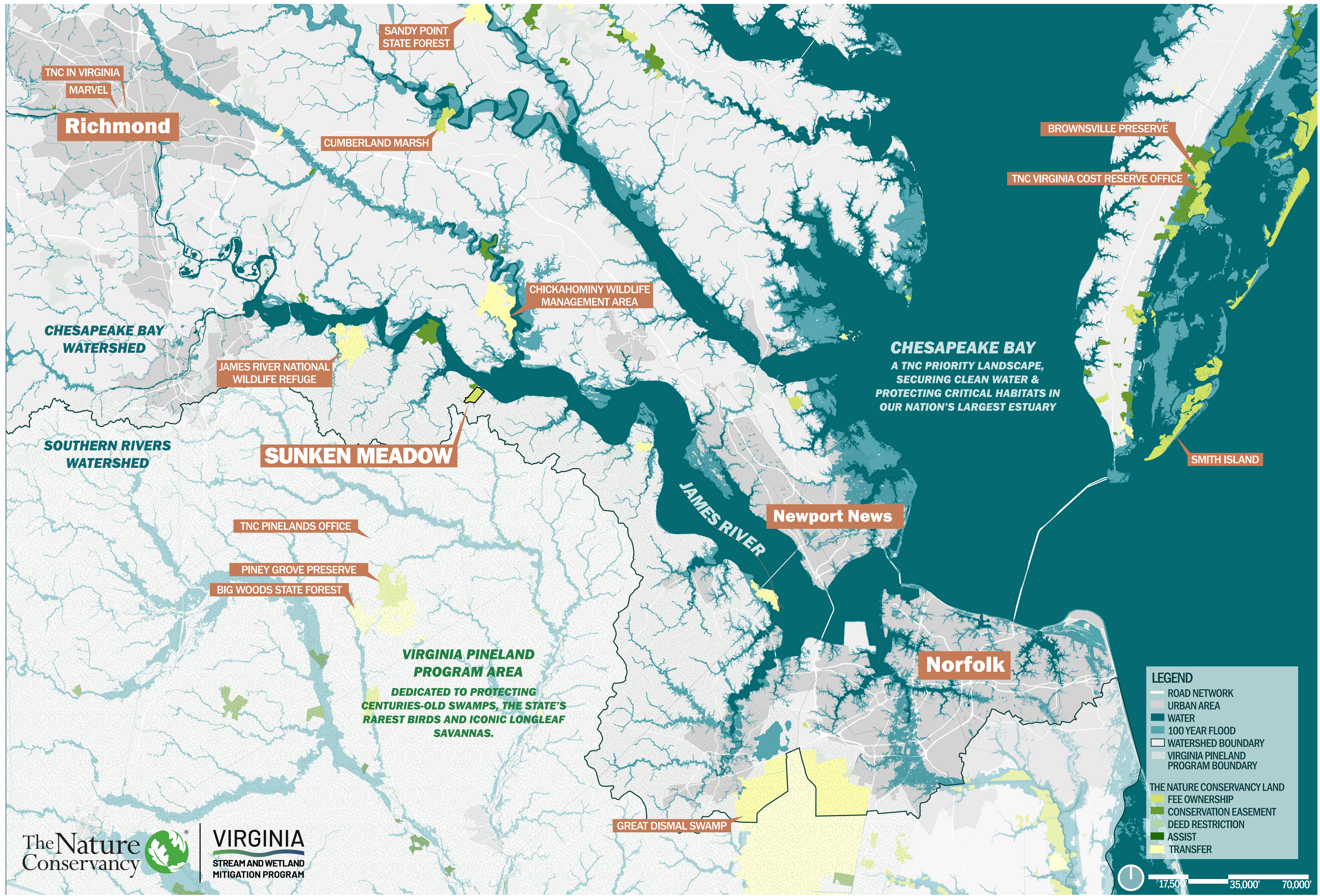
HOW ELSE DO YOU LIKE TO ENJOY NATURE?

