

WATERSHED-BASED PLANNING IN KEYUP BROOK

FRANKLIN REGIONAL COUNCIL OF GOVERNMENTS (FRCOG)

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A *WATERSHED* IS THE AREA OF LAND THAT "SHEDS WATER" TO A COMMON OUTLET LIKE KEYUP BROOK. **WHAT HAPPENS HIGH UP IN THE WATERSHED NEAR THE HEADWATERS IMPACTS POINTS LOWER IN THE WATERSHED.**

FRCOG IS WORKING WITH THE TOWN OF ERVING TO

- WRITE A WATERSHED BASED PLAN &
- APPLY FOR GRANT FUNDING

TO IMPROVE NONPOINT SOURCE POLLUTION AND FLUVIAL EROSION IN THE WHOLE WATERSHED.

WHAT IS A WATERSHED-BASED PLAN?

A Watershed-Based Plan to Maintain the Health and Improve the Resiliency of the

Deerfield River Watershed



- PROGRAM OF THE MA DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)
- FUNDED UNDER S.319 OF THE CLEAN WATER ACT
- PURPOSE
 - DOCUMENT IMPAIRED AND HEALTHY WATERSHEDS
 - IDENTIFY PAST AND CURRENT WATER QUALITY CONDITIONS AND KNOWN AND LIKELY CAUSES AND SOURCES OF NONPOINT SOURCE POLLUTION
 - RECOGNIZE DATA GAPS
 - PRIORITIZE PROBLEMS AND THREATS
 - IDENTIFY APPROPRIATE BEST MANAGEMENT PRACTICES AND WATERSHED-BASED STRATEGIES
- REQUIRED FOR S.319 NONPOINT SOURCE COMPETITIVE GRANT FUNDING FOR IMPLEMENTATION PROJECTS; HELPFUL FOR OTHER WATER QUALITY GRANTS

WHAT IS NONPOINT SOURCE (NPS) POLLUTION?

- NOT FROM A SPECIFIC SOURCE (e.g., DISCHARGE PIPE)
- TYPICALLY *SURFACE/STORMWATER RUNOFF* PICKING UP POLLUTANTS
- SEDIMENT, VEHICLE CHEMICALS, FERTILIZERS, PESTICIDES, PET WASTE, MANURE, ROAD SALT & MORE
- MOST UNTREATED, UNMANAGED STORMWATER RUNOFF IN FRANKLIN COUNTY COMES FROM
 - DEVELOPED AREAS
 - ROADS AND CULVERTS
 - RESIDENTIAL HOMES
 - AGRICULTURE
- MOST COMMON POLLUTANT TYPES THAT WE CAN DO SOMETHING ABOUT:
 - BACTERIA (E. COLI)
 - NUTRIENTS (NITROGEN & PHOSPHORUS)
 - SEDIMENT
 - TEMPERATURE

According to the EPA, NPS POLLUTION is now the greatest cause of water quality problems in the country



HEALTHY & CLIMATE RESILIENT RIVERS STORYMAP

WHY THE KEYUP BROOK WATERSHED?



- E. Coli impairment identified in 2006
- Erosion issues, especially in the year 2021
- Vulnerability of housing and other infrastructure around Keyup Brook are a significant community concern

Keyup Brook along North Street north of former Swamp Road bridge, 2021

NPS POLLUTION IN KEYUP BROOK: E. COLI

- MASS DEP'S *INTEGRATED LIST OF WATERS* (ILW) LISTS KEYUP BROOK AS HAVING AN **ECOLI IMPAIRMENT**

A NPS **POLLUTION IMPAIRMENT** IS DETERMINED BY HOW MUCH POLLUTANT CONCENTRATION A WATERBODY CAN TAKE BEFORE THE VARIOUS USES (RECREATION, HABITAT & AESTHETICS) ARE COMPROMISED

SOURCES UNKNOWN

- WATERSHED IS PREDOMINANTLY FORESTED
- WATERSHED IS PREDOMINANTLY ON SEWER
- WILD ANIMALS?
- DOG POOP?

