



Why Protect Wetlands?

WETLAND FUNCTIONS & VALUES

Presentation to the
RI Department of Administration
Legislative Task Force

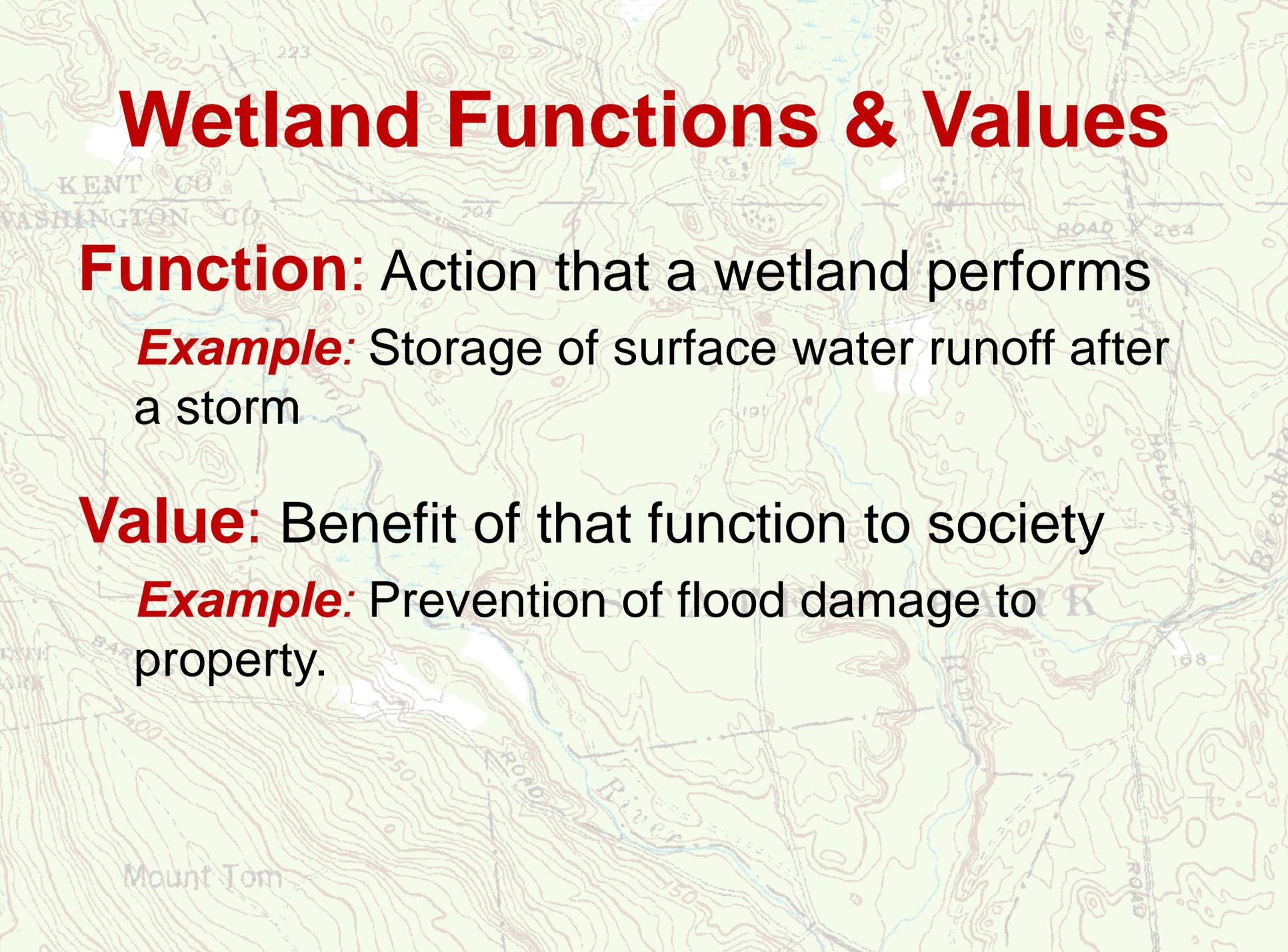
November 19, 2013

By Christopher Mason, PWS
President, Mason & Associates, Inc.

WHY PROTECT WETLANDS?

WETLAND FUNCTIONS AND VALUES:

- Water Supply
- Flood Control / Storm Damage Prevention
- Pollution Filtration / Transformation
- Productivity – Food Chain Support
- Protection of Fisheries / Shellfish
- Wildlife Habitat & Biodiversity
- Open Space / Recreation / Education



Wetland Functions & Values

Function: Action that a wetland performs

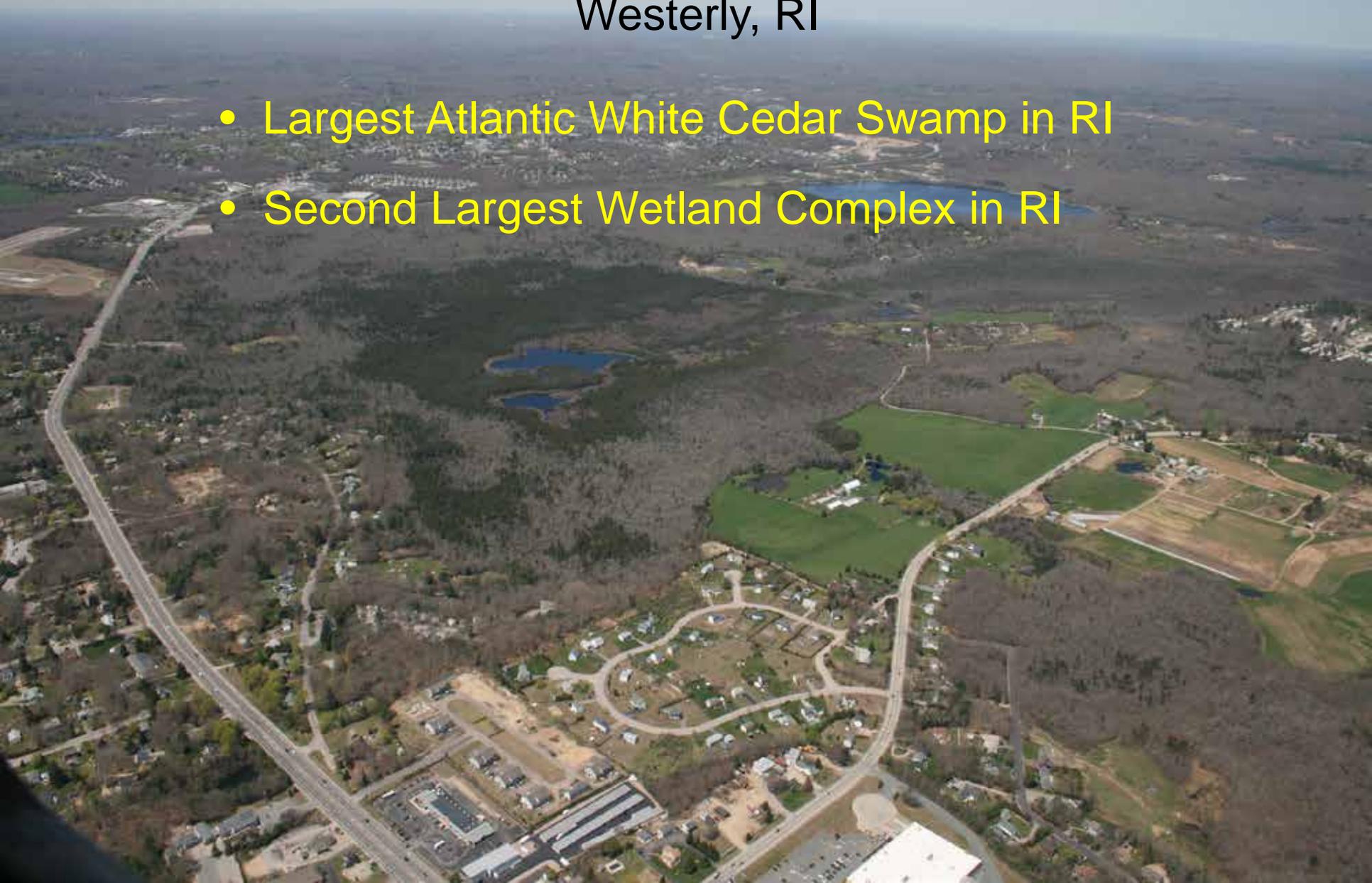
Example: Storage of surface water runoff after a storm

Value: Benefit of that function to society

Example: Prevention of flood damage to property.

Aguntaug Swamp – Chapman Swamp – Newton Marsh Westerly, RI

- Largest Atlantic White Cedar Swamp in RI
- Second Largest Wetland Complex in RI





WATER SUPPLY

Industrial /
Manufacturing
Uses

Fire Pond

- Town Well –
Drinking Water

Agricultural Uses



FLOOD CONTROL / STORM DAMAGE PREVENTION



Pawcatuck River

Floodplain

POLLUTION FILTRATION / TRANSFORMATION



The Sky
(Atmospheric Deposition)

High Traffic Roadway

Former
Town Dump

Gravel Pit

Former Auto
Junkyard

Waterfowl

Farms

Homes

Shopping
Center

Upstream
Sources

PRODUCTIVITY – FOOD CHAIN SUPPORT



Fish

Deer

Timber

Detritus

Flowering Plants (Honey)

Waterfowl

Berry Producing Shrubs

Firewood

PROTECTION OF FISHERIES / SHELLFISH



Estuary

Lakes

River

Food & Clean Water
Protected Shallows
(Nursery Areas)

Ponds

Streams

WILDLIFE HABITAT & BIODIVERSITY



Estuary

Lake

River

Vernal Pool

Cedar Swamp

Shrub Swamp

Marsh

Bog & Fen

Pond

Red Maple
Swamp

Streams

RECREATION / OPEN SPACE / EDUCATION

Fishing / Ice Fishing

Boating / Iceboating

Swimming

Water Quality Monitoring

Hiking

Education Trail

Birdwatching

Photography

Hunting

Public Open Space &
Conservation Lands:

RIDEM

Town of Westerly

The Westerly Land Trust

The Nature Conservancy



Overview:

- What are wetlands?
(Examples)
- What functions do wetlands perform?
- Why do we care?