# SUNKEN MEADOW | EXISTING CONDITIONS



## WHAT ARE YOUR ECOLOGICAL PRIORITIES?

# THE NATURE CONSERVANCY | WHO WE ARE



## THE NATURE CONSERVANCY STREAM AND WETLAND MITIGATION PROGRAM MISSION

- PROTECT & RESTORE STREAMS, WETLANDS & ASSOCIATED UPLAND HABITAT
- APPLY CONSERVATION SCIENCE & PLANNING TO CREATE HIGH-QUALITY OUTCOMES IN PRIORITY AREAS
- EXCEED THE ECOLOGICAL BENEFITS OF ISOLATED/SMALL-SCALE MITIGATION BY POOLING RESOURCES TO IMPLEMENT LARGER RESTORATION PROJECTS WITH MORE SIGNIFICANT ECOLOGICAL BENEFITS
- MONITOR THE ECOLOGICAL HEALTH OF THE RESTORATION SITE TO ENSURE LONG-TERM SUCCESS FOR EACH PROJECT
- WORK WITH PARTNERS, BUSINESSES & LOCAL COMMUNITIES TO FIND, DESIGN, IMPLEMENT & MANAGE PROJECTS

TNC USES STREAM AND WETLAND MITIGATION CREDITS TO CONSTRUCT RESTORATION PROJECTS IN STRATEGIC PLACES & TO PROTECT VIRGINIA'S RARE PLANTS, ANIMALS, & NATURAL HABITATS. ALL PROJECTS ARE CAREFULLY REVIEWED & APPROVED BY STATE & FEDERAL AGENCIES BEFORE MOVING FORWARD.

