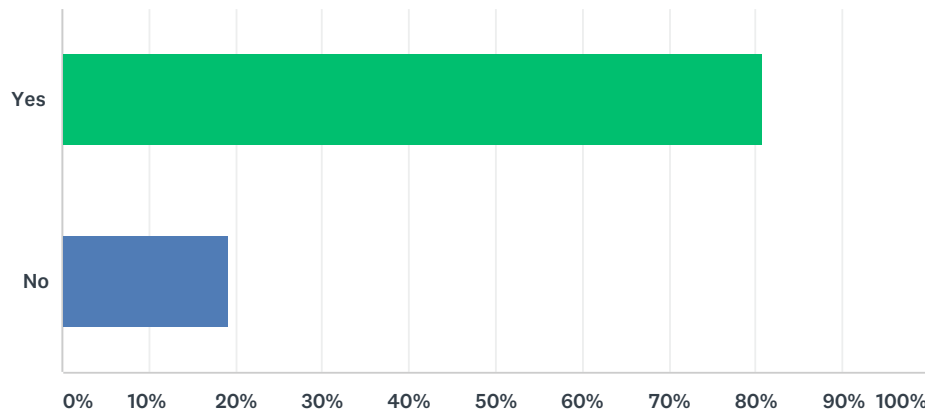


APPENDIX B: OUTREACH EFFORTS

- 1. COMMUNITY SURVEY ON CLIMATE RESILIENCY**
- 2. PRESENTATION FROM SOUTHEAST WATERSHEDS ALLIANCE**
- 3. WATER TRAIL SIGNS**

Q1 Does your municipality consider severe weather events and changing environmental conditions a priority issue?

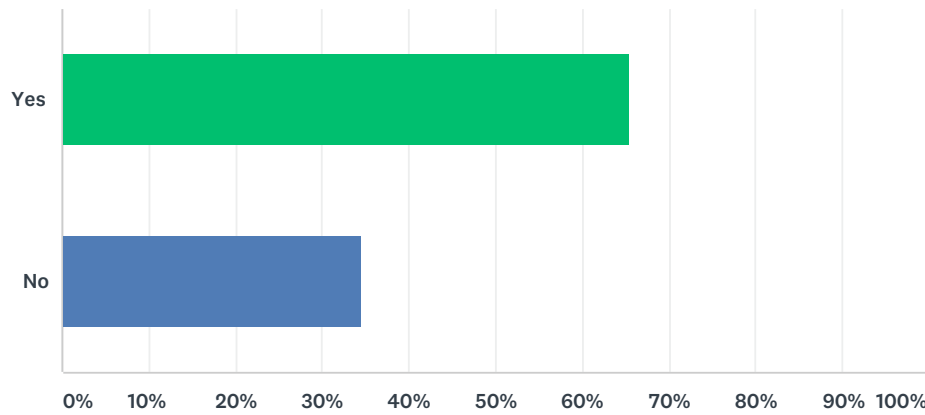
Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	80.77%	21
No	19.23%	5
Total Respondents: 26		

Q2 Has your municipality conducted a vulnerability assessment either for sea-level rise or freshwater flooding?

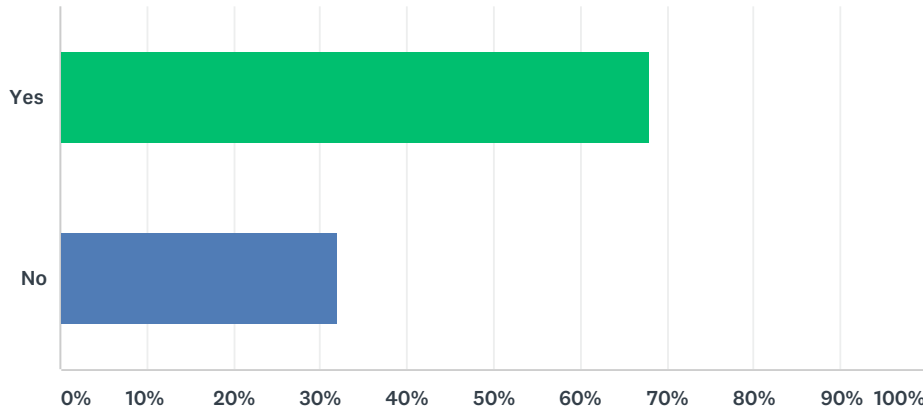
Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	65.38%	17
No	34.62%	9
Total Respondents: 26		

Q3 Do municipal planning staff and engineering/infrastructure management staff understand and/or apply the positive co-benefits that resiliency planning can have on stormwater management, flooding, water quality?

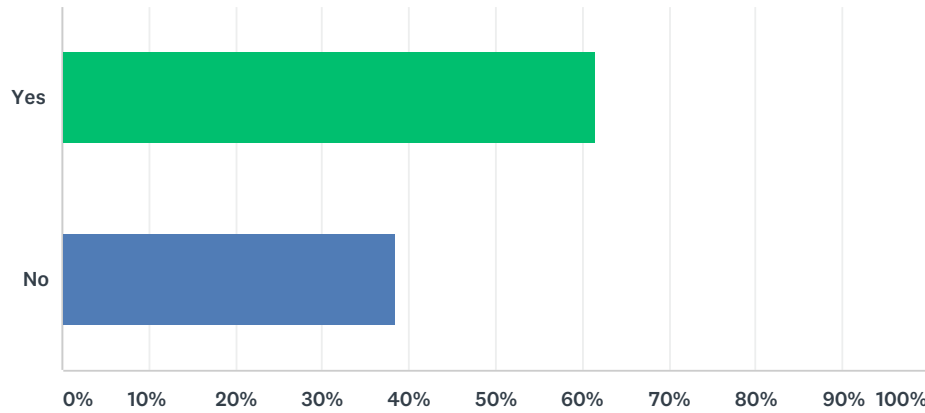
Answered: 25 Skipped: 1



ANSWER CHOICES	RESPONSES
Yes	68.00% 17
No	32.00% 8
Total Respondents: 25	

Q4 Does your municipality have an inventory of its drainage infrastructure?

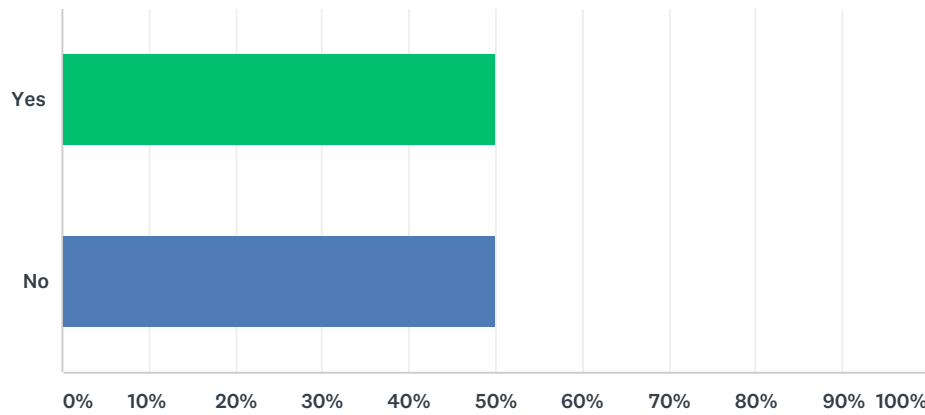
Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	61.54% 16
No	38.46% 10
Total Respondents: 26	

Q5 Does your municipality have GIS/digital data of its stormwater, drainage and road infrastructure?

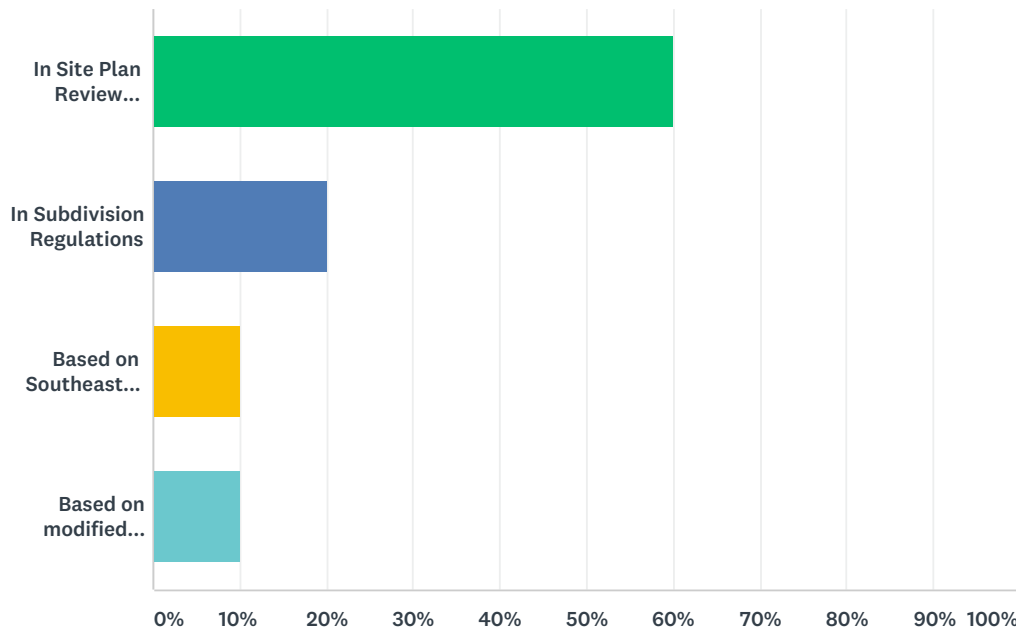
Answered: 24 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	50.00%	12
No	50.00%	12
Total Respondents: 24		

Q6 Does your municipality have updated stormwater standards? Check all that apply.

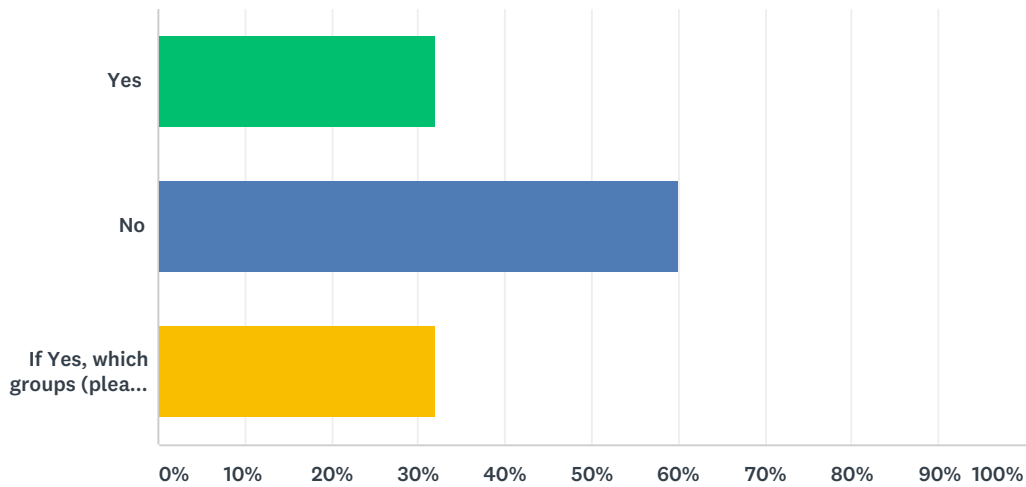
Answered: 20 Skipped: 6



ANSWER CHOICES	RESPONSES	
In Site Plan Review Regulations	60.00%	12
In Subdivision Regulations	20.00%	4
Based on Southeast Watershed Alliance model	10.00%	2
Based on modified Southeast Watershed Alliance model	10.00%	2
TOTAL		20

Q7 Do any civic groups communicate information about local flooding and climate change impacts to the local public, residents and business?