NPS POLLUTION IN KEYUP BROOK: SEDIMENT

A **FLUVIAL GEOMORPHIC IMPAIRMENT** RELATES TO HOW A STREAM INTERACTS WITH THE LANDSCAPE AROUND IT – EROSION, SCOUR, INCISION.



Erosion around Route 2 Bridge, 2021

STORMWATER AND ROAD EROSION



Sediment settled under RR bridge on Arch Street



Erosion of gravel road (not in Erving/Northfield)

NPS POLLUTION IN KEYUP BROOK: LAND USE & CLIMATE CHANGE

WATERSHED HYDROLOGY NO LONGER A “NATURAL”
SYSTEM. IT HAS BEEN MANIPULATED THROUGH
HUMAN-DRIVEN DEVELOPMENT AND LAND USE.



LAND CLEARING



FOREST CUTTING



ABSENCE OF RIPARIAN
BUFFER



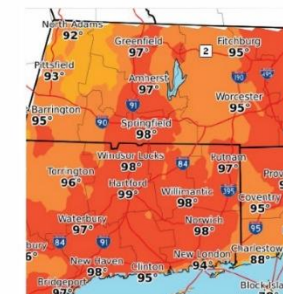
ENCROACHMENT



CHANNEL MODIFICATION



INVASIVE SPECIES



HOTTER TEMPERATURES



SEVERE PRECIPITATION



DROUGHT

NPS POLLUTION IN KEYUP BROOK: LAND USE & CLIMATE CHANGE

CLIMATE CHANGE CREATES A COMPLEX SET OF INTERACTING STRESSORS, BRINGING:

- INCREASED HEAT
- INCREASED ANNUAL PRECIPITATION
- MORE FREQUENT DROUGHTS.



LAND CLEARING



FOREST CUTTING



ABSENCE OF RIPARIAN BUFFER



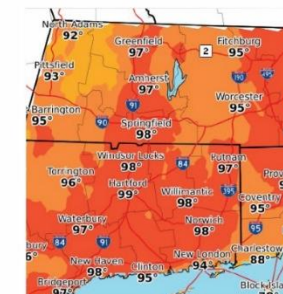
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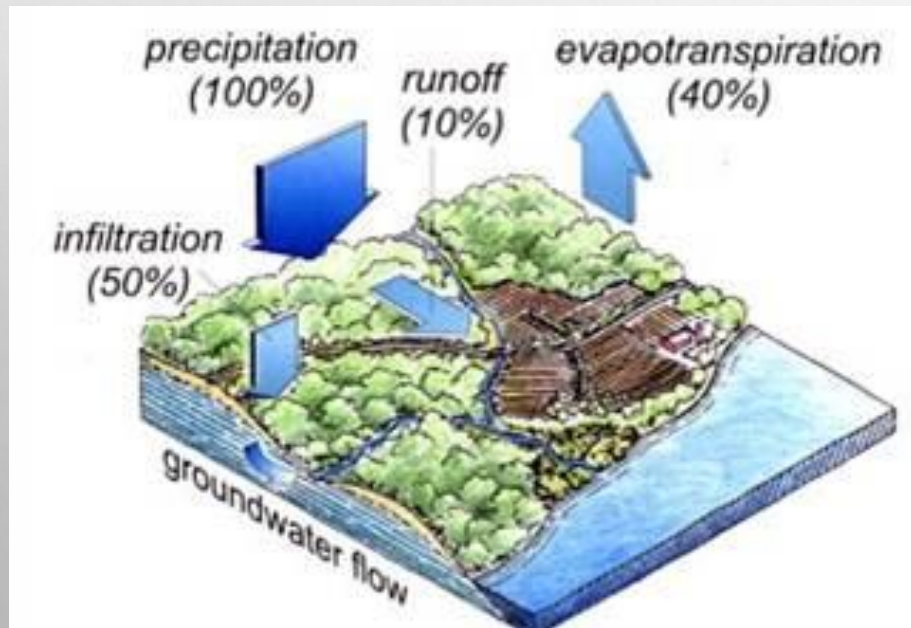
DROUGHT