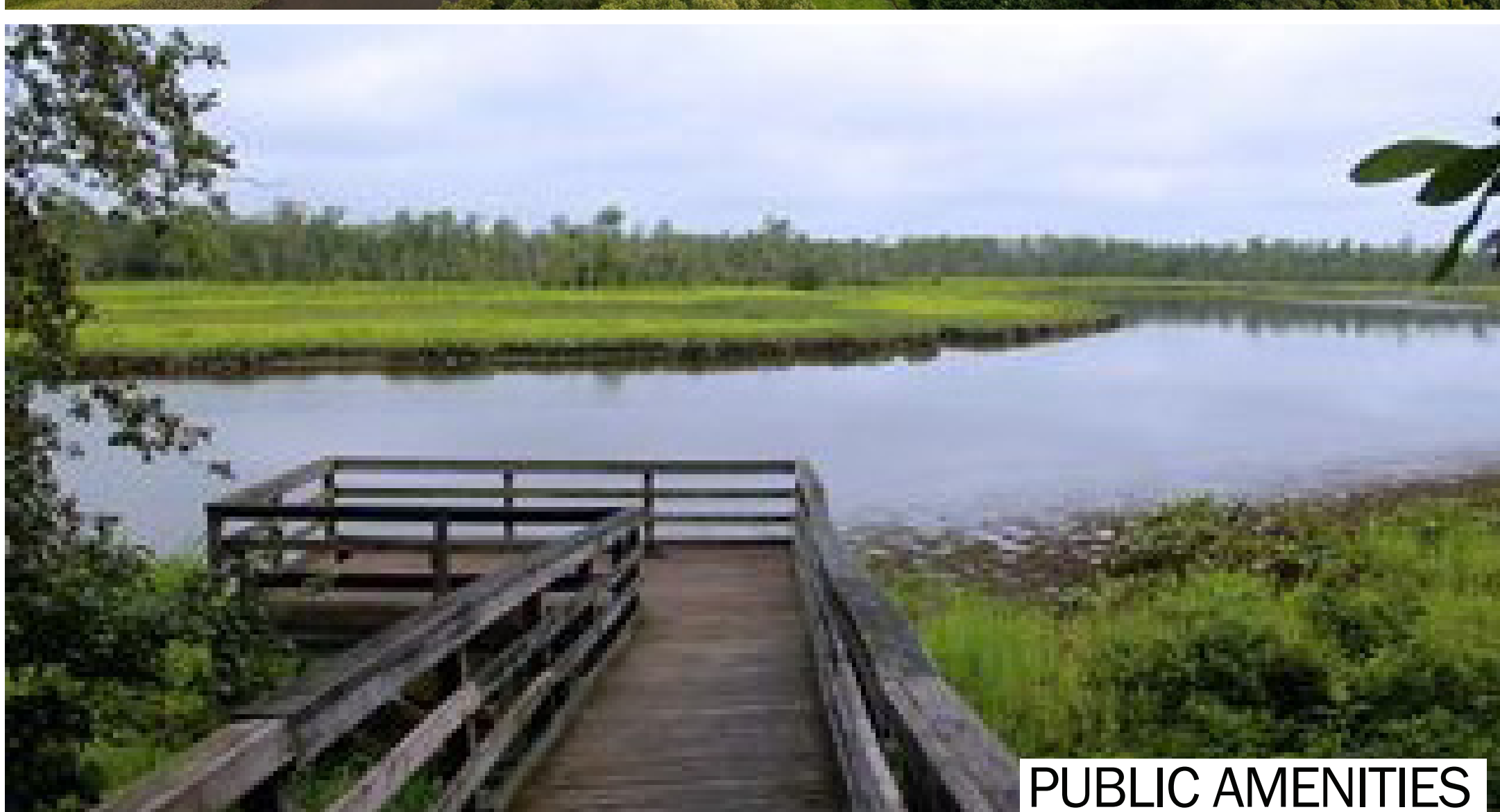


### VANDELL PRESERVE AT CUMBERLAND MARSH | VCU & TNC

CONSERVATION OF A FRESHWATER TIDAL MARSH & WOODED UPLAND. PROVIDED RECREATION OPPORTUNITIES & REMOVED DAM.



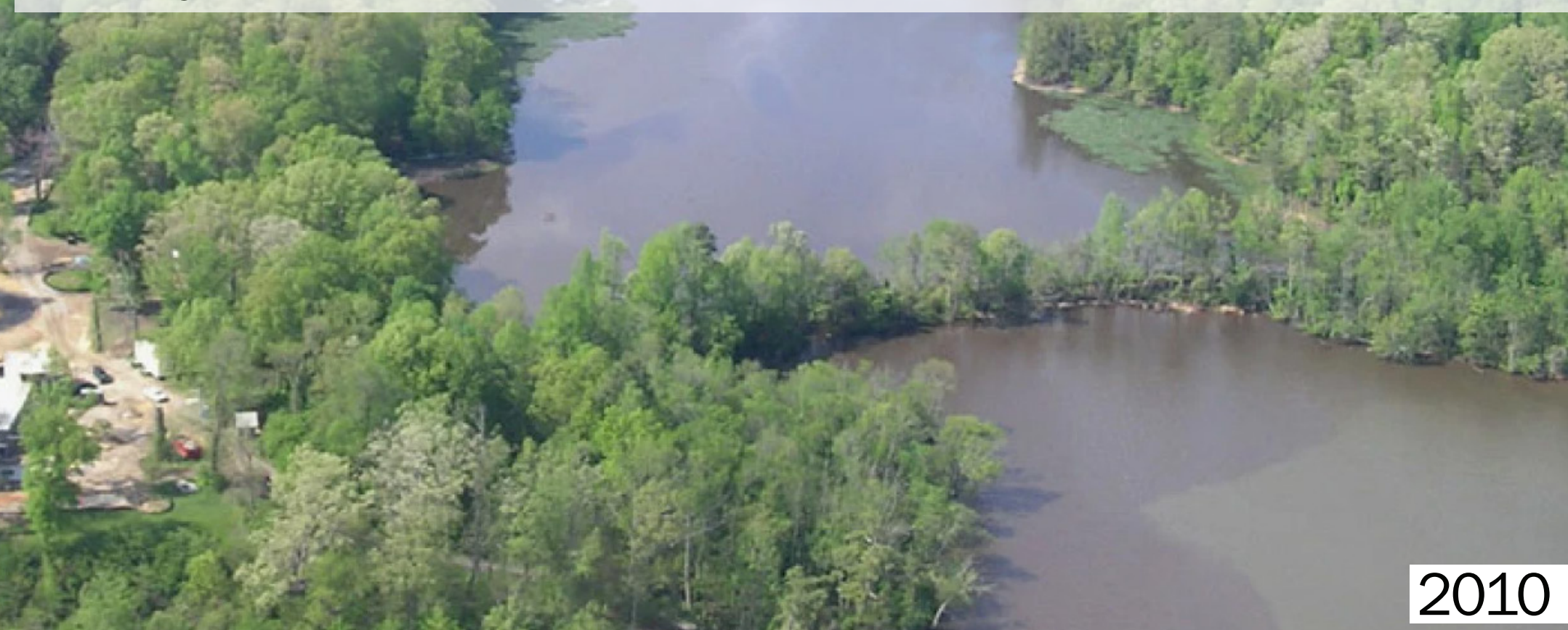
RESTORATION



PUBLIC AMENITIES

### KIMAGES CREEK RESTORATION | VCU & TNC

SUCCESSFUL DAM REMOVAL ALONG THE JAMES RIVER, WHICH REESTABLISHED NATURAL HYDROLOGY & ECOLOGY, CREATING A DIVERSE HABITAT & IMPROVING WATER QUALITY.