Answered: 25 Skipped: 1

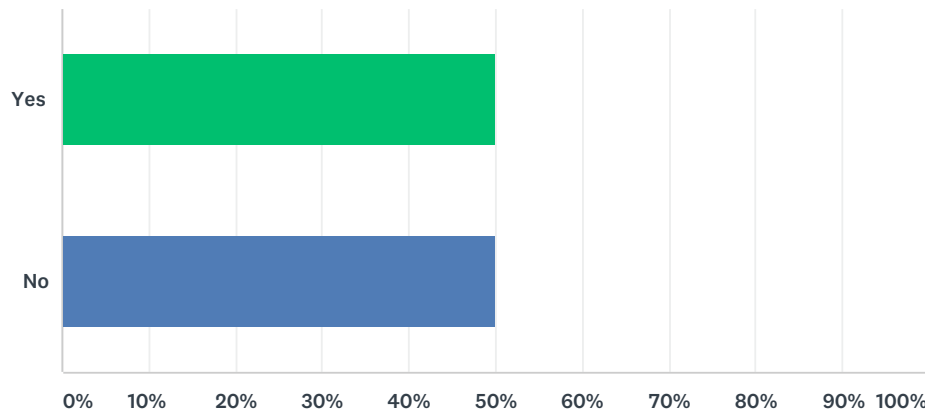


ANSWER CHOICES	RESPONSES
Yes	32.00% 8
No	60.00% 15
If Yes, which groups (please specify).	32.00% 8
Total Respondents: 25	

#	IF YES, WHICH GROUPS (PLEASE SPECIFY).	DATE
1	RPC, Conservation Commission	3/26/2018 1:48 PM
2	Conservation Commission	3/26/2018 10:46 AM
3	Planning Department	3/26/2018 9:09 AM
4	Planning board, civic league	3/23/2018 6:16 PM
5	Con Comm, Planning Board, BOS	3/21/2018 11:14 AM
6	Conservation Commission (I think...)	3/21/2018 9:38 AM
7	Conservation Commission	3/20/2018 5:23 PM
8	Not sure on this one	3/20/2018 12:33 PM

Q8 Does your Conservation Commission communicate information about local flooding and climate change impacts to the public?

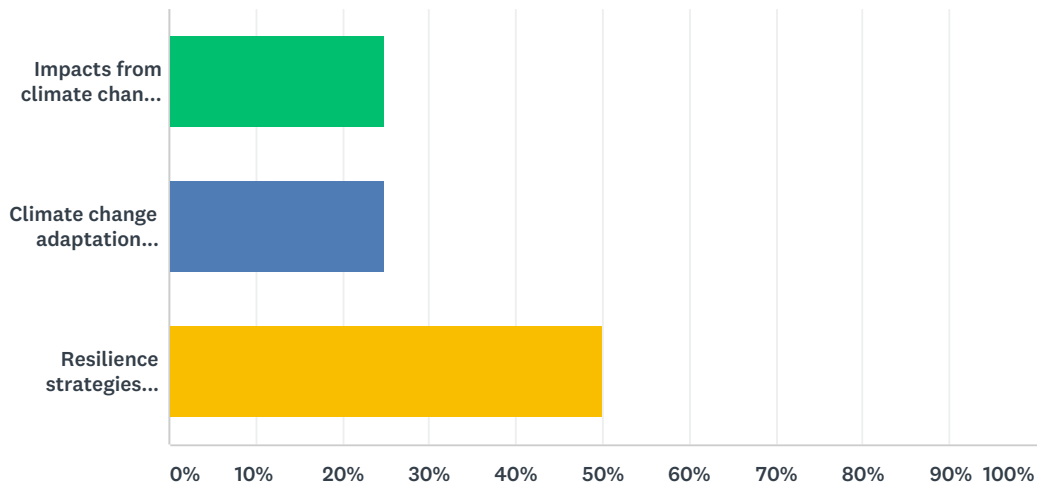
Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	50.00% 13
No	50.00% 13
Total Respondents: 26	

Q9 Has your municipality adopted any specific policies or plans that address (check all that apply):

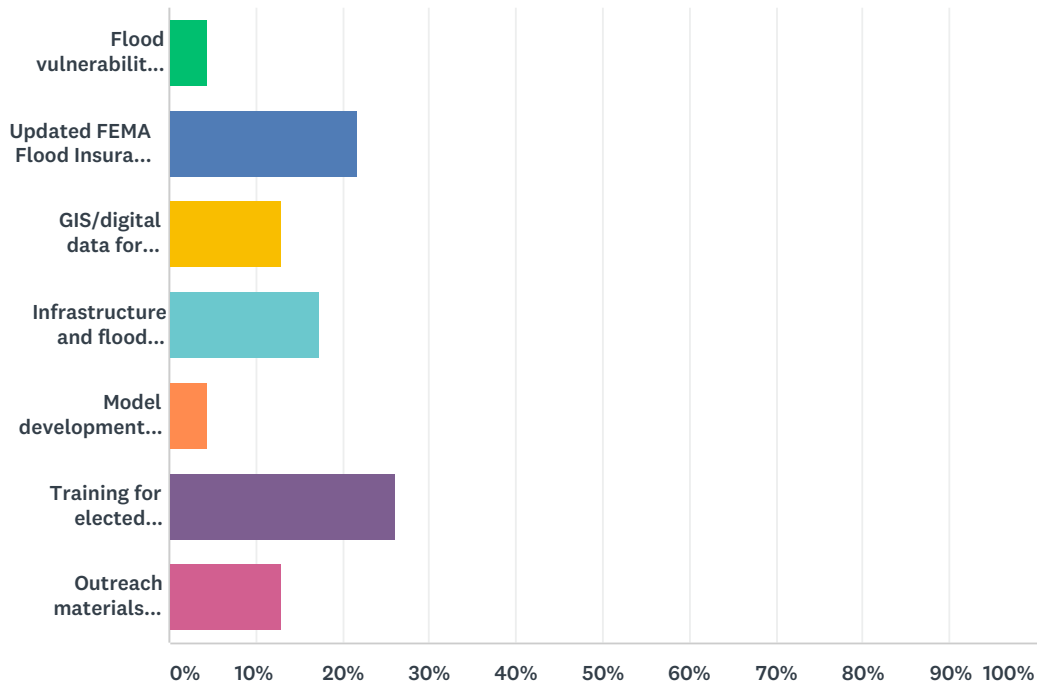
Answered: 16 Skipped: 10



ANSWER CHOICES	RESPONSES
Impacts from climate change (e.g. sea-level rise, precipitation, increased storm intensity).	25.00% 4
Climate change adaptation actions that limit vulnerability to impacts (e.g. sea walls, living shorelines, increased pipe/culvert size, green infrastructure, low impact development to accommodate increased precipitation).	25.00% 4
Resilience strategies (e.g. planning or management actions that reduce or minimize harmful impacts, planning with revised floodplain maps and/or future projected flooding).	50.00% 8
TOTAL	16

Q10 What information would be most helpful to inform future decisions about local flooding, climate change impacts and adaptation actions? Check all that apply.

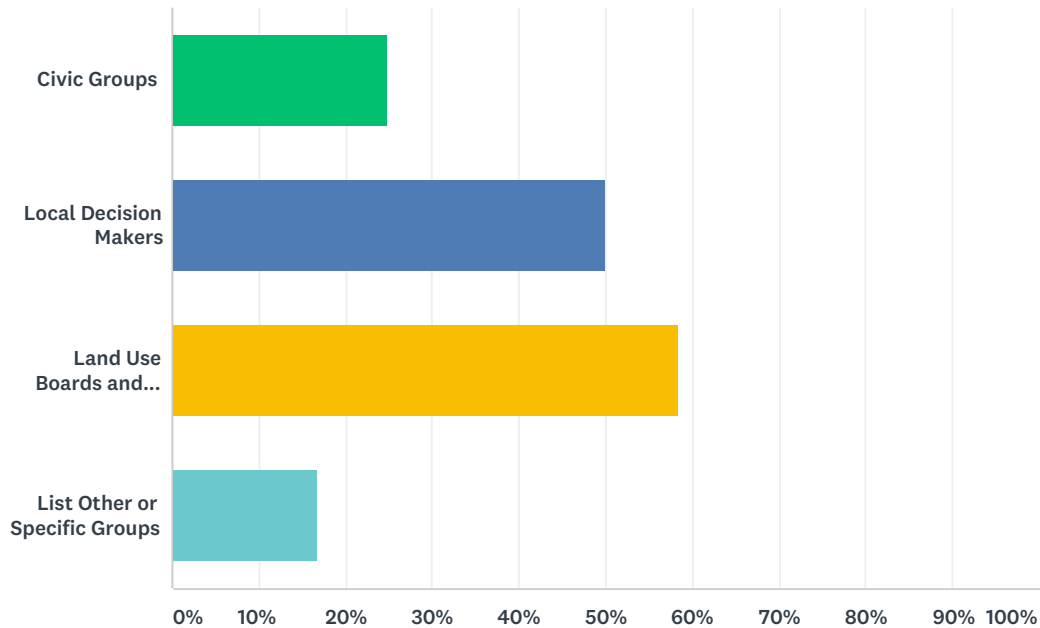
Answered: 23 Skipped: 3



ANSWER CHOICES	RESPONSES	
Flood vulnerability assessment	4.35%	1
Updated FEMA Flood Insurance Rate Maps (FIRMs) or other flood maps and studies	21.74%	5
GIS/digital data for infrastructure, roads etc.	13.04%	3
Infrastructure and flood impact costing studies	17.39%	4
Model development standards	4.35%	1
Training for elected officials, staff and boards/commissions	26.09%	6
Outreach materials and/or programs	13.04%	3
TOTAL		23

Q11 What groups or audiences in your community would most benefit from receiving information about local flooding and climate change impacts?

Answered: 24 Skipped: 2

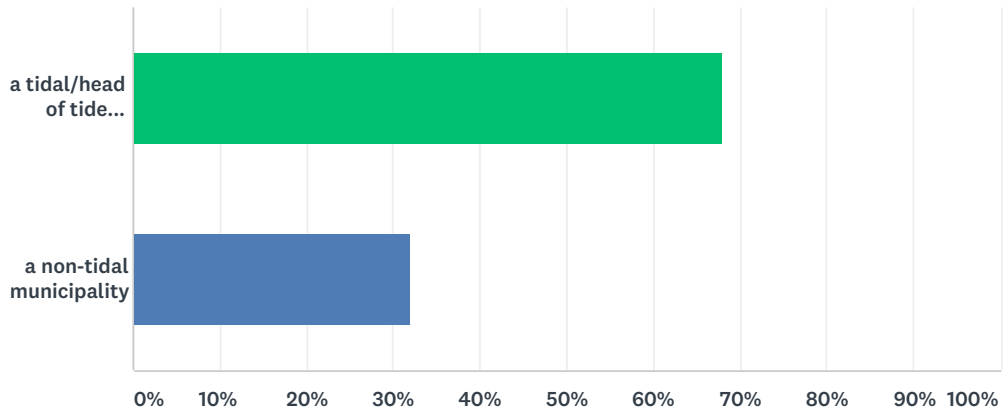


ANSWER CHOICES	RESPONSES
Civic Groups	25.00% 6
Local Decision Makers	50.00% 12
Land Use Boards and Commissions	58.33% 14
List Other or Specific Groups	16.67% 4
Total Respondents: 24	

#	LIST OTHER OR SPECIFIC GROUPS	DATE
1	Developers/Engineers	3/26/2018 1:48 PM
2	Inhabitants	3/23/2018 9:49 PM
3	Beach and near marsh residents	3/23/2018 6:16 PM
4	property owners	3/20/2018 1:41 PM