RAINFALL AND STORMWATER RUNOFF VS. INFILTRATION

UNDEVELOPED

STORMWATER RUNOFF = 10%

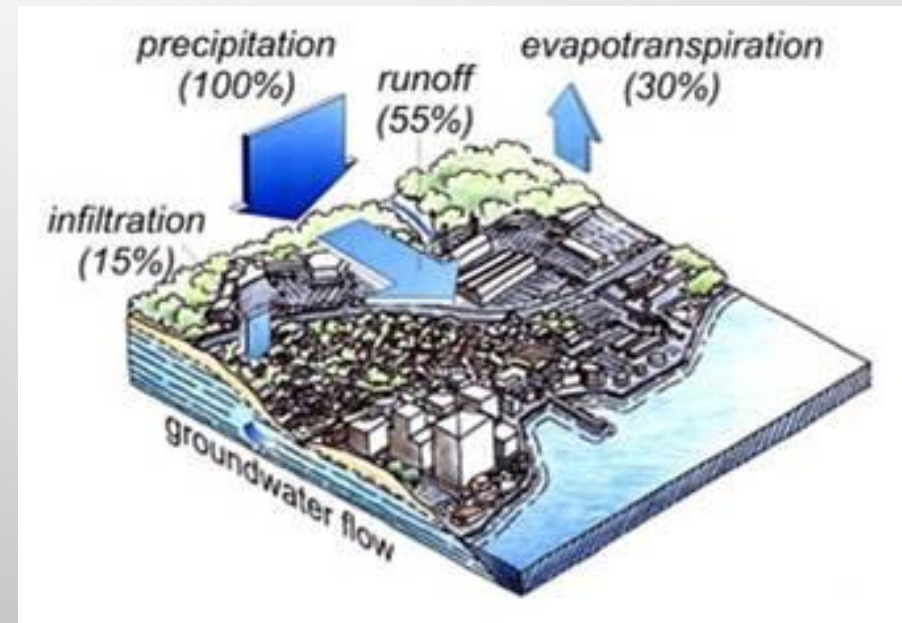