What Are Wetlands?

Various definitions by science and regulation.

For this presentation, “wetlands” include:

- Swamps, Marshes, Bogs, Fens, Wet Meadows
- Lakes, Ponds, Pools (standing water)
- Rivers, Streams, Channels (flowing water)
- Areas that Flood

Wetland Types – Swamps

**Atlantic White Cedar
Often Flooded**

**Red Maple
Flooded to Seasonally Wet**



Wetland Types – Bogs / Fens

Low Nutrients: Stunted Growth, Carnivorous Plants, Peat



Mount Tom

Wetland Types – Marshes

Mostly Herbaceous

Pools, Shallow Flooding



Mount Tom

Wetland Types – Wet Meadows

Mostly Herbaceous

Seasonally Wet Pastures



Mount Tom

Also “Wetlands”

Rivers

Streams



Mount Tom

Also “Wetlands”

Floodplains

Intermittent Streams



Mount Tom

Also “Wetlands”

Lakes



Vernal Pool



Mount Tom

Also “Wetlands”

Tidal Marshes & Creeks

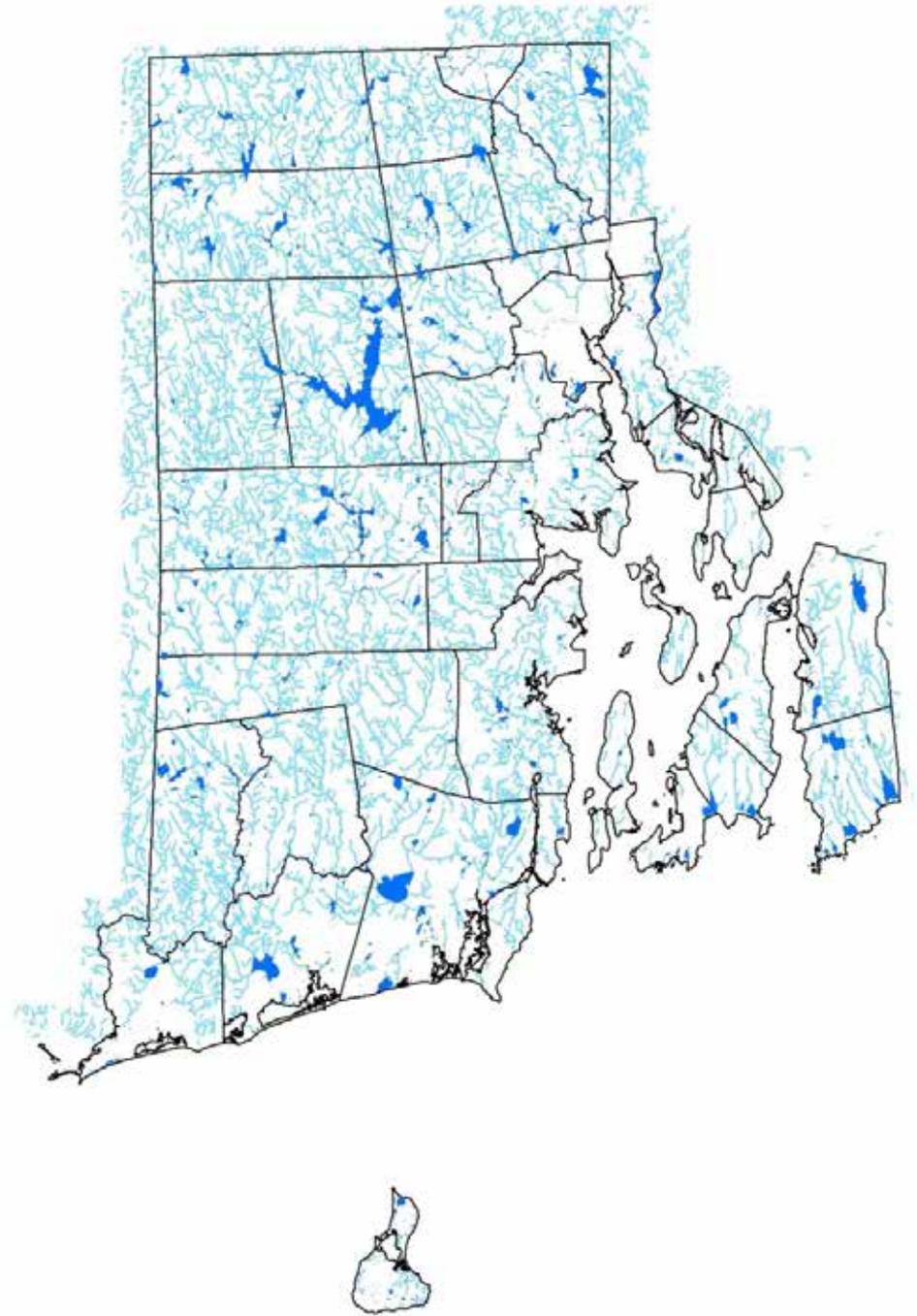
Saltmarsh on Rocky Shore



Mount Tom

Many (Most) Wetlands Are Interconnected

- Surface Waters
(Freshwater):
- Streams
- Rivers
- Ponds
- Lakes



**Many (Most) Wetlands
Are Interconnected**

*Surface Waters
(Freshwater):*

- Streams
- Rivers
- Ponds
- Lakes
- Swamps
- Marshes
- Bogs

Coastal Waters:

- Saltmarshes
- Tidal Creeks
- Coastal Ponds



Wetland Functions

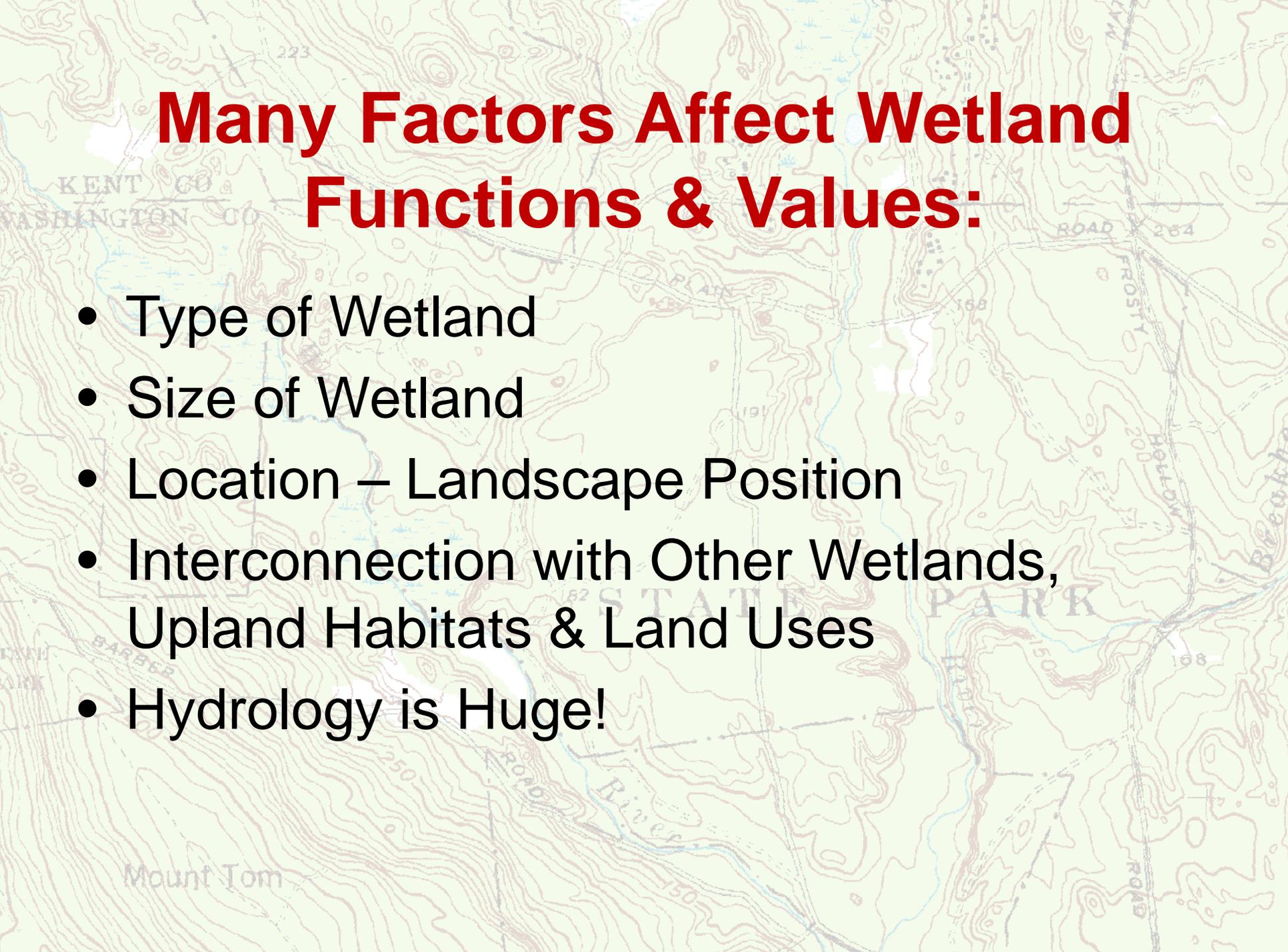
- Water Supply
- Flood Control / Storm Damage Prevention
- Pollution Filtration / Transformation
- Productivity – Food Chain Support
- Protection of Fisheries / Shellfish
- Wildlife Habitat & Biodiversity
- Open Space / Recreation / Education