Q12 Do you live or work in -

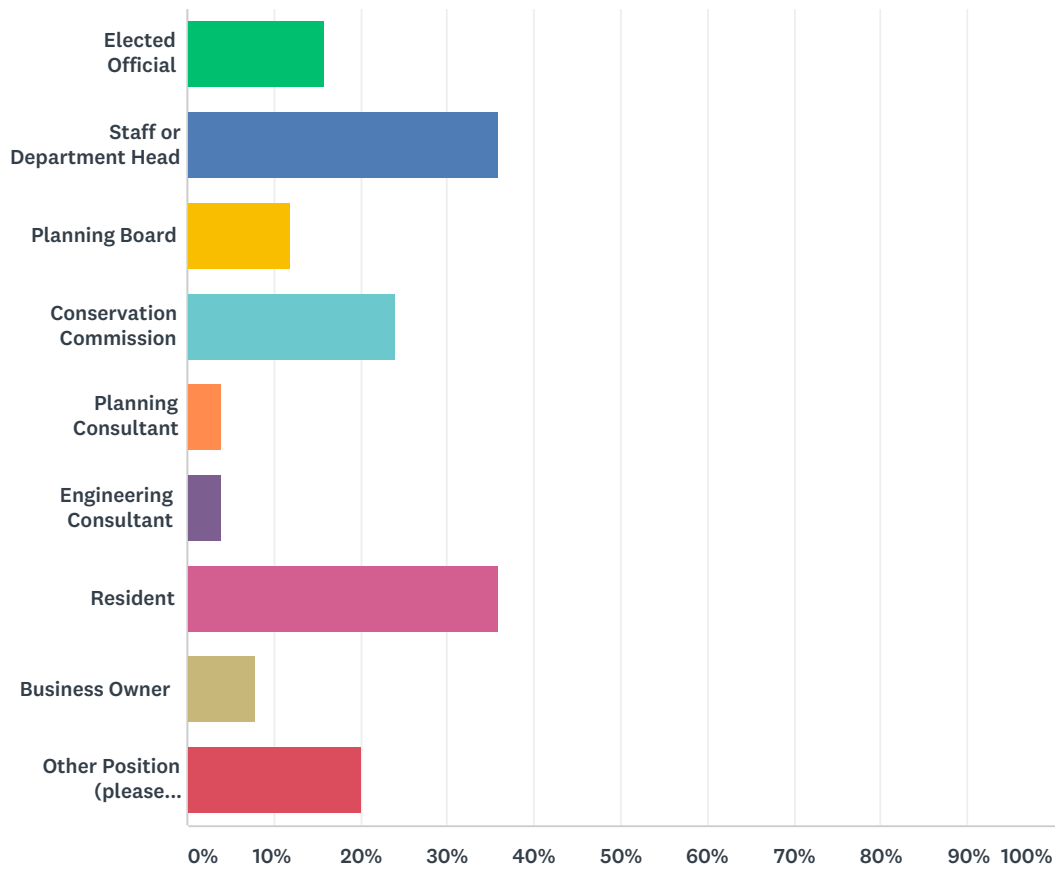
Answered: 25 Skipped: 1



ANSWER CHOICES	RESPONSES
a tidal/head of tide municipality	68.00% 17
a non-tidal municipality	32.00% 8
Total Respondents: 25	

Q13 What position do you hold in your municipality or work? Check all that apply.

Answered: 25 Skipped: 1



ANSWER CHOICES	RESPONSES
Elected Official	16.00% 4
Staff or Department Head	36.00% 9
Planning Board	12.00% 3
Conservation Commission	24.00% 6
Planning Consultant	4.00% 1
Engineering Consultant	4.00% 1
Resident	36.00% 9
Business Owner	8.00% 2
Other Position (please specify)	20.00% 5
Total Respondents: 25	

#	OTHER POSITION (PLEASE SPECIFY)	DATE
1	Various	3/23/2018 9:49 PM

2	Energy committee	3/23/2018 6:16 PM
3	Zoning Review Committee	3/20/2018 3:43 PM
4	Engineer	3/20/2018 12:53 PM
5	Many check all that apply questions did not work. Some yes or no questions should have had an inbetween selection.	3/10/2018 4:17 PM

Exeter Resilience Project: Innovative Approaches to Stormwater Management and Communications

Southeast Watershed Alliance
March 28, 2018

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(603) 778-0885 www.rpc-nh.org



Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

OVERVIEW

- ✓ Innovative Communication Methods
- ✓ Climate Adaptation Policy
- ✓ Resilient Stormwater Management



This project was funded, in part, by NOAA's Office of Coastal Management under the Coastal Zone Management Act in conjunction with the NH Department of Environmental Services Coastal Program.



Rockingham Planning Commission



Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Innovative Communications

Climate Change – Adaptation - Resilience

Ensuring a Successful Initiative

What is unique about the watershed or area of interest?

What resources are important, prominent, and tell the story?

What is the place-based connection?

Who are the key stakeholders to engage?

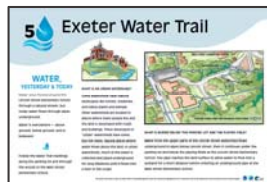
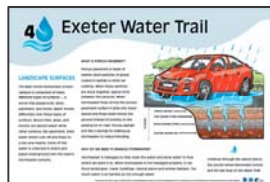
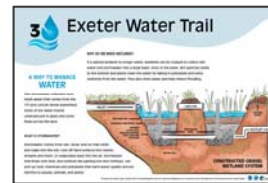
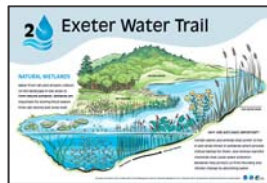
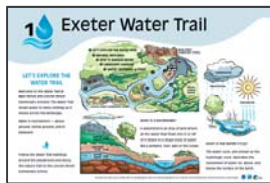
What is the community benefit?

- Identify the Audience
- Maximize Exposure
- Develop Impactful Message(s)
- Permanent/Repeatable Installation or Event

Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Innovative Communications

Educational installation at Main Street and Lincoln Street Elementary Schools
Reaches students Kindergarten through grade 5, yearly reinforcement, workbooks



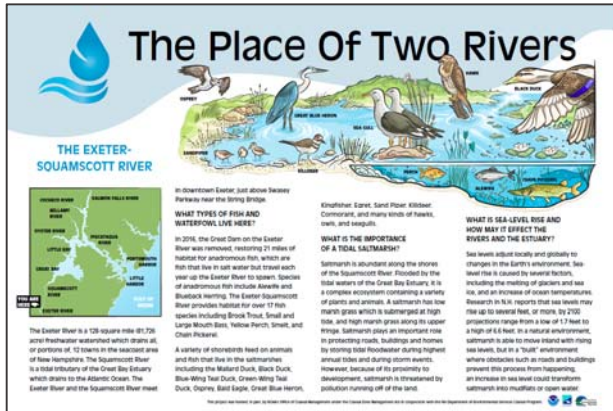
- Water Cycle, Flooding
- Surface interactions
- Natural Wetlands
- Constructed Wetlands
- Porous Pavement
- Stormwater Management

Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Innovative Communications

Educational installation at Swasey Parkway, Exeter

Highly Visited Area – Permanent Messaging – Expand with Future Installations



Exeter-Squamscott Rivers Watershed Facts
Importance of Saltmarsh Riverine Ecosystems
Impacts of Sea-level Rise

Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Climate Adaptation Policy *(draft)*

Vision Statement

Proactive strategies are identified and implemented that address the impacts of coastal hazards and climate change to create a more sustainable and resilient community.

Purpose

- Unified vision, goals, and actions
- Guide planning, investment, management, regulations
- Support for grants and other funding sources
- Living document, informed by best available science/information

Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Climate Adaptation Policy *(draft)*

Goals

Ensure the community is better prepared to protect the security, health and safety of its citizens.

Protect natural resources from the impacts of flooding from sea-level rise and storm events.

Provide for a stable and viable economic future.

Minimize the future costs of infrastructure replacement and maintenance.

Support installations of renewable energy systems and electric vehicle charging stations.

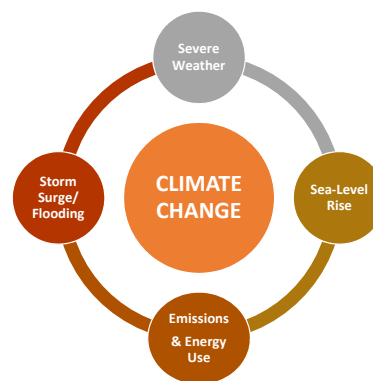
- Municipal Policy and Actions*
- Management and Investment*
- Environment-Natural Resources*
- Regulatory and Land Use Planning*
- Community-Based*

Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Climate Adaptation Policy *(draft)*

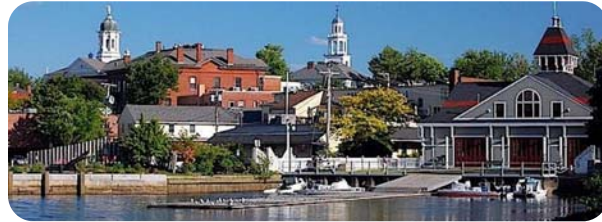
Recipe for Process/Methods

- ✓ Supported by Master Plan
- ✓ Audit of Zoning and Regulations
- ✓ Community Initiatives and Activities
- ✓ Capital Improvement/Infrastructure Management Plans
- ✓ Coordination with elected officials, staff, boards, commissions
- ✓ Exeter "Climate Proclamation" (to uphold principles of Paris Climate Accord)



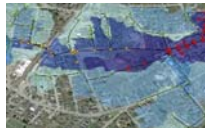
REGIONAL CONTEXT

- In 2009, NHDES concluded that many sub-estuaries in the Great Bay Estuary were impaired by nitrogen, and the Great Bay was placed on the Clean Water Act (CWA) Sec. 303(d) list of impaired and threatened waters (NHDES, 2009).
- New and revised discharge permits in the watershed are now subject to additional nitrogen requirements including the National Pollutant Discharge Elimination System (NPDES) permits for wastewater treatment facilities, and Municipal Separate Storm Sewer Discharge (MS4) permits for stormwater.
- 2017 NH Small MS4 issued, effective in 2018, includes significant new elements such as a focus on illicit discharge detection and elimination, and nutrient management through BMP retrofits.



9

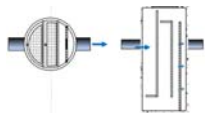
Tasks



1. Watershed Modeling



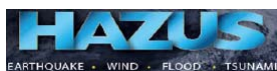
2. Identify Green Infrastructure Retrofit Locations