RAINFALL INFILTRATION = 50%

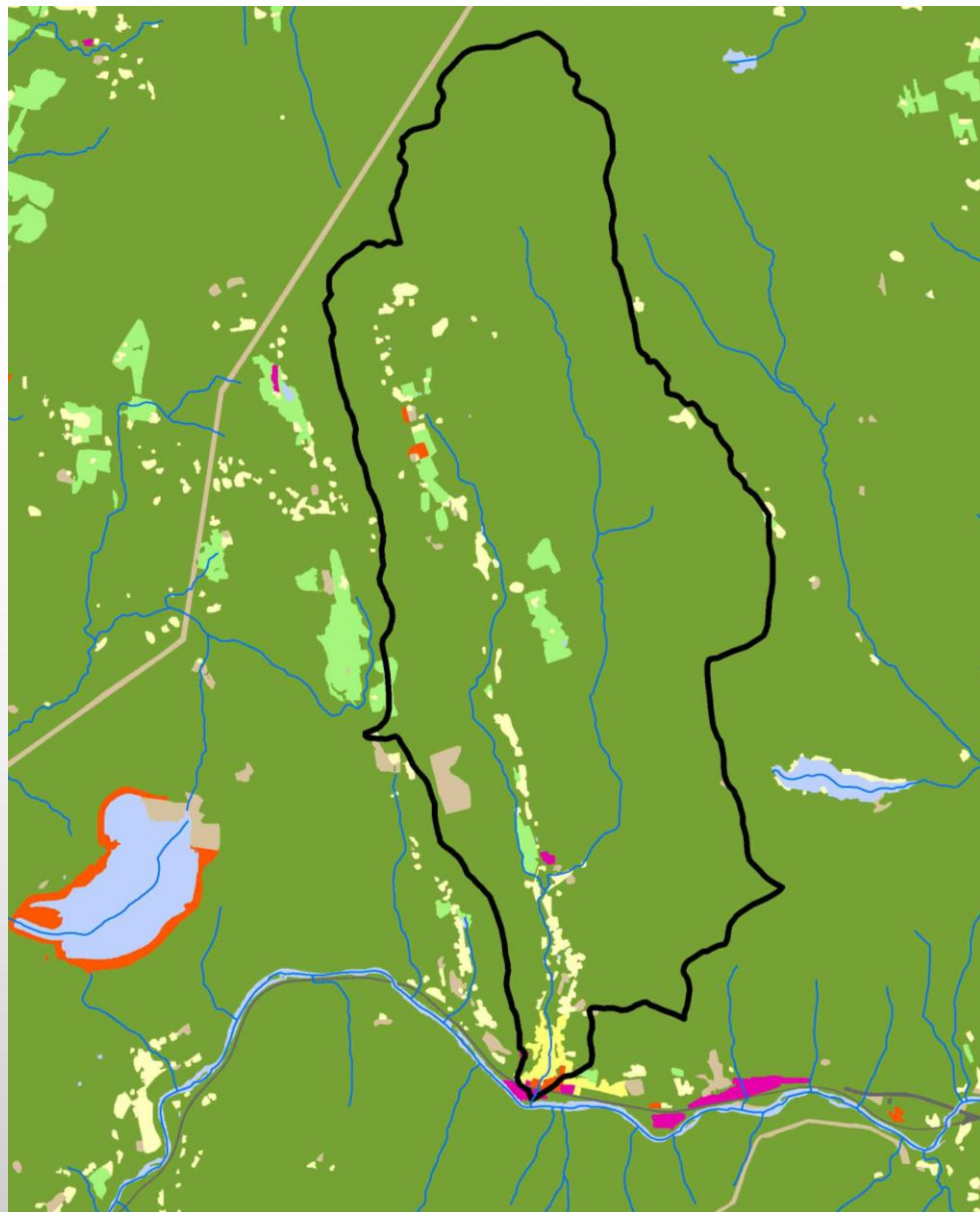
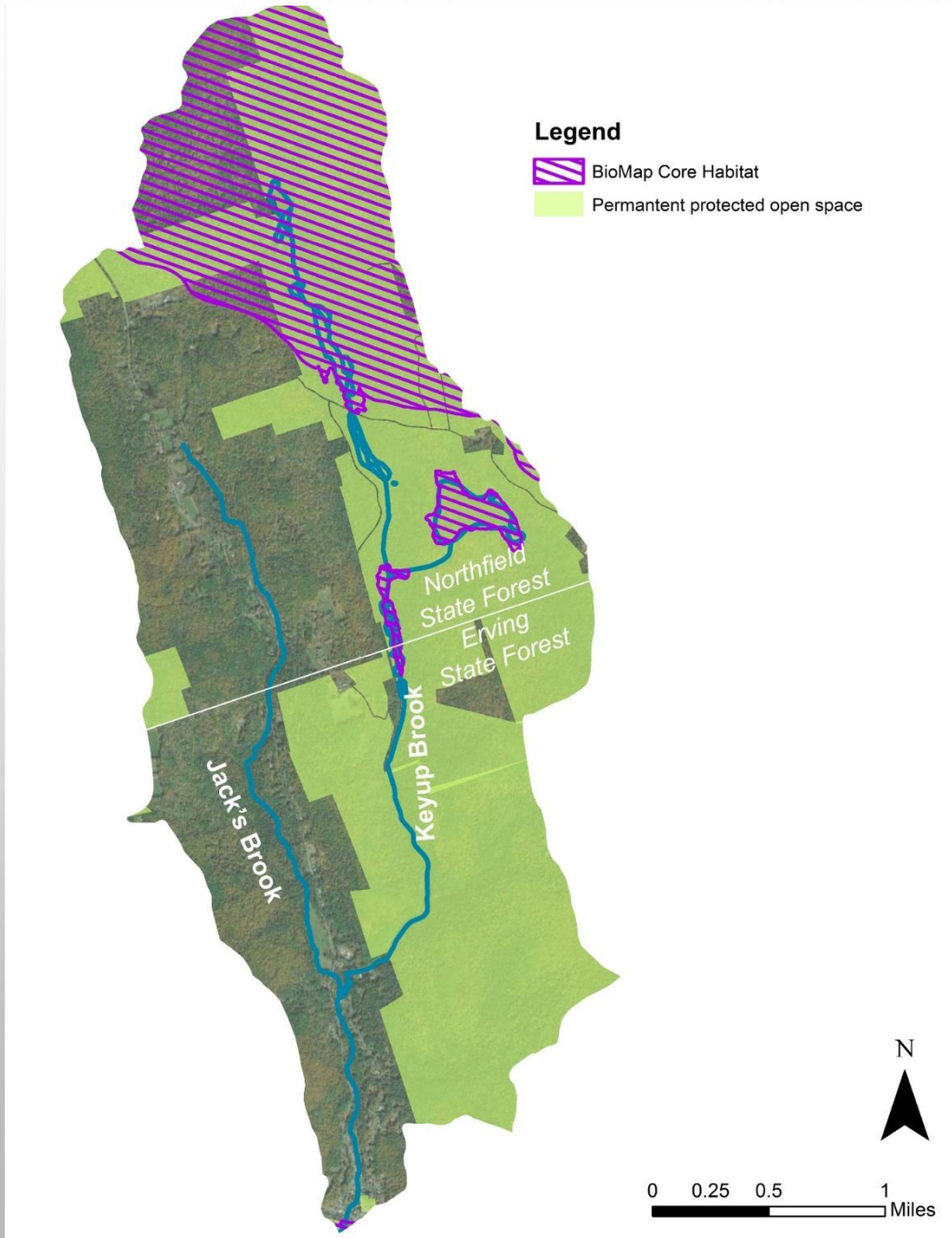