Functions & Values – The Basics

- Most wetlands perform multiple functions
- All wetlands perform at least one function
- Even small wetlands can provide high value (e.g., vernal pools)
- A wetland's performance of a function may vary with season, and from year to year

Interplay of Functions

- Functions Support Each Other
 - Example: ground water discharge helps maintain summer stream flow for fish
- Functions Conflict With Each Other
 - Example: sediment trapping destroys shallow water habitat for frogs
- Functions Mutually Exclusive
 - Example ground water discharge - ground water recharge

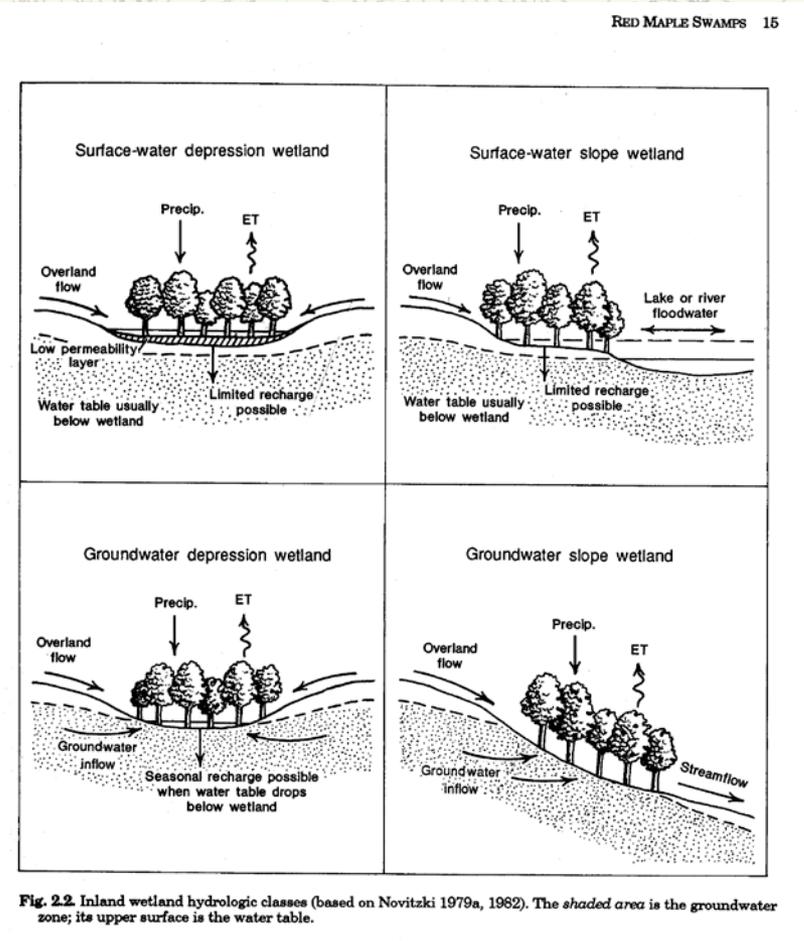


Many Factors Affect Wetland Functions & Values:

- Type of Wetland
- Size of Wetland
- Location – Landscape Position
- Interconnection with Other Wetlands, Upland Habitats & Land Uses
- Hydrology is Huge!

Water Supply

- Landscape Position, Topography, & Geology Are Key to Water Supply Functions of Wetlands
- Surface Water Recharge / Discharge
- Ground Water Recharge / Discharge



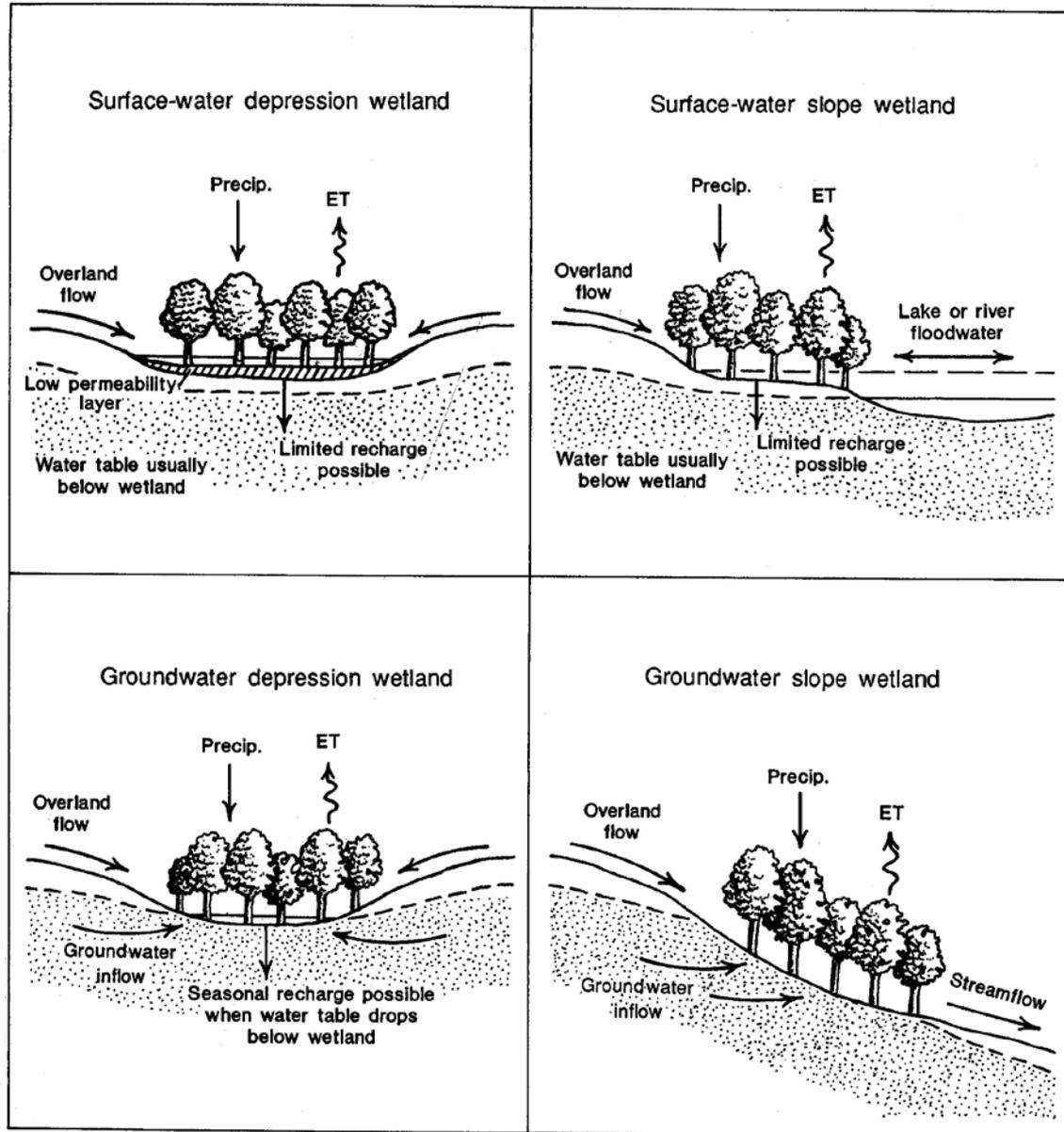


Fig. 2.2. Inland wetland hydrologic classes (based on Novitzki 1979a, 1982). The shaded area is the groundwater zone; its upper surface is the water table.