3. Project Design



4. Nutrient and Flooding Reduction

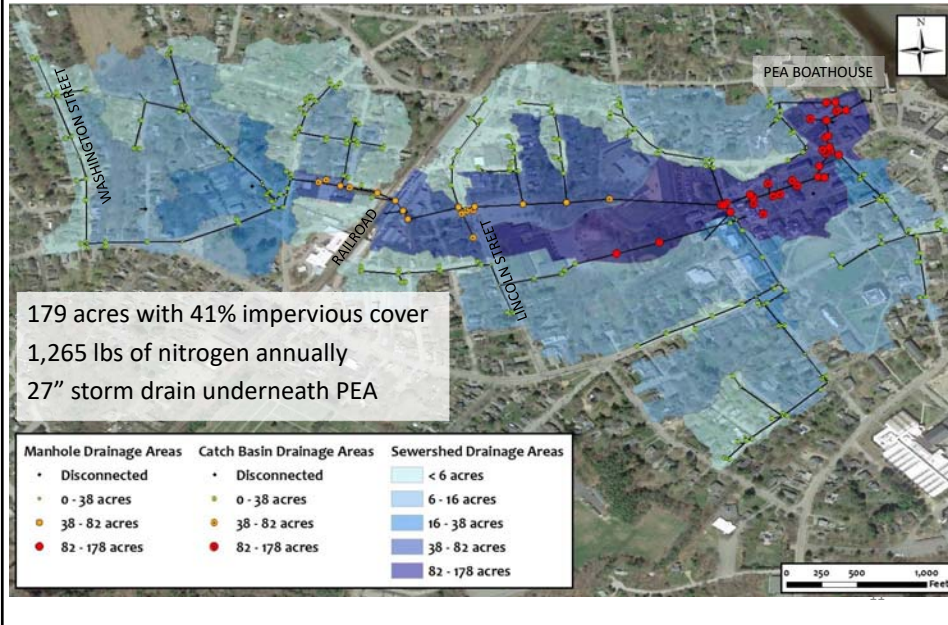


5. HAZUS Damage Costing

10

Watershed Characteristics

ADD REGIONAL MAP ANIMATION

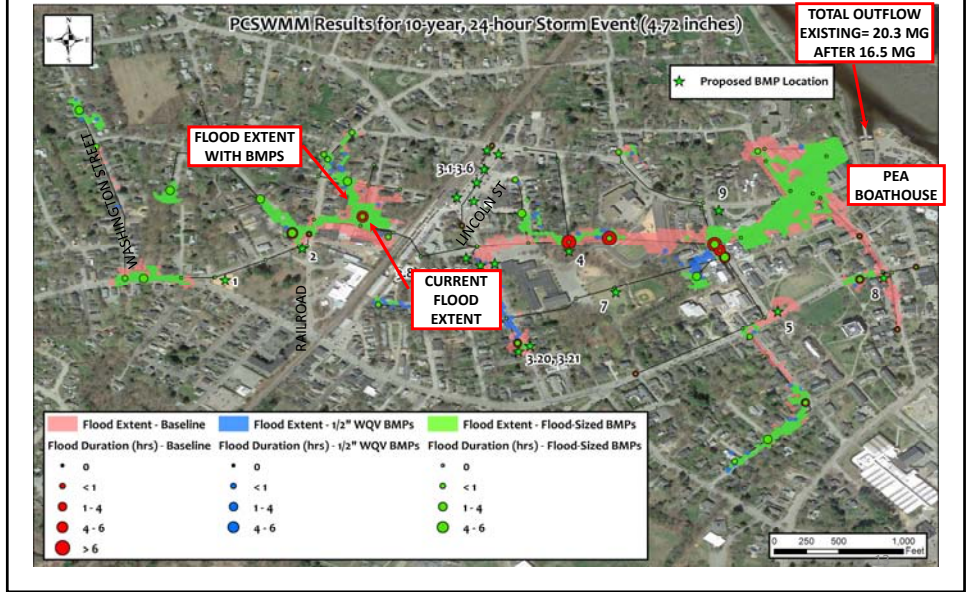


LOW IMPACT DEVELOPMENT

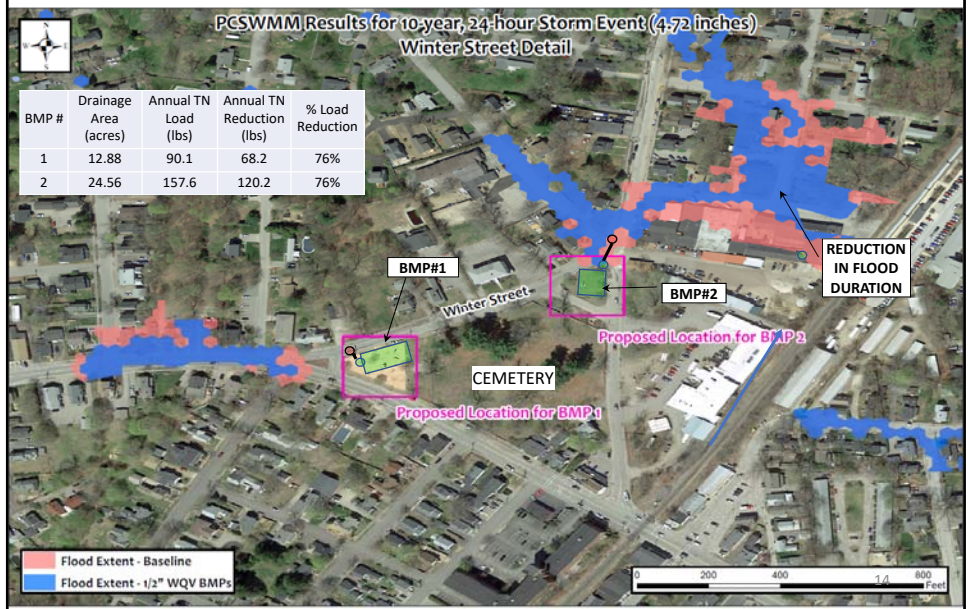


Modeling designs after natural systems

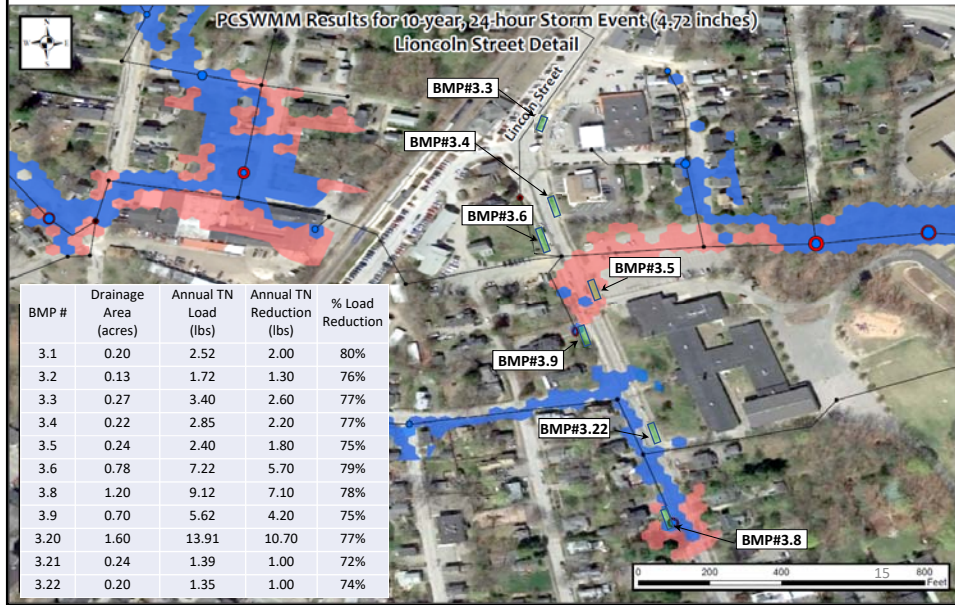
Watershed Flooding, BMP's and Load Reduction



FLOODING BEFORE AND AFTER- WINTER & RAILROAD

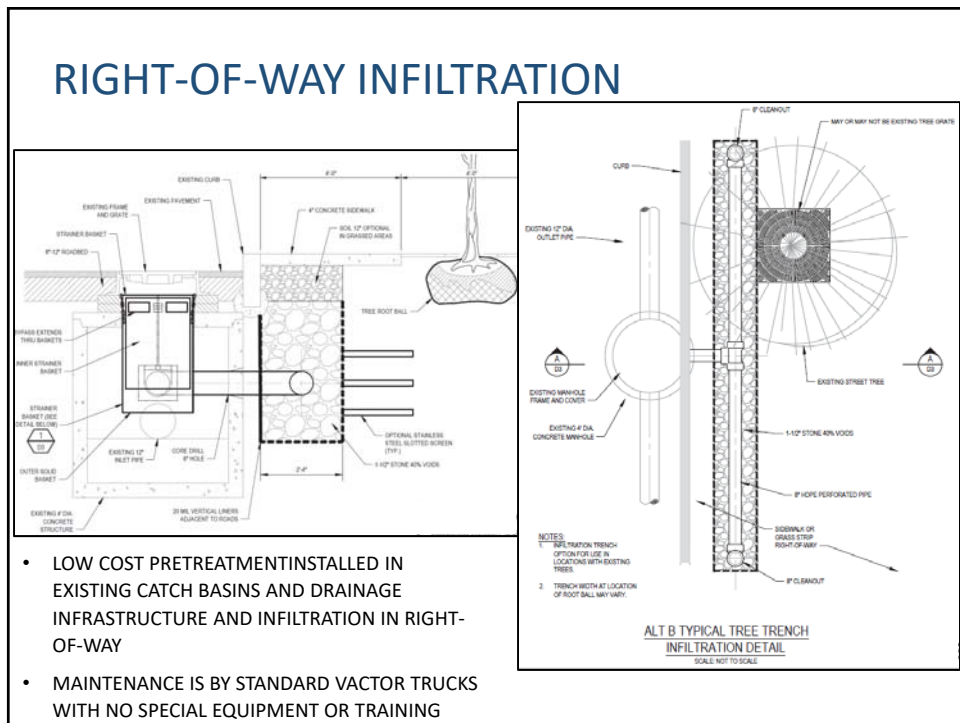
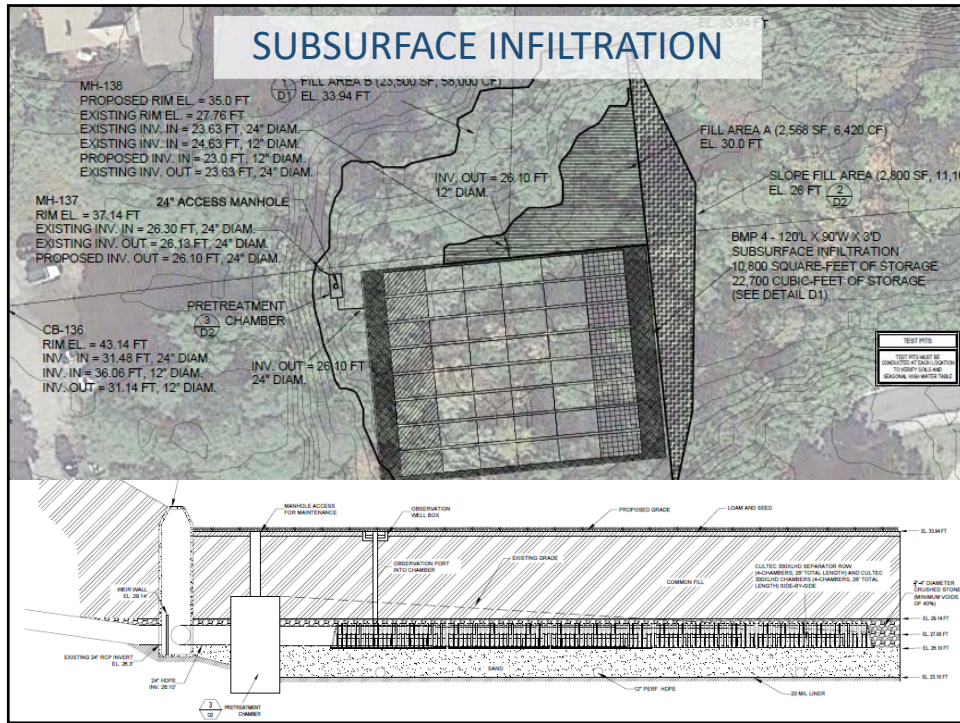