2010



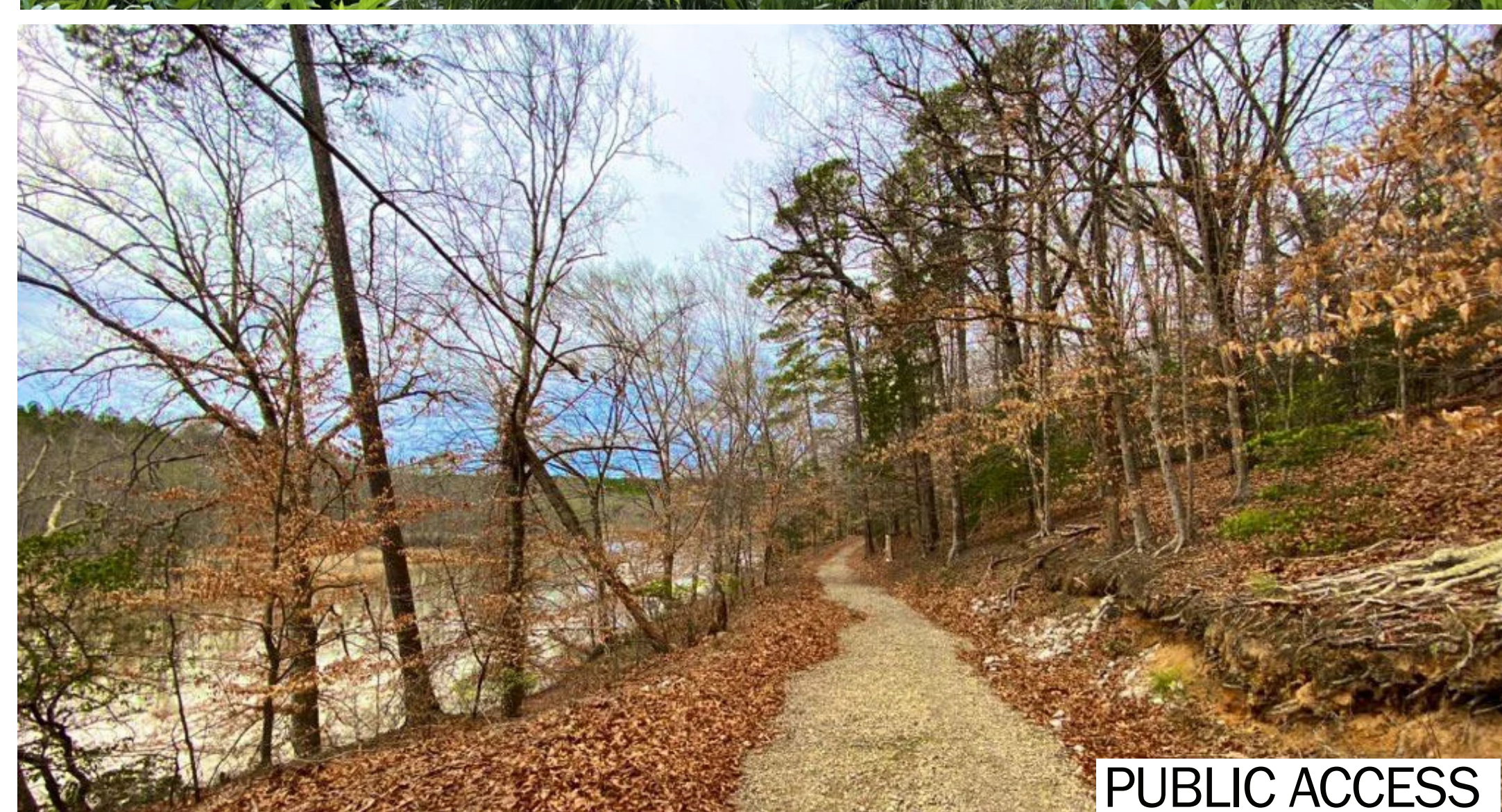
2023

### JAMES RIVER NATIONAL WILDLIFE REFUGE | FWS & TNC

AIMS TO INCREASE RIVERFRONT ACCESS, TRANSFORM THE ISLAND FROM A PARKING LOT INTO A PARK FOR RECREATION, AND RESTORE NATIVE HABITATS.



HABITAT CONSERVATION



PUBLIC ACCESS