Water Supply: Surface Water Reservoirs

Scituate Reservoir

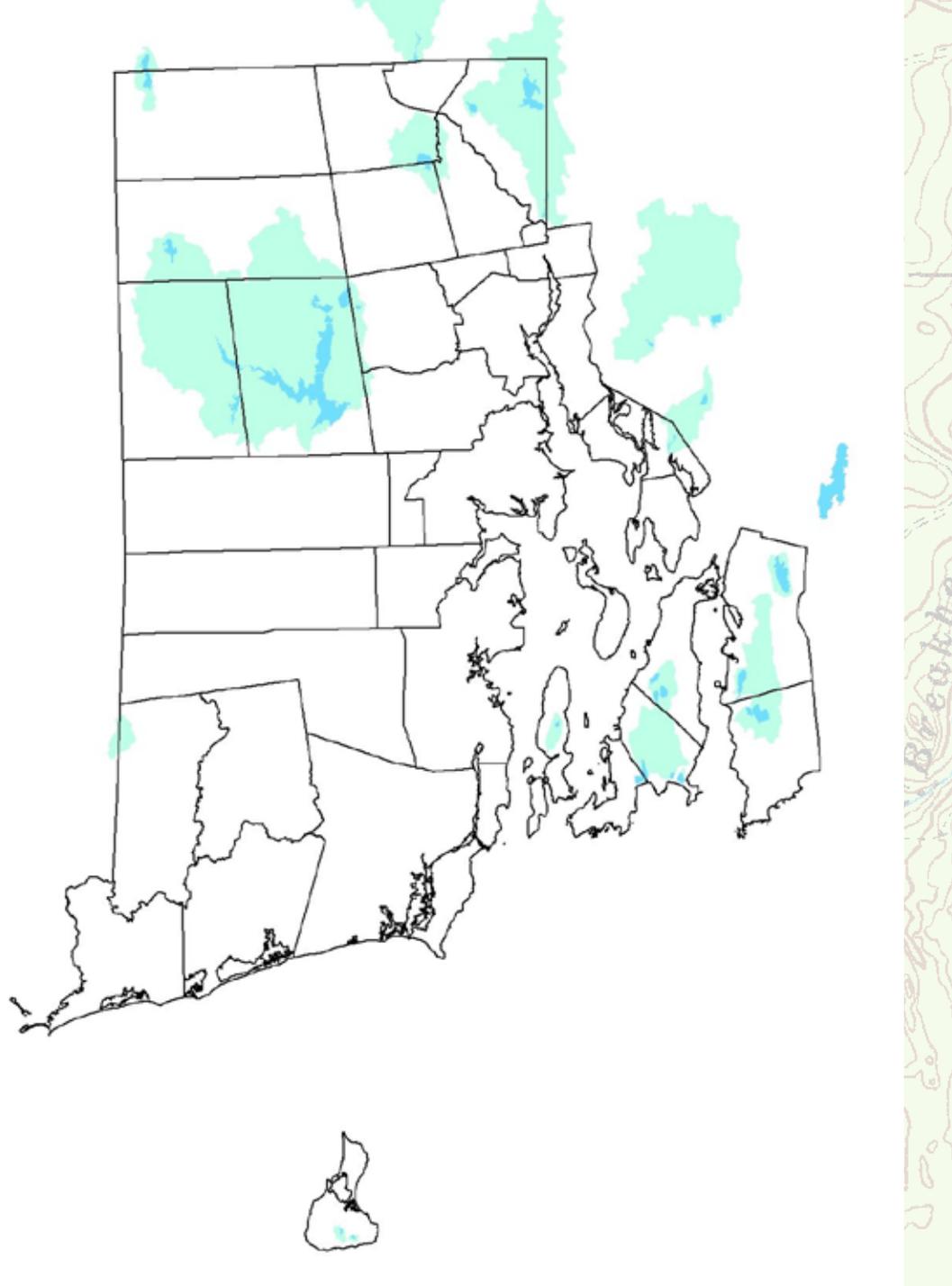
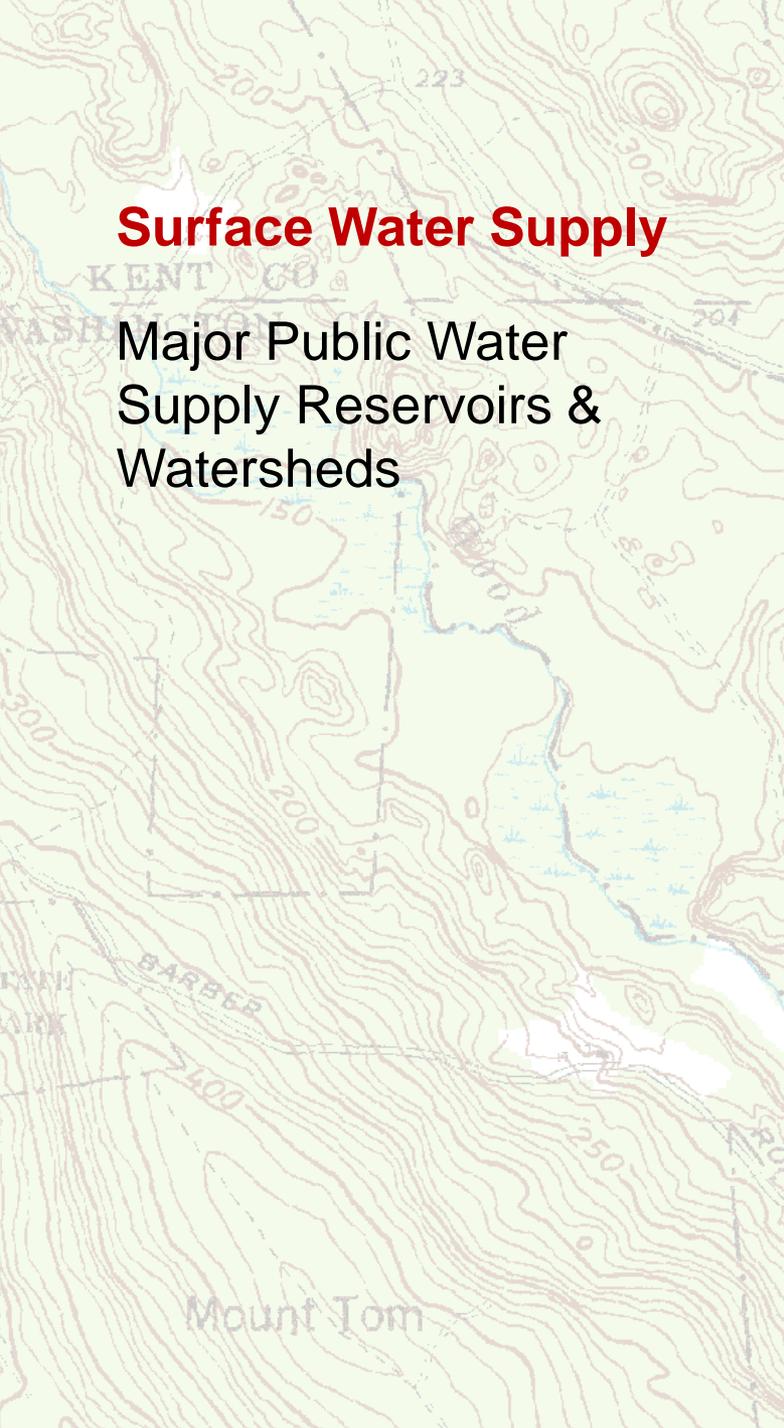