FLOODING BEFORE AND AFTER- RAILROAD AND LINCOLN ST



FLOODING BEFORE AND AFTER- ELM ST, FRONT ST & TAN LANE

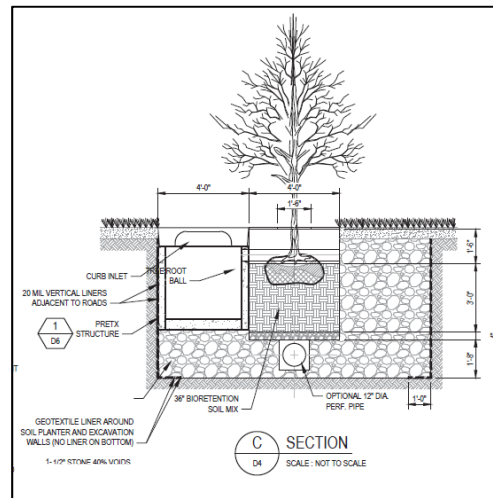
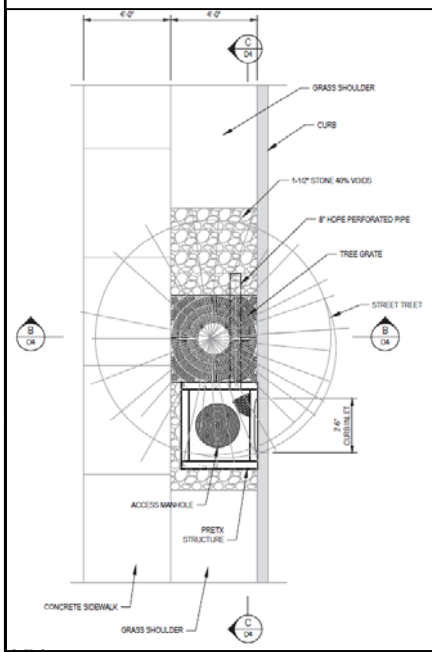




RIGHT-OF-WAY INFILTRATION



TREE PLANTERS



- LOW COST PRETREATMENT INSTALLED IN EXISTING CATCH BASINS AND DRAINAGE INFRASTRUCTURE AND PLANTERS UNDERNEATH SIDEWALK FOR MAXIMUM PEDESTRIAN USAGE
- MAINTENANCE IS BY STANDARD VACUUM TRUCKS WITH NO SPECIAL EQUIPMENT OR TRAINING

TREE PLANTERS



Low Maintenance Asset Management With Pretreatment

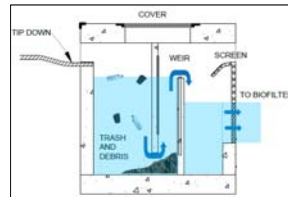
- In urban environments return on investment may be 1-2 years
- Goal is to use existing staff, equipment for standard catch basin cleaning
- Land-use and trash and debris load
- Aesthetics
- Cost to maintain versus cost of pretreatment



Condition Shortly After Install



Anderson Street Bioswale



Pretreatment by ACF



Condition After Winter

SOURCE: NYC OFFICE OF GREEN INFRASTRUCTURE

95% COST ESTIMATES

	BMP #	Drainage Area (acres)	Annual TN Reduction (lbs)	% Load Reduction	95% Design Cost Estimate	\$/LBS NITROGEN
WINTER STREET	1	12.9	68.2	76%	\$45,900	\$680
	2	24.6	120.2	76%	\$79,000	\$660
	Subtotal	-	37.4	188.4	76%	\$124,900
LINCOLN STREET NORTH	BMP #	Drainage Area (acres)	Annual TN Reduction (lbs)	% Load Reduction	95% Design Cost Estimate	\$/LBS NITROGEN
	3.1	0.2	2.0	80%	\$8,000	\$4,000
	3.2	0.1	1.3	76%	\$6,600	\$5,080
	3.3	0.3	2.6	77%	\$12,000	\$4,620
	3.4	0.2	2.2	77%	\$9,900	\$4,500
	3.5	0.2	1.8	75%	\$7,000	\$3,890
	3.6	0.8	5.7	79%	\$21,800	\$3,830
	3.8	1.2	7.1	78%	\$22,000	\$3,100
	3.9	0.7	4.2	75%	\$13,600	\$3,240
3.22	0.2	1.0	77%	\$3,000	\$3,000	
Subtotal	-	3.9	27.9	77%	\$103,900	-
LINCOLN STREET SOUTH	BMP #	Drainage Area (acres)	Annual TN Reduction (lbs)	% Load Reduction	95% Design Cost Estimate	\$/LBS NITROGEN
	3.20	1.6	10.7	77%	\$33,000	\$3,090
	3.21	0.2	1.0	72%	\$2,800	\$2,800
Subtotal	-	1.8	11.7	76%	\$35,800	-
FRONT STREET	BMP #	Drainage Area (acres)	Annual TN Reduction (lbs)	% Load Reduction	95% Design Cost Estimate	\$/LBS NITROGEN
	5	20.3	71.7	52%	\$45,200	\$640
Total	-	63.5	299.7	69%	\$309,800	-

HAZUS Analysis and Damage Cost Avoidance



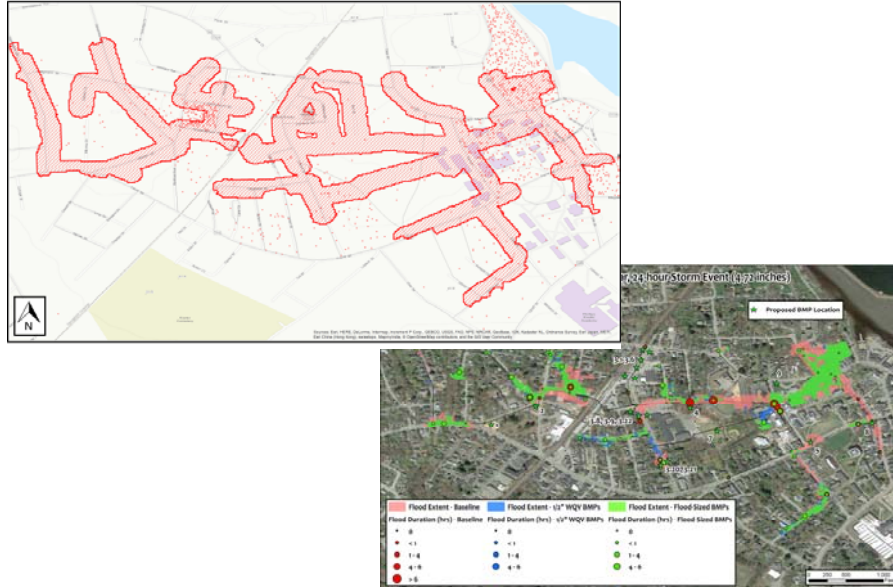
FEMA



RiskMAP
Increasing Resilience Together

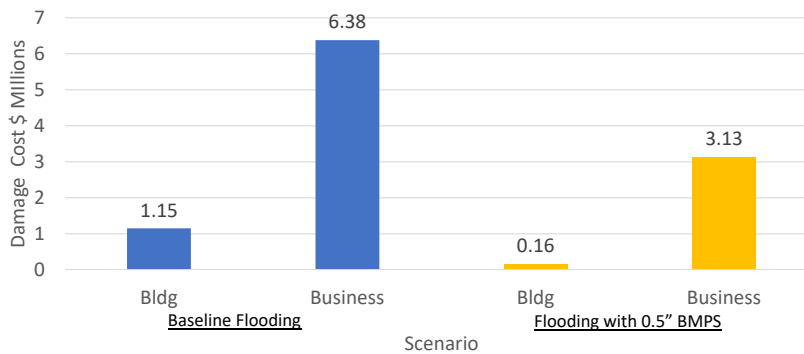
HAZUS Analysis and Damage Cost Avoidance

Total Economic Loss (1 dot = \$300K) Overview Map

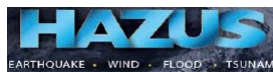


HAZUS Analysis and Damage Cost Avoidance

Damage in \$ Millions for 10-YR 24 Hour Storm for Baseline Flooding Vs 0.5" BMPs



FEMA



RiskMAP
Increasing Resilience Together

Exeter Resilience Project: Innovative Approaches to Stormwater Management, Communications, Policy

Thank you!



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Julie LaBranche, Senior Planner
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Rockingham Planning Commission





Exeter Water Trail

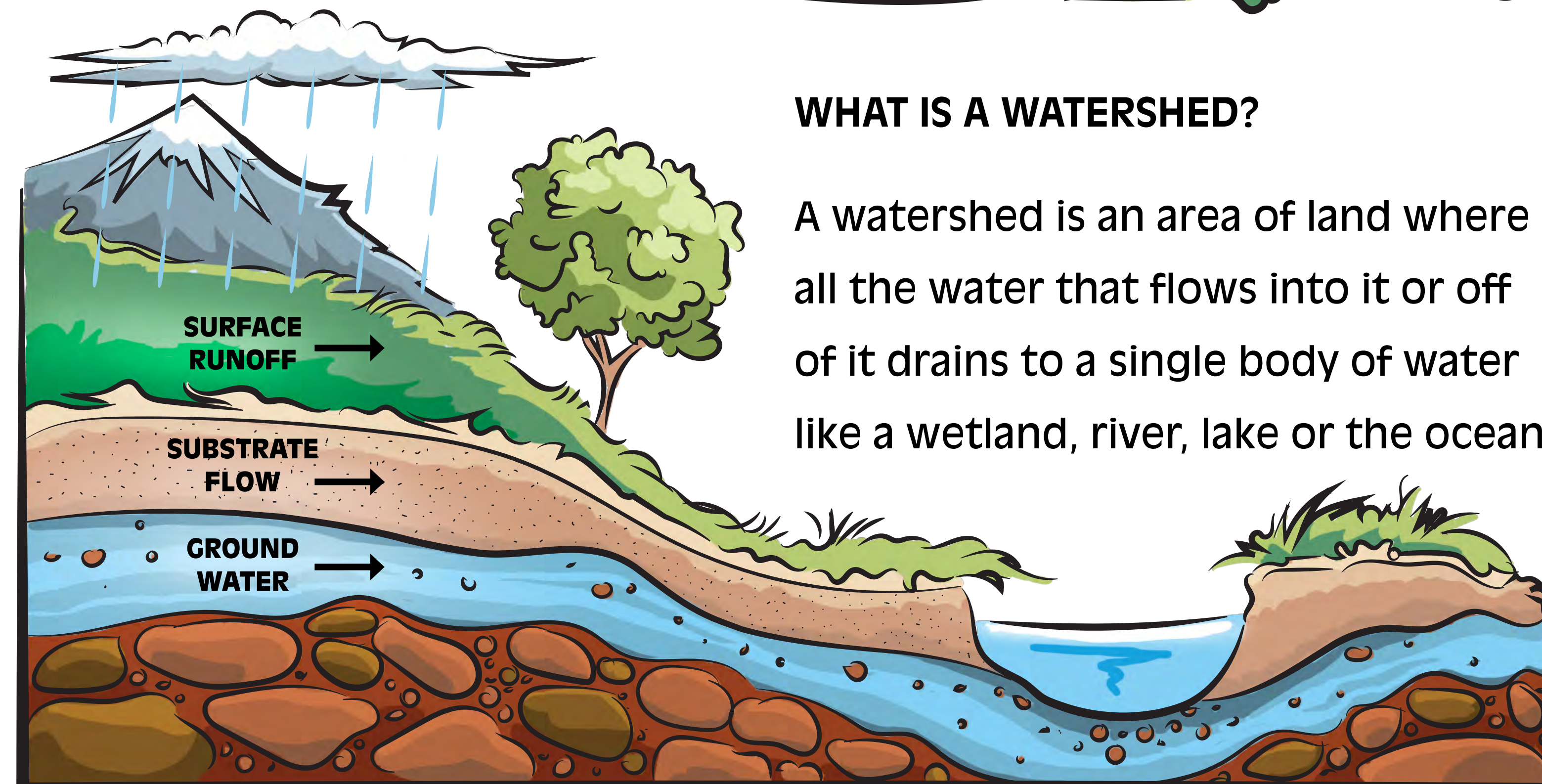
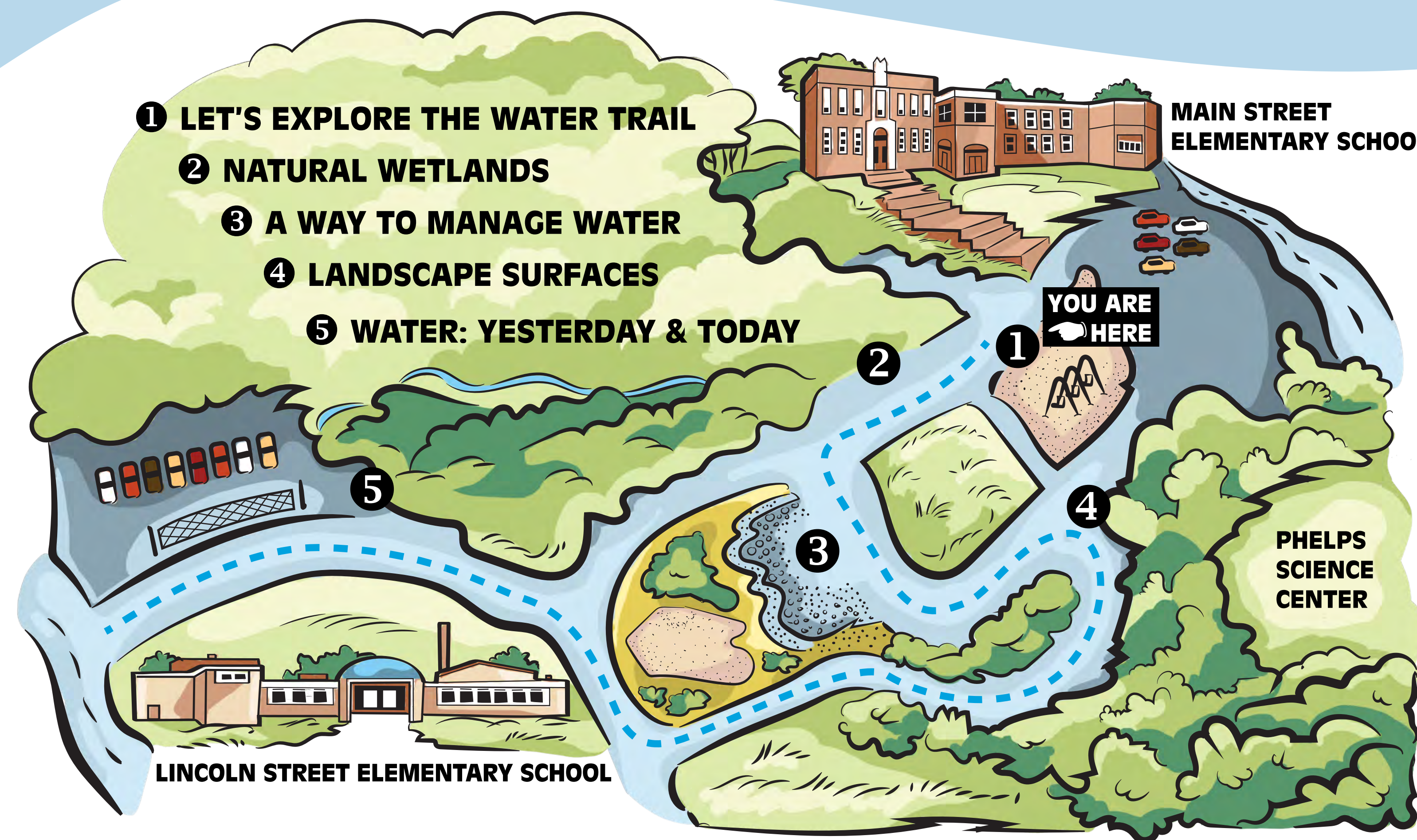
LET'S EXPLORE THE WATER TRAIL