DEVELOPED

STORMWATER RUNOFF = 55%

RAINFALL INFILTRATION = 15%





WATERSHED CHARACTERISTICS

UPPER WATERSHED – LARGELY UNDEVELOPED

- STEEP TOPOGRAPHY
- CONFINED BY ROADS AND HOUSES

MIDDLE WATERSHED – LIGHTLY DEVELOPED

- EXPERIENCING SEVERE EROSION IN PLACES
- MIX OF TOPOGRAPHY
- CHANNELIZED
- CONFINED BY ROADS, HOUSES, RETAINING WALLS AND ARMORED EMBANKMENTS
- LIMITED ACCESS TO FLOODPLAIN, INCISION
- PETE'S POND & DAM

LOWER WATERSHED – MORE HEAVILY DEVELOPED

- SIMILAR TO MIDDLE WATERSHED WITH MORE SEVERE CONFINEMENT
- MORE STORMWATER DRAINING INTO BROOK
- RESTORES TO MORE NATURAL STATE AT MOUTH



LAND USE CLASSIFICATION MAP

11/28/2016

Legend

- Rivers and Streams
- ▭ Watershed Boundary
- Land Use Classification**
- Commercial
- Industrial
- Highway
- High Density Residential
- Medium Density Residential
- Low Density Residential
- Open Land
- Agriculture
- Forest
- Water



Impervious surface
(brown)


GOALS

SEDIMENT

- REDUCE SEDIMENT BY:
 - SLOWING FLOW
 - TRAPPING STREAM-EROSION SEDIMENT CLOSE TO SOURCE
 - RECONNECTING FLOODPLAIN
 - KEEPING SEDIMENT OUT OF STORMWATER REACHING THE BROOK

E. COLI

- CONDUCT MORE SAMPLING WITH HOPE THAT SOURCE WILL BE IDENTIFIED OR BROOK WILL BE “DELISTED”



POLLUTANTS LIKE PHOSPHORUS CAN BIND TO SEDIMENT, SO FILTERING AND INFILTRATING STORMWATER TO KEEP IT OUT OF THE BROOK HELPS REDUCE THE AMOUNT OF OTHER POLLUTANTS

>> FLOOD RESILIENCE IS A CO-BENEFIT OF ADDRESSING WATER QUALITY AND FLUVIAL GEOMORPHIC IMPAIRMENTS

OPPORTUNITIES FOR IMPROVING WATERSHED MANAGEMENT

MORE STUDY

- Hydraulic & hydrology (H&H)
- Fluvial Geomorphic Assessment
- Engineering study of potential BMPs
- Beaver management plan?

UPPER WATERSHED PROJECTS

- Land protection
- Instream BMPs like “chop and drop”, engineered log jams, and log or rock vanes
- Floodplain reconnection and attenuation