Green End Pond



Surface Water Supply

Major Public Water Supply Reservoirs & Watersheds



Water Supply: Ground Water Aquifers

**Municipal Well – Pump Station
and Treatment System**



**Adjacent Wetland Providing
Groundwater Recharge**



Mount Tom

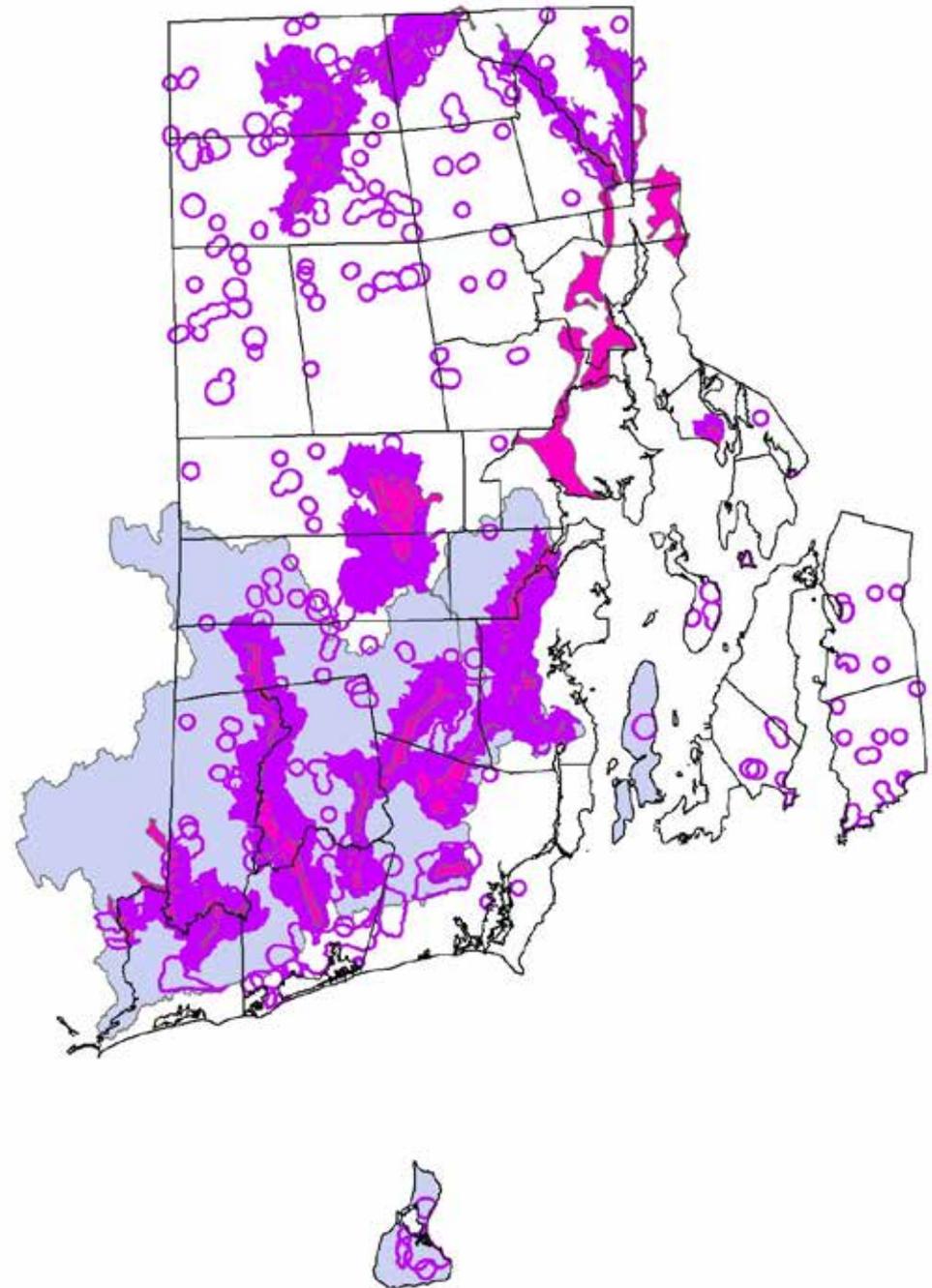
Ground Water Supply

Sole Source Aquifers

Major Ground Water
Recharge Areas

Major High-Yield
Aquifers

Wellhead Protection
Areas



Water Supply: Agriculture



Water Supply: Industry



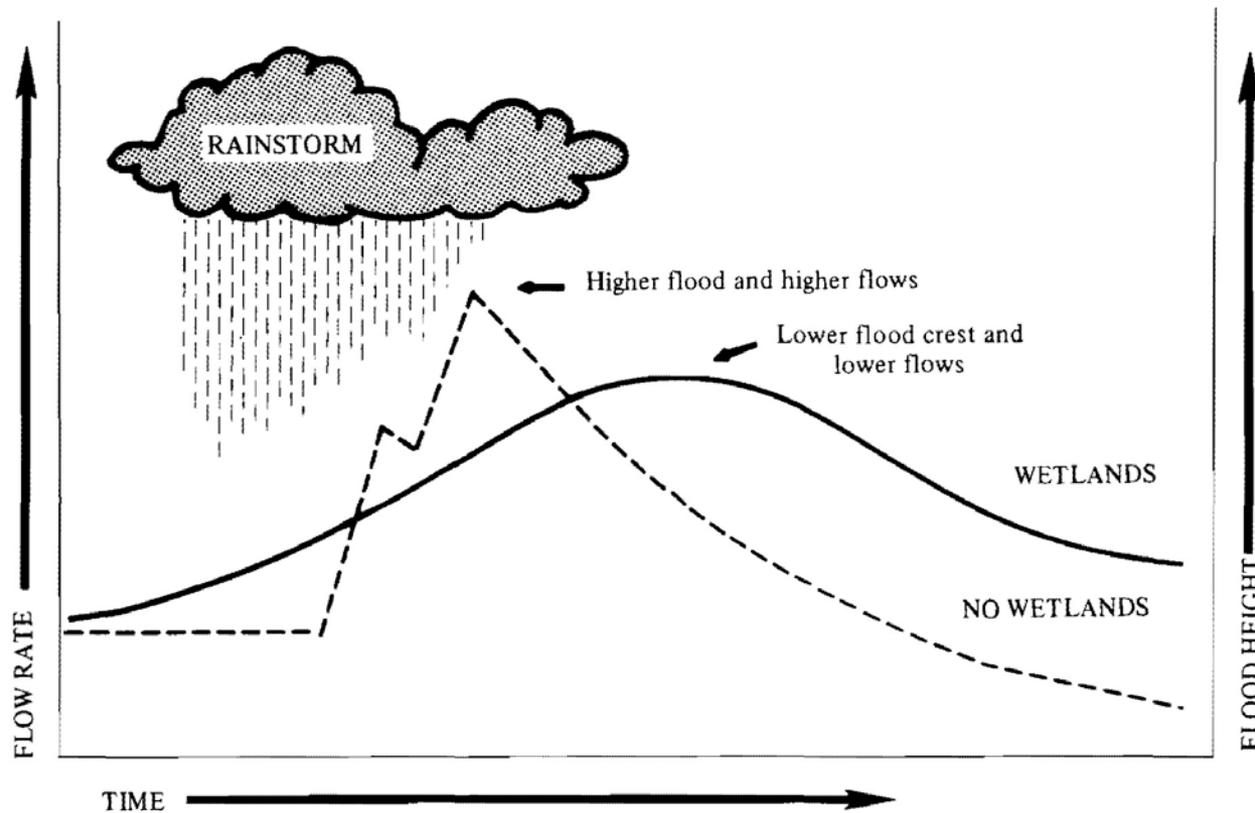
Mount Tom

Flood Control / Storm Damage Prevention

- Wetlands Store Precipitation, Stormwater Runoff, Floodwaters
- Wetland Topography and Vegetation Slow Flood Velocity
- Wetland Vegetation Anchors Shorelines, Reducing Erosion



Flood Control / Storm Damage Prevention



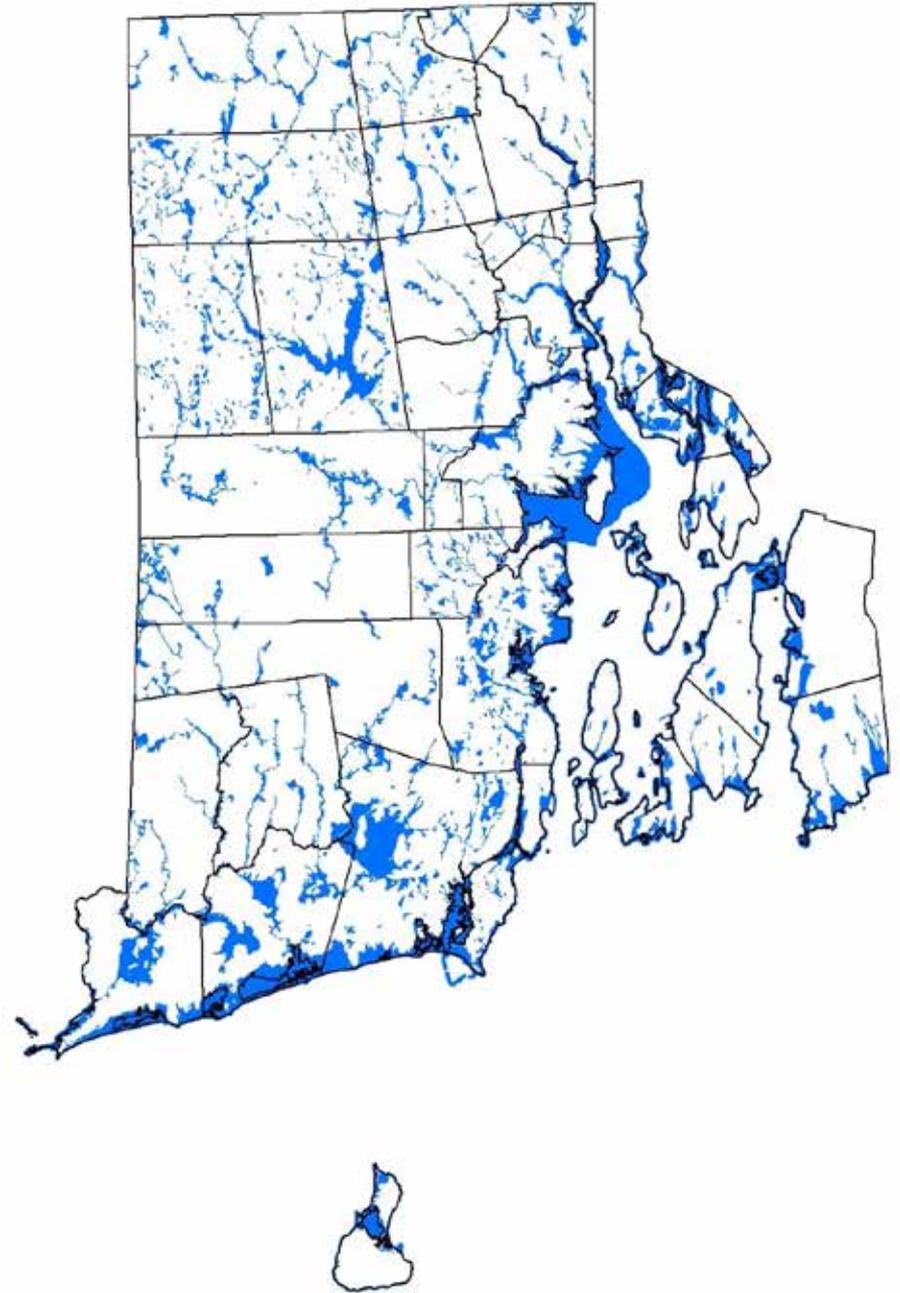
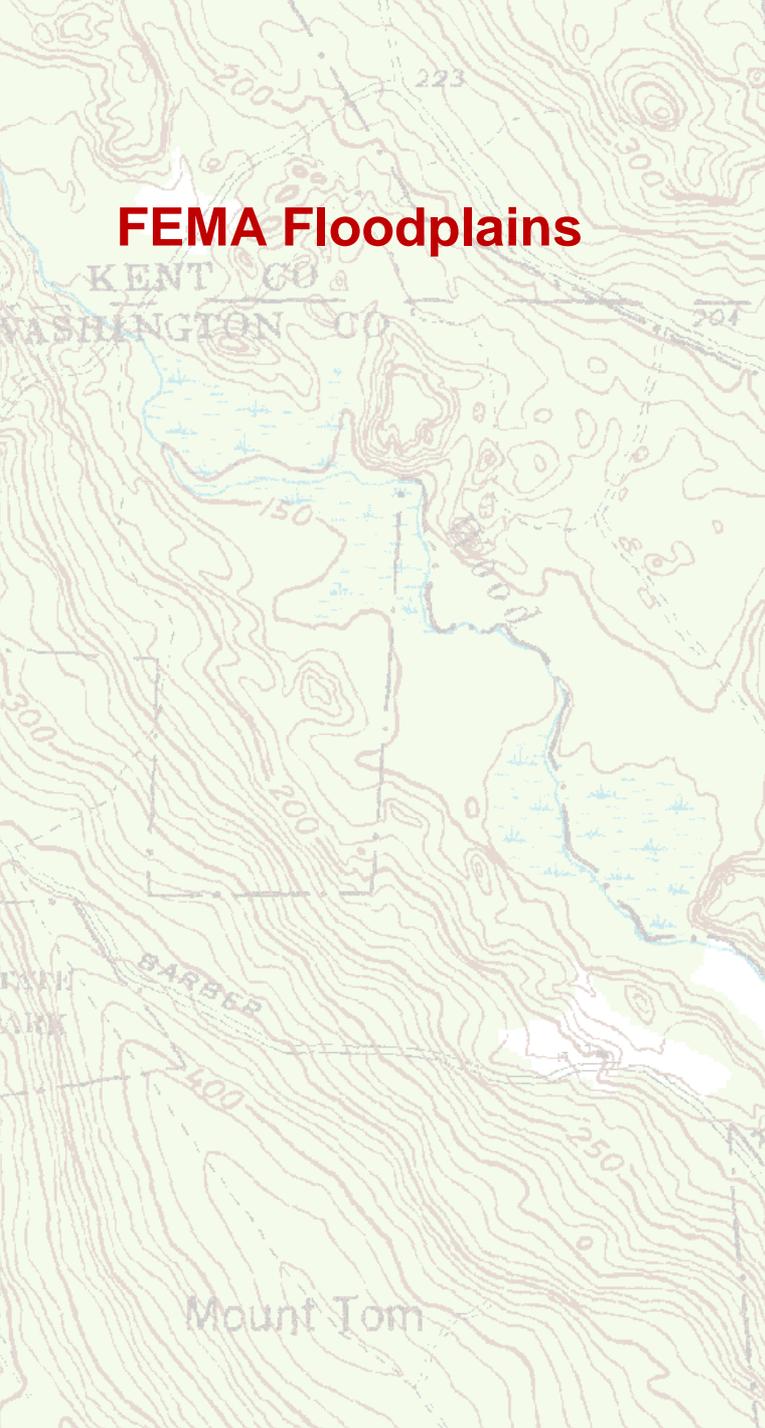
61