Welcome to the *Water Trail* at Main Street and Lincoln Street Elementary Schools! The Water Trail shows water in many settings as it moves across the landscape.

Water is everywhere — above ground, below ground, and in between!

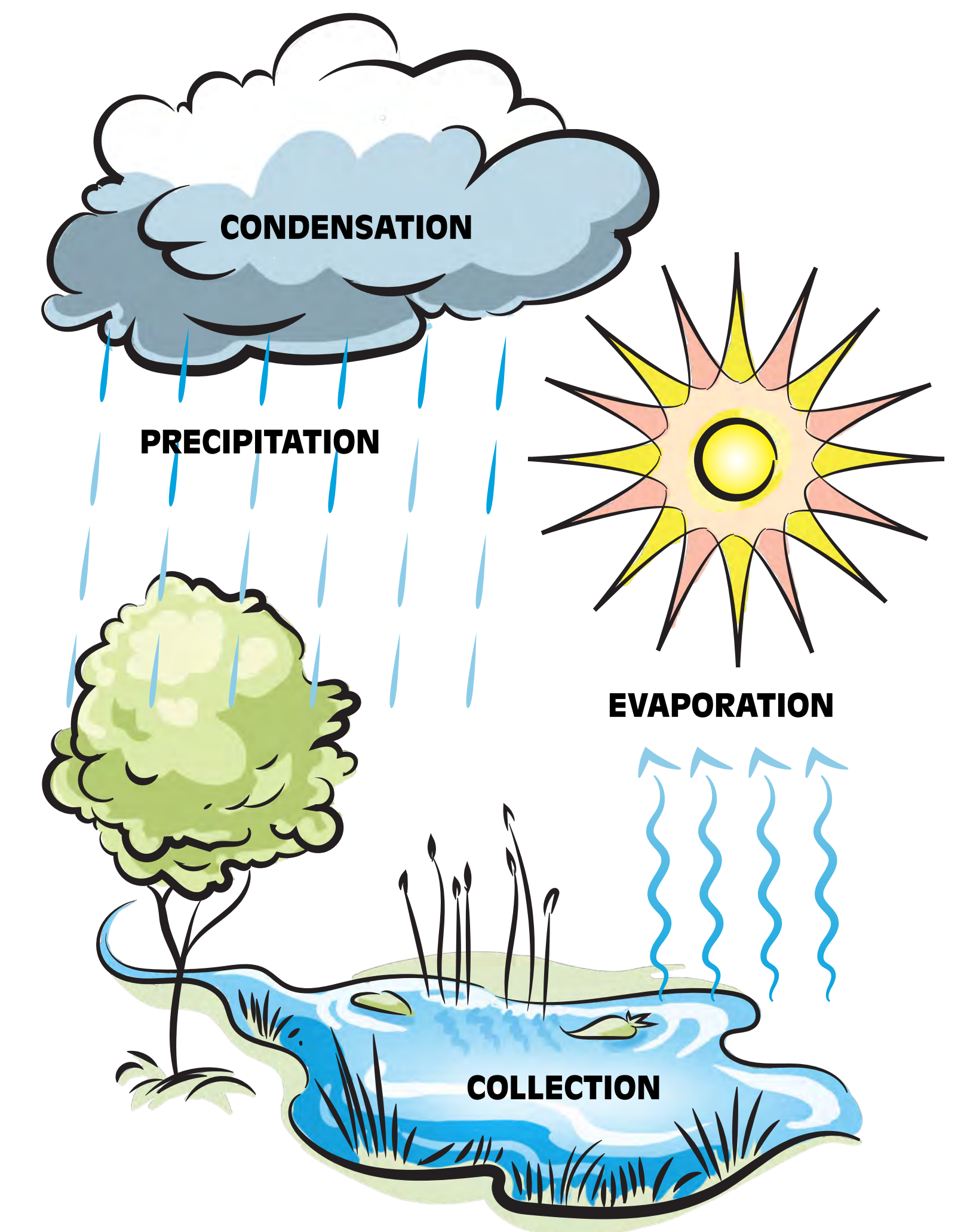


Follow the *Water Trail* markings around the playground and along the nature trail to the Lincoln Street Elementary School.



WHAT IS A WATERSHED?

A watershed is an area of land where all the water that flows into it or off of it drains to a single body of water like a wetland, river, lake or the ocean.



WHAT IS THE WATER CYCLE?

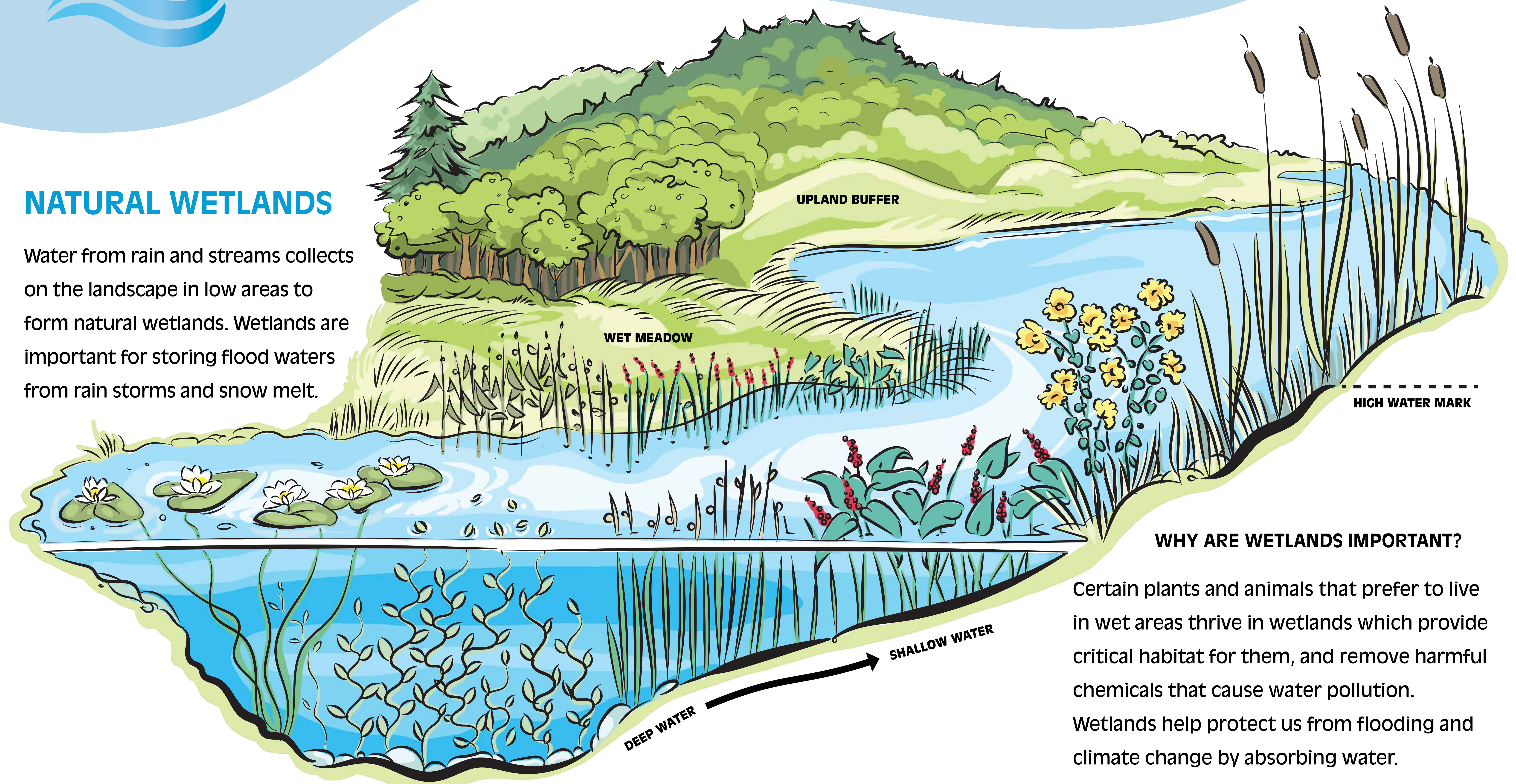
The water cycle, also known as the hydrologic cycle, describes the movement of water on, above, and below the surface of the Earth.



Exeter Water Trail

NATURAL WETLANDS

Water from rain and streams collects on the landscape in low areas to form natural wetlands. Wetlands are important for storing flood waters from rain storms and snow melt.



WHY ARE WETLANDS IMPORTANT?

Certain plants and animals that prefer to live in wet areas thrive in wetlands which provide critical habitat for them, and remove harmful chemicals that cause water pollution. Wetlands help protect us from flooding and climate change by absorbing water.



Exeter Water Trail

A WAY TO MANAGE WATER

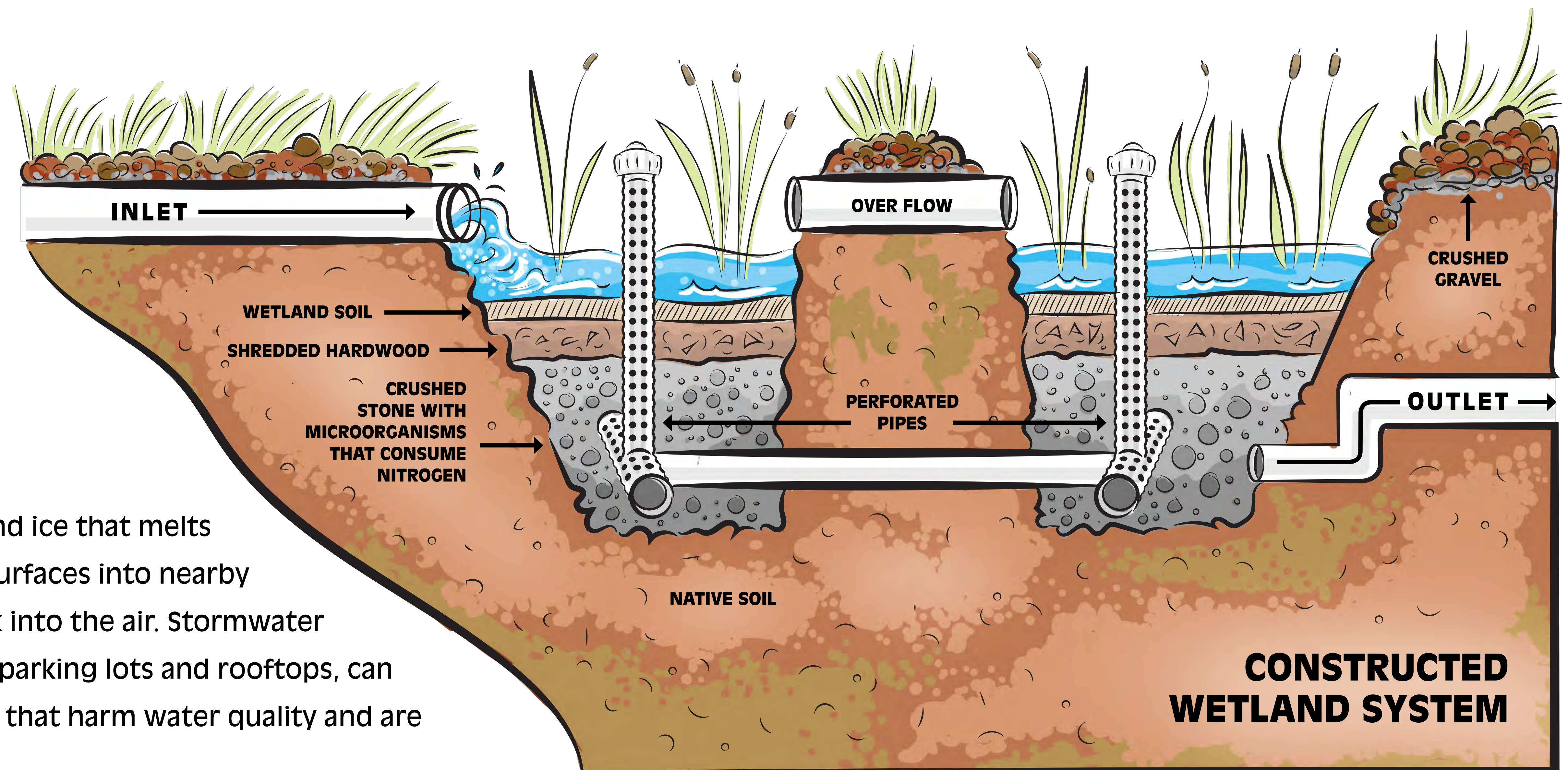
This stormwater collection area holds water that comes from the 177 acre Lincoln Street watershed. Some of the water travels underground in pipes and some flows across the land.

WHAT IS STORMWATER?

Stormwater comes from rain, snow, and ice that melts and soaks into the soil, runs off hard surfaces into nearby streams and rivers, or evaporates back into the air. Stormwater that flows over land, and surfaces like parking lots and rooftops, can pick up toxic chemicals and pollutants that harm water quality and are harmful to people, animals, and plants.

WHY DO WE MAKE WETLANDS?

If a natural wetland no longer exists, man-made wetlands can be created to collect rain water and stormwater into a large basin. Once in the basin, dirt particles settle to the bottom and plants clean the water by taking in pollutants and extra nutrients from the water. These wetlands also store water and help reduce flooding.





Exeter Water Trail

LANDSCAPE SURFACES

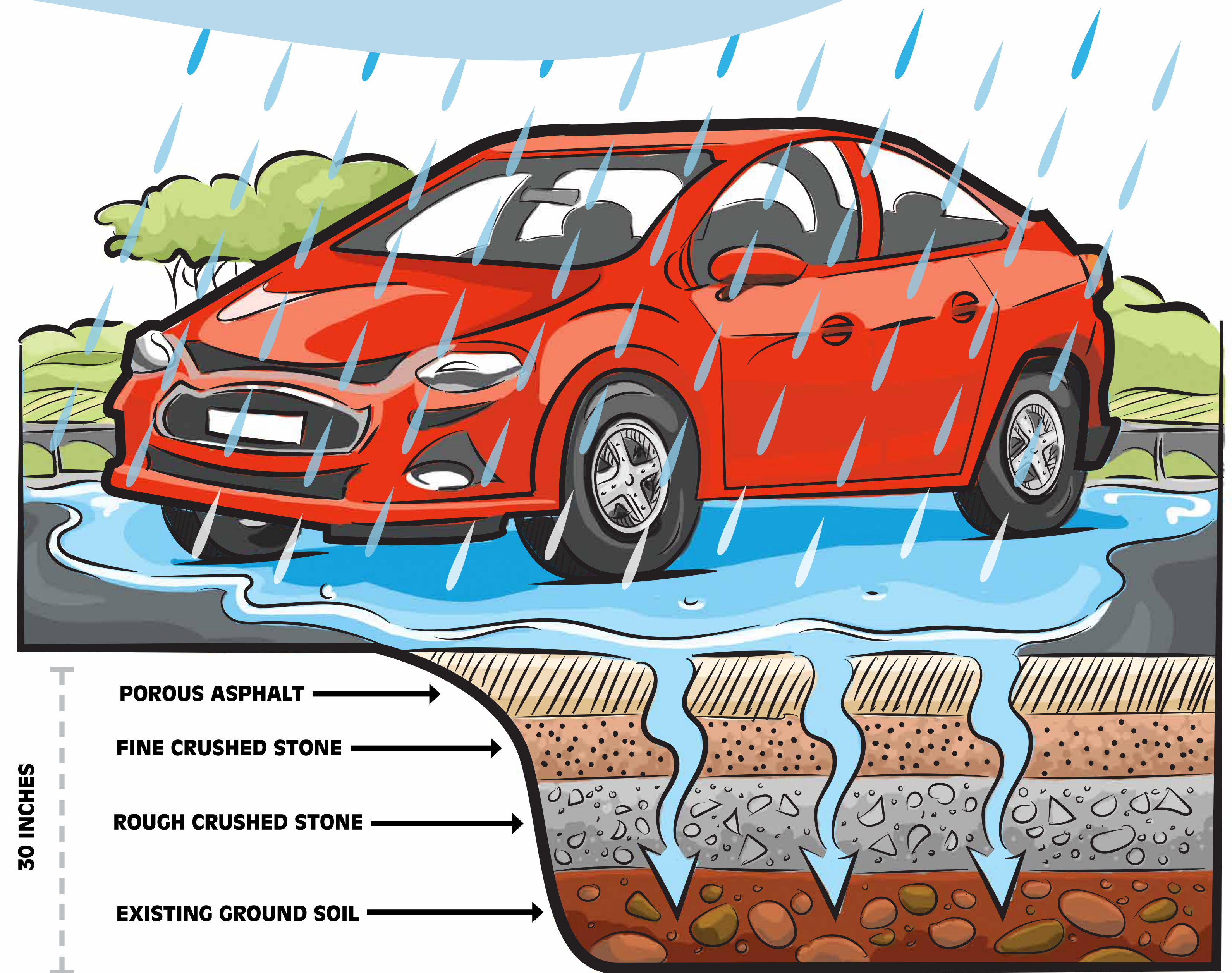
The Main Street Elementary School campus is composed of many different types of surfaces — a wood chip playground, grass, pavement, and forest. Water moves differently over these types of surfaces. Wood chips, grass, and forests can absorb water while other surfaces, like pavement, shed water which runs off and flows to a low area nearby. Some of this water is collected in drains and piped underground into the town's stormwater systems.

WHAT IS POROUS PAVEMENT?

Porous pavement is made of marble-sized particles of gravel coated in asphalt (a sticky tar coating). When these particles are stuck together, spaces form between the particles. When stormwater flows across the porous pavement surface it sinks into these spaces and flows down below the ground instead of pooling on the parking lot or road. Porous asphalt acts like a sponge by soaking up stormwater to reduce flooding.

WHY DO WE NEED TO MANAGE STORMWATER?

Stormwater is managed to help clean the water and allow water to flow where we want it to. When stormwater is not managed properly, it can flood landscapes, roads, buildings, natural places and animal habitats. Too much water is as harmful as not enough water.



Continue through the nature trail to the Lincoln Street Elementary School and the last stop on the Water Trail!