Figure 27. Wetlands help reduce flood crests and slow flow rates after rainstorms (adapted from Kusler 1983).





FEMA Floodplains

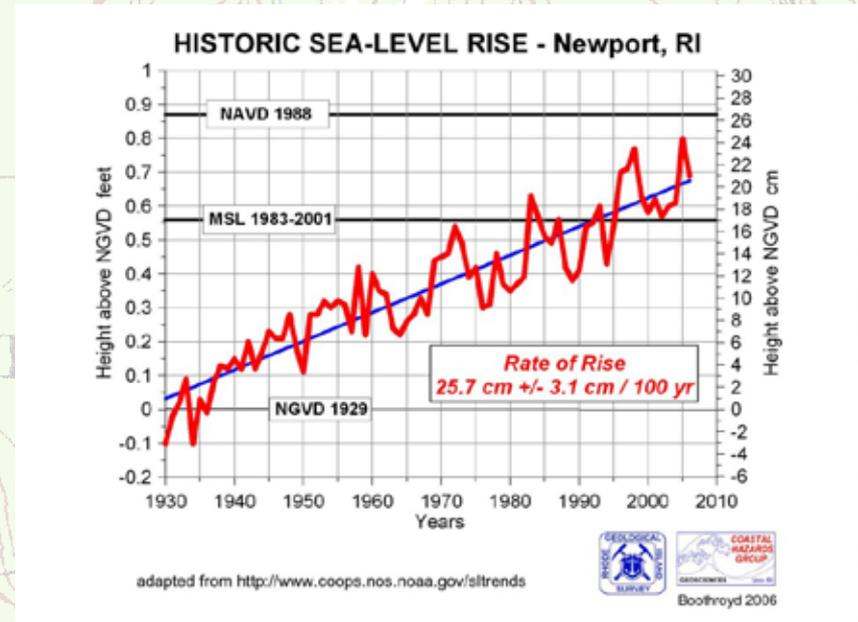


Coastal Storm Damage

Hurricane Tracks

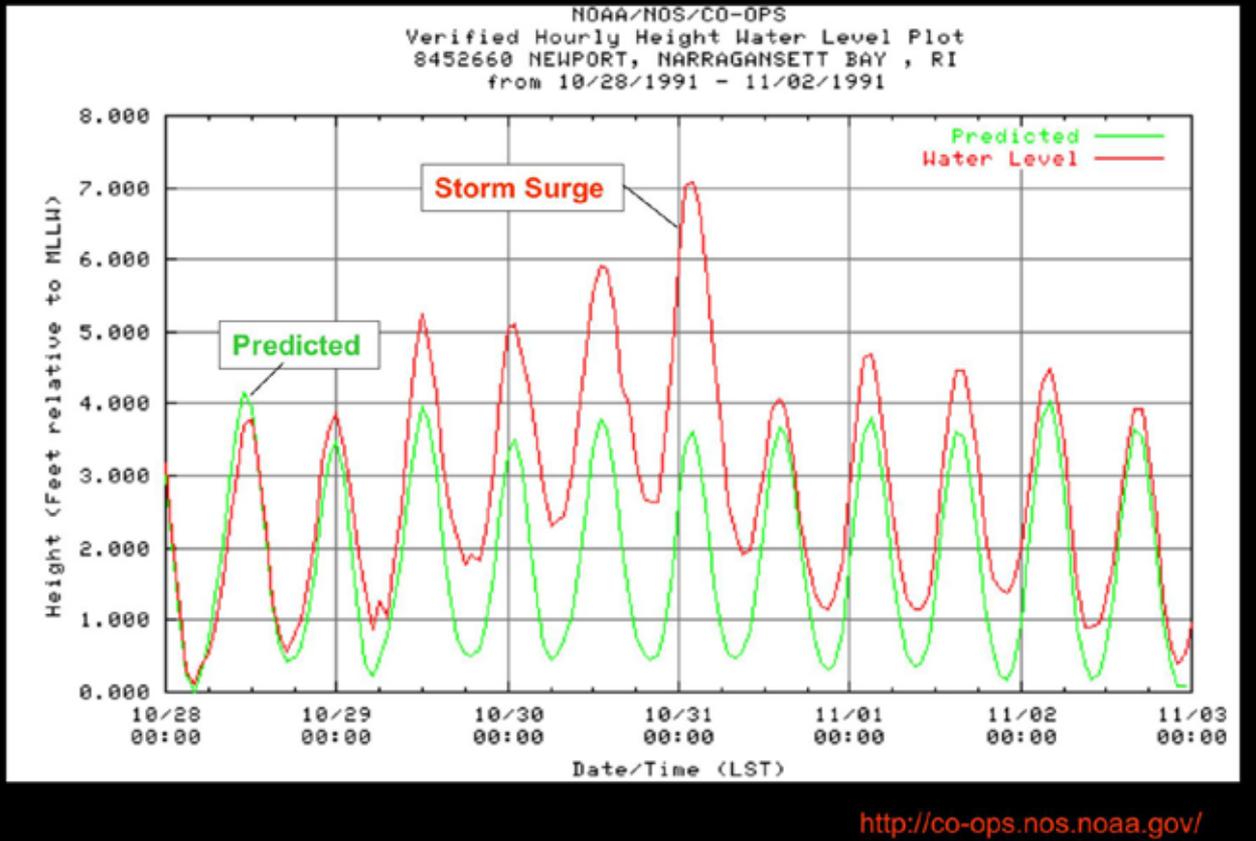


Sea Level Rise



Storm Surge Effect

PERFECT STORM – OCT-NOV 1991



Pollution Filtration & Transformation

- Sediment Trapping – basin topography, vegetation, decreased flow velocity
- Nutrient Uptake / Transformation – plant growth, microbial denitrification, chemical interactions
- Heavy Metal Trapping – chemical interactions, some plant uptake
- Volatile, Semi-Volatile, Other Toxic Compounds – chemical interactions, photodegradation, microbial degradation



223

KE

ASHLEY

STATE
PARK

Mount Tom

150

150

Beech



223

KE

ASH

TAKE
ARK

Mount Tom

150

200

Beech

8



Mount Tom



223

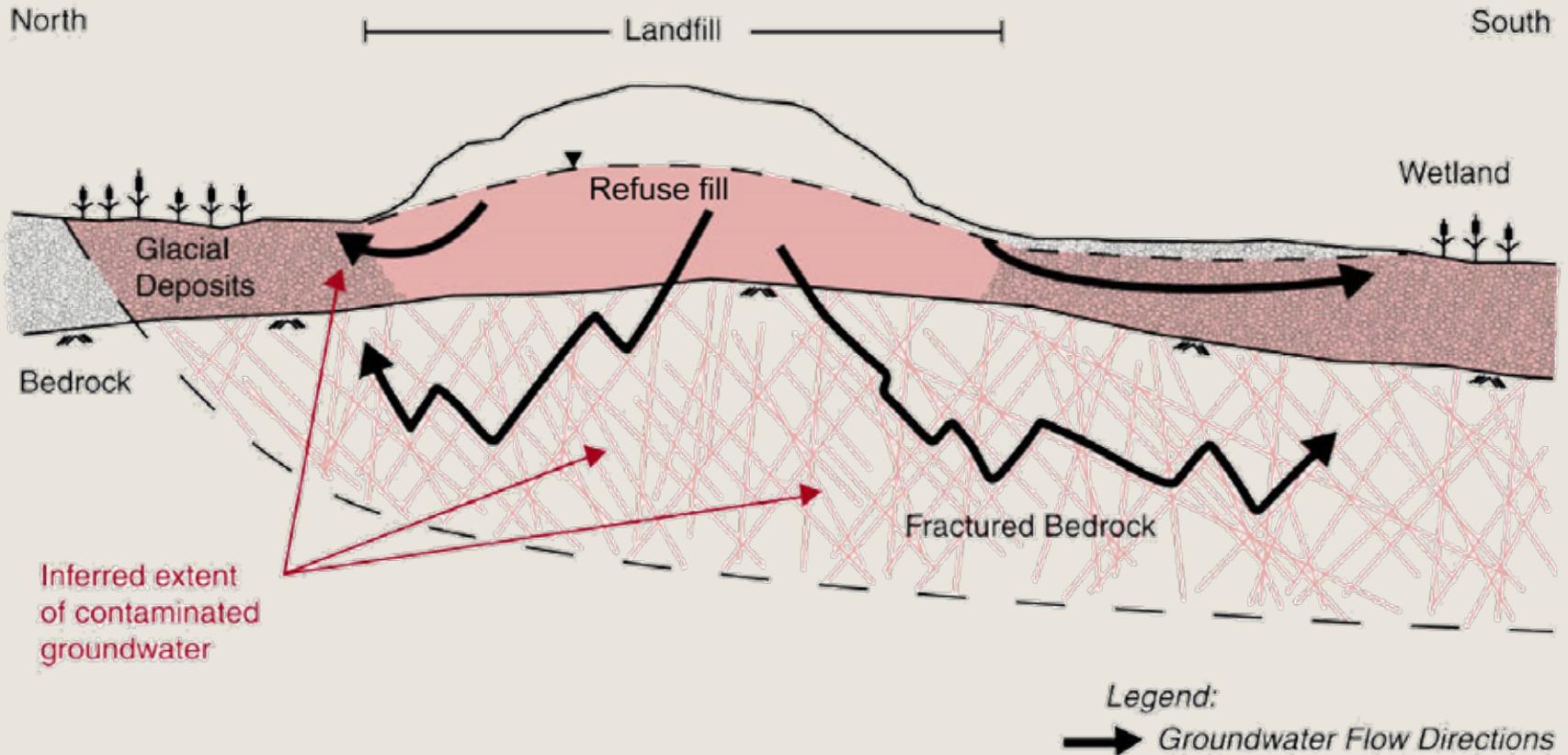


Mount Tom

150

600

Landfill Conceptual Model



- Landfill is uncapped, unlined
- Infiltration generates leachate
- Leachate discharges to surface waters
- Metals precipitate on wetland sediments

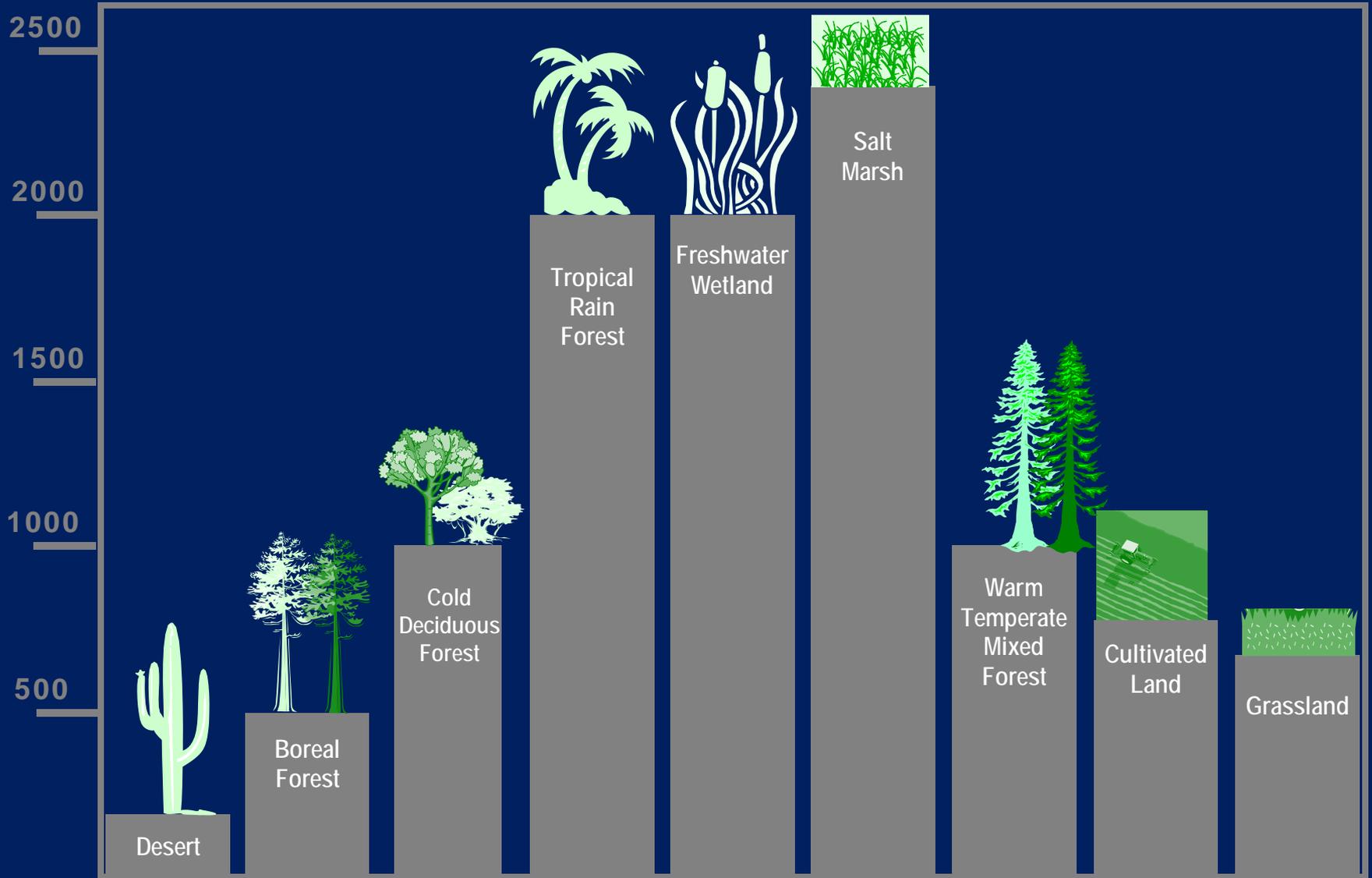
Leachate Discharge to Surface Waters





Productivity – Food Chain Support

- Wetlands are highly productive compared to other habitats
- Productivity measured different ways:
 - Biomass (organic matter)
 - Crop / Timber Harvest
 - Trap Yield (pelts)
 - Fish Catch



Net Primary Productivity of Selected Ecosystems (g/m²/year)

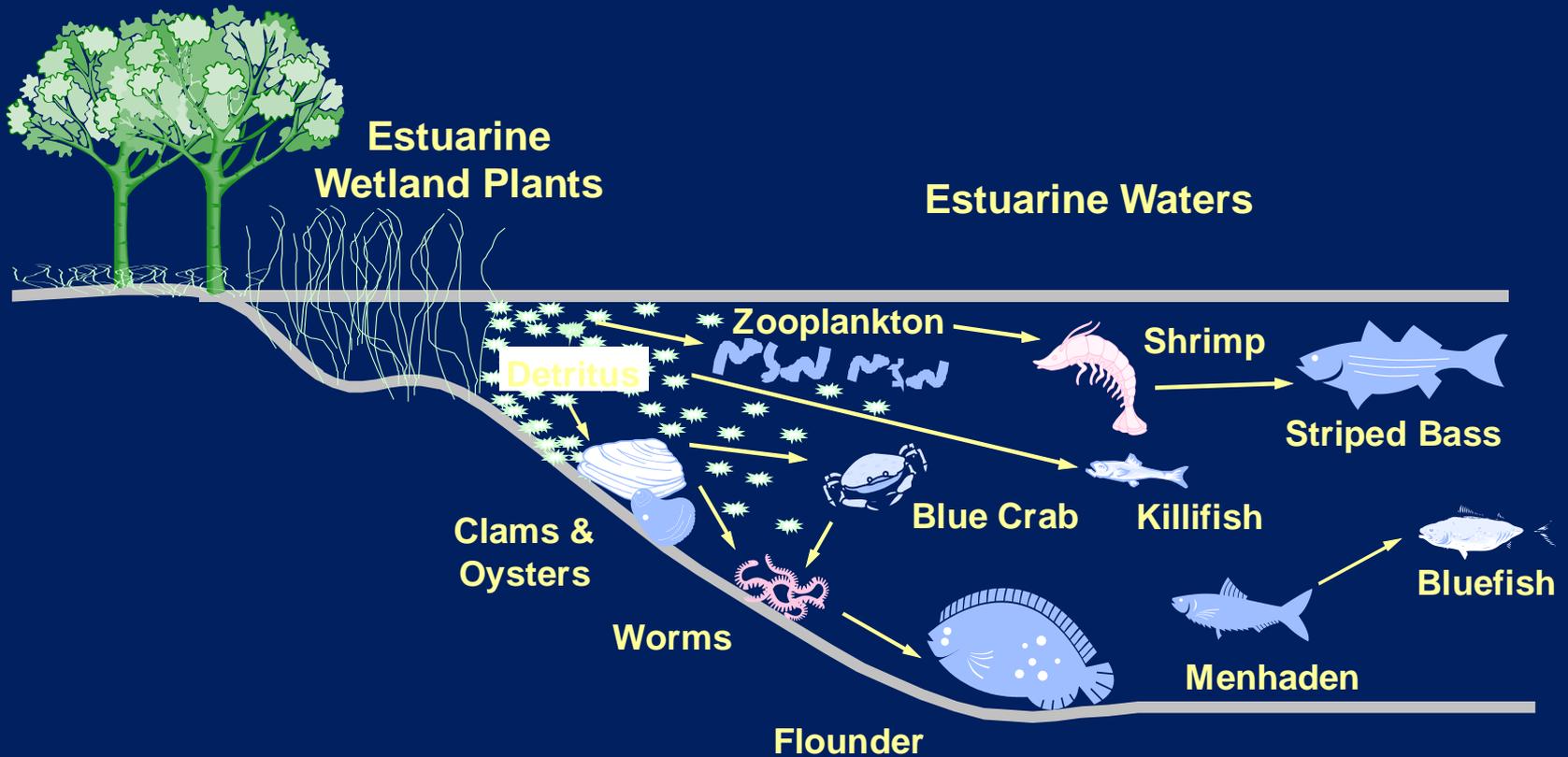
Production Export

- Salt Marsh Draining After Moon High Tide



Mount Tom

Estuarine Food Chain Support



Benefits of High Productivity

Wetland Crops

- Fish and Shellfish
- Furbearing Animals
- Wood Products
- Forage Crops

Recreation

- Duck Hunting
- Fishing
- Birdwatching

Protection of Shellfish & Fisheries



Wetlands Are Required Habitat:

- Freshwater Fish
- Anadromous Fish
- Many Saltwater Fish

Wetlands Provide:

- Food
- Cover
- Spawning Area
- Clean Water

Freshwater Fish - Lakes

Artificial Impoundment

Glacier Formed Lake



Mount Tom

Freshwater Fish – Rivers & Streams

Lower Perennial River

Seasonal Headwater Stream



Mount Tom

Fish & Shellfish – Coastal Wetlands

Salt Marsh & Tidal Creek



Salt Ponds, Marshes, Flats



Mount Tom

Fish & Shellfish of Coastal Wetlands

A topographic map of a coastal wetland area, likely in the Pacific Northwest, showing the coastline, rivers, and surrounding land. The map includes contour lines, roads, and geographical labels such as 'KENT CO', 'WASHINGTON CO', 'STATE PARK', and 'Mount Tom'. The title 'Fish & Shellfish of Coastal Wetlands' is prominently displayed in red at the top. Two columns of species names, each preceded by a green dot, are overlaid on the map.

- Menhaden
- Flounder
- Weakfish
- Bluefish

- Striped Bass
- Blue Crabs
- Shrimp
- Soft Clams

Wildlife Habitat & Biodiversity

- Many Wildlife Species Require Wetlands to Survive
- Other Species Use Wetlands Sometimes
- Source of Food & Water
- Shelter (Cover)
- Reproduction

Wildlife of Wetlands

- “Obligate” Species
 - Water-dependent Species
 - Require wetlands for survival



Wood
Duck

Wildlife of Wetlands

- “Facultative” Species
 - Found in wetlands and uplands
 - Do not require wetlands for survival



Moose

Examples of Obligate Wildlife

Reptiles & Amphibians

- Green Frog
- Wood Frog
- Spotted Salamander
- Northern Water Snake
- Painted Turtle
- Snapping Turtle
- Diamondback Terrapin



Examples of Obligate Wildlife

Birds

- Swamp Sparrow
- Marsh Wren
- Great Blue Heron
- Osprey
- Bald Eagle
- Black Duck
- Canada Goose



Examples of Obligate Wildlife

Mammals

- Water Shrew
- Mink
- Fisher
- Otter
- Muskrat
- Beaver



Examples of Facultative Wildlife

Birds

- Ovenbird
- Wood Thrush
- Song Sparrow
- Gray Catbird
- Great Horned Owl
- Black-capped Chickadee
- Blue Jay



Examples of Facultative Wildlife

Mammals

- Opossum
- Raccoon
- White-tailed Deer
- Black Bear
- Eastern Cottontail
- Gray Squirrel
- White-footed Mouse



Examples of Facultative Wildlife

Red Maple Swamps:

- 59 Species of Facultative Birds
- 44 Species of Facultative Mammals



U.S. Threatened & Endangered Species

- 50% of animals are wetland-dependent
- 28% of plants are wetland-dependent
- Surface area of wetlands & deep waters = 9% of U.S.

**Swamp-Pink or
Dragon Mouth**



Sociocultural Values

A topographic map of a park area, likely State Park, showing contour lines, roads, and water features. A red rectangular box highlights a specific region in the lower-left quadrant of the map, which is the focus of the text overlay. The map includes labels for 'KENT CO', 'WASHINGTON CO', 'STATE PARK', 'Barber River', 'Frosty River', and 'Mount Tom'. Contour lines are labeled with elevations such as 200, 223, 204, 168, 191, 150, 200, 198, 250, 200, 150, and 100. Roads are labeled 'ROAD', 'FROSTY ROAD', 'BARBER ROAD', and 'MOUNT TOM ROAD'. Water features include 'Barber River', 'Frosty River', and 'Beetho'. The text 'STATE PARK' is prominently displayed in the center of the map.

- Recreation
- Scenic or Aesthetic Value
- Education & Research
- Open Space

Recreation

- Swimming
- Fishing
- Shellfishing
- Canoeing
- Hiking
- Hunting
- Birdwatching
- Photography
- Skating / Skiing



Scenic / Aesthetic Value

- Water Views
- Natural Landscapes
- Undeveloped
- Variety & Interest
- Private



Education & Research



Mount Tom

Open Space



Mount Tom

Wetland Functions & Values – Why Do We Care?

- Functions Performed Represent Huge Economic Value to Public
- Value of Clean Water Alone is Priceless
- Floodwater Damage Costly - Ruinous
- Key Element of Recreation Based Tourism
- Value Added to Property
- Quality of Life – Recreation, Open Space

Recreational Values

U.S. Fish & Wildlife Service

2011 National Survey
of Fishing, Hunting,
and Wildlife-Associated Recreation



Rhode Island



Mount Tom

2011 Rhode Island Summary

Activities in Rhode Island by Residents and Nonresidents

Fishing

Anglers	175,000
Days of fishing	2,080,000
Average days per angler	12
Total expenditures.....	\$130,046,000
Trip-related	\$83,935,000
Equipment and other	\$46,111,000
Average per angler	\$730
Average trip expenditure per day	\$40

Hunting

Hunters	20,000
Days of hunting	419,000
Average days per hunter	21
Total expenditures.....	\$18,308,000
Trip-related	\$4,610,000
Equipment and other	\$13,698,000
Average per hunter	\$891
Average trip expenditure per day	\$11

Wildlife Watching

Total wildlife-watching participants ..	308,000
Away-from-home participants.....	82,000
Around-the-home participants.....	260,000
Days of participation away from home.....	1,230,000
Average days of participation away from home	15
Total expenditures.....	\$200,481,000
Trip-related	\$78,920,000
Equipment and other	\$121,561,000
Average per participant	\$409
Average trip expenditure per day	\$64

Activities by Rhode Island Residents Both Inside and Outside Rhode Island

Fishing

Anglers	93,000
Days of fishing	1,742,000
Average days per angler	19
Total expenditures.....	\$96,538,000
Trip-related	\$44,838,000
Equipment and other	\$51,700,000
Average per angler	\$1,042
Average trip expenditure per day	\$26

Hunting

Hunters	17,000
Days of hunting	311,000
Average days per hunter	18
Total expenditures.....	\$26,131,000
Trip-related	\$6,445,000
Equipment and other	\$19,686,000
Average per hunter	\$1,532
Average trip expenditure per day	\$21

Wildlife Watching

Total wildlife-watching participants ..	270,000
Away-from-home participants.....	66,000
Around-the-home participants.....	260,000
Days of participation away from home.....	1,094,000
Average days of participation away from home	17
Total expenditures.....	\$161,954,000
Trip-related	\$88,059,000
Equipment and other	\$73,895,000
Average per participant	\$600
Average trip expenditure per day	\$80

Fishing - \$130 Million

Fishing

Anglers	175,000
Days of fishing	2,080,000
Average days per angler	12
Total expenditures	\$130,046,000
Trip-related	\$83,935,000
Equipment and other	\$46,111,000
Average per angler	\$730
Average trip expenditure per day	\$40

Hunting - \$18 Million

Hunting

Hunters	20,000
Days of hunting	419,000
Average days per hunter	21
Total expenditures	\$18,308,000
Trip-related	\$4,610,000
Equipment and other	\$13,698,000
Average per hunter	\$891
Average trip expenditure per day	\$11

Wildlife Watching - \$200 Million

Wildlife Watching

Total wildlife-watching participants .	308,000
Away-from-home participants.	82,000
Around-the-home participants.	260,000
Days of participation away from home.	1,230,000
Average days of participation away from home	15
Total expenditures.	\$200,481,000
Trip-related	\$78,920,000
Equipment and other	\$121,561,000
Average per participant.	\$409
Average trip expenditure per day	\$64

Thanks -

- Department of Administration
- Department of Environmental Management
- Coastal Resources Management Council
- University of Rhode Island
- Dr. Francis C. Golet

Discussion