Exeter Water Trail

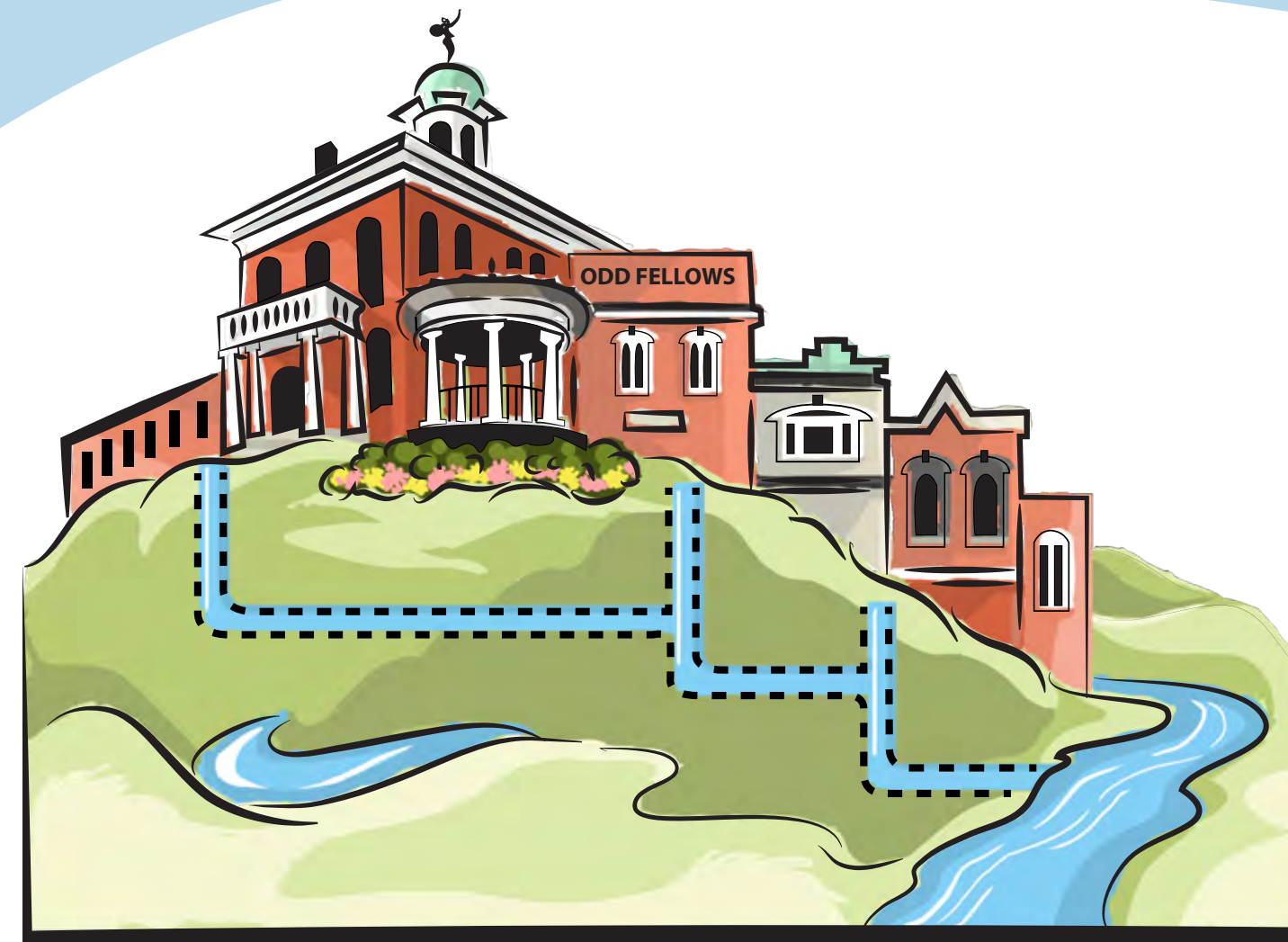
WATER, YESTERDAY & TODAY

Water once flowed around the Lincoln Street Elementary School through a natural stream, but today water flows through pipes underground.

Water is everywhere — above ground, below ground, and in between!

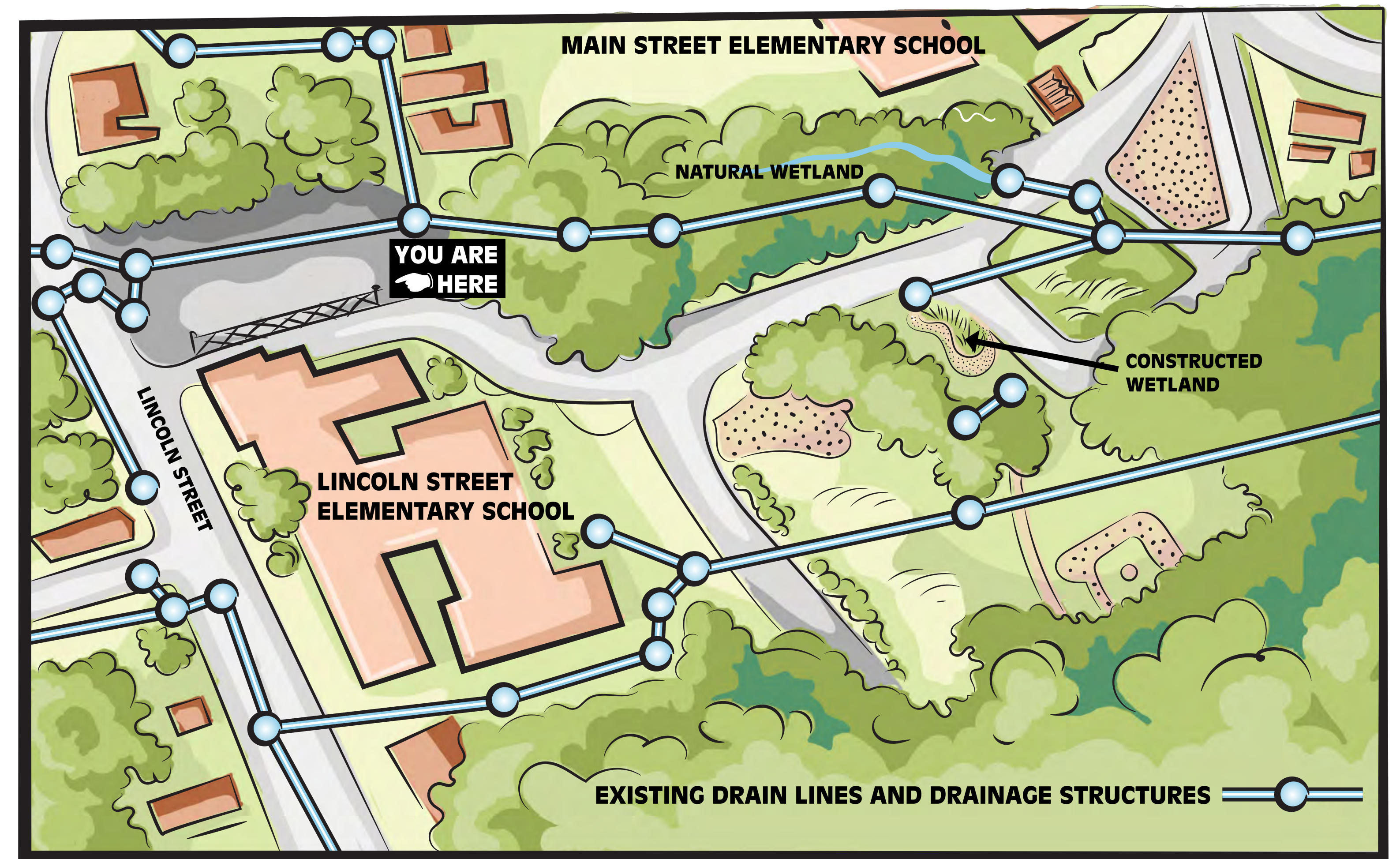


Follow the Water Trail markings along the parking lot and through the woods to the Main Street Elementary School.



WHAT IS AN URBAN WATERSHED?

Some watersheds have natural landscapes like forests, meadows, and native plants and animals. Other watersheds are located in places where many people live and the land is developed with roads and buildings. These developed or “urban” watersheds have some, but not many, natural places where water flows over the land. In urban watersheds, much of the water is collected and piped underground for long distances until it flows into a river or the ocean.



WHAT IS BURIED BELOW THIS PARKING LOT AND THE PLAYING FIELDS?

Water from the upper parts of the Lincoln Street watershed flows underground in pipes below Lincoln Street, then it continues under the parking lot and below the playing fields at the Lincoln Street Elementary School. One pipe reaches the land surface to allow water to flow into a wetland for a short distance before entering an underground pipe at the Main Street Elementary School.

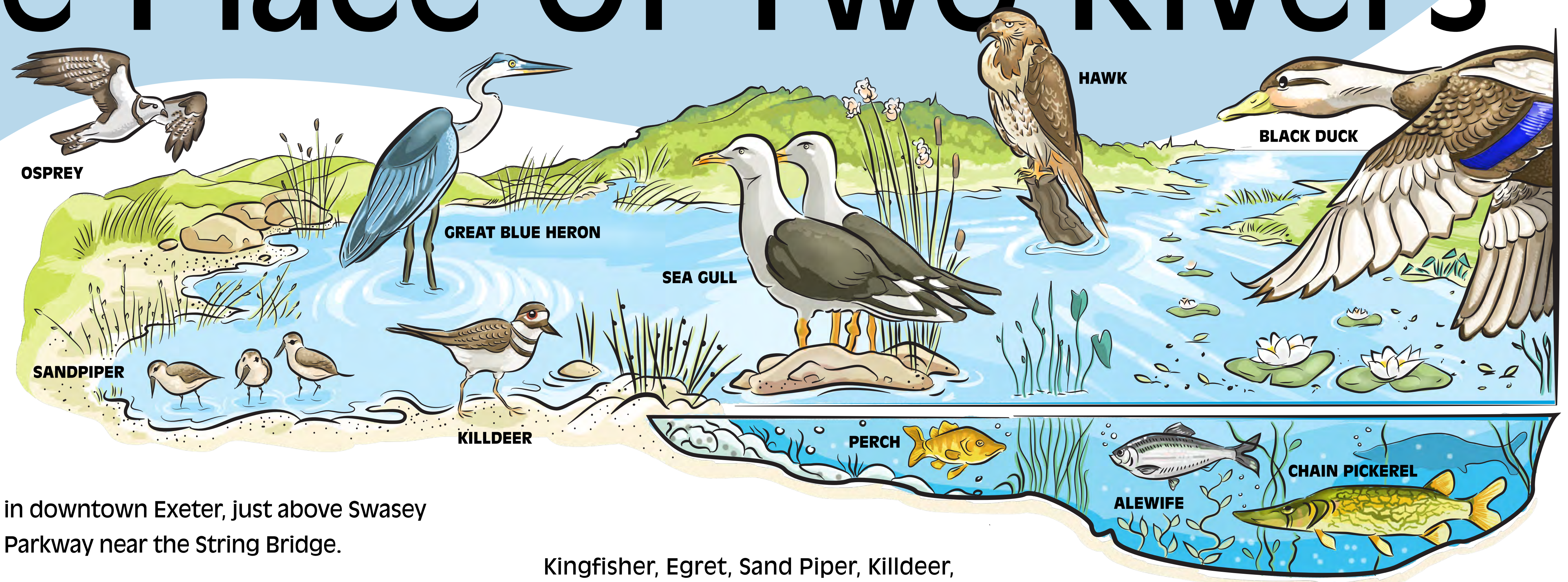


The Place Of Two Rivers

THE EXETER-SQUAMSCOTT RIVER



The Exeter River is a 128-square mile (81,726 acre) freshwater watershed which drains all, or portions of, 12 towns in the seacoast area of New Hampshire. The Squamscott River is a tidal tributary of the Great Bay Estuary which drains to the Atlantic Ocean. The Exeter River and the Squamscott River meet



in downtown Exeter, just above Swasey Parkway near the String Bridge.

WHAT TYPES OF FISH AND WATERFOWL LIVE HERE?

In 2016, the Great Dam on the Exeter River was removed, restoring 21 miles of habitat for anadromous fish, which are fish that live in salt water but travel each year up the Exeter River to spawn. Species of anadromous fish include Alewife and Blueback Herring. The Exeter-Squamscott River provides habitat for over 17 fish species including Brook Trout, Small and Large Mouth Bass, Yellow Perch, Smelt, and Chain Pickerel.

A variety of shorebirds feed on animals and fish that live in the saltmarshes including the Mallard Duck, Black Duck, Blue-Wing Teal Duck, Green-Wing Teal Duck, Osprey, Bald Eagle, Great Blue Heron,

Kingfisher, Egret, Sand Piper, Killdeer, Cormorant, and many kinds of hawks, owls, and seagulls.

WHAT IS THE IMPORTANCE OF A TIDAL SALTMARSH?

Saltmarsh is abundant along the shores of the Squamscott River. Flooded by the tidal waters of the Great Bay Estuary, it is a complex ecosystem containing a variety of plants and animals. A saltmarsh has low marsh grass which is submerged at high tide, and high marsh grass along its upper fringe. Saltmarsh plays an important role in protecting roads, buildings and homes by storing tidal floodwater during highest annual tides and during storm events. However, because of its proximity to development, saltmarsh is threatened by pollution running off of the land.

WHAT IS SEA-LEVEL RISE AND HOW MAY IT EFFECT THE RIVERS AND THE ESTUARY?

Sea levels adjust locally and globally to changes in the Earth's environment. Sea-level rise is caused by several factors, including the melting of glaciers and sea ice, and an increase of ocean temperatures. Research in N.H. reports that sea levels may rise up to several feet, or more, by 2100 and projections range from a low of 1.7 feet to a high of 6.6 feet. In a natural environment, saltmarsh is able to move inland with rising sea levels, but in a "built" environment where obstacles such as roads and buildings prevent this process from happening, an increase in sea level could transform saltmarsh into mudflats or open water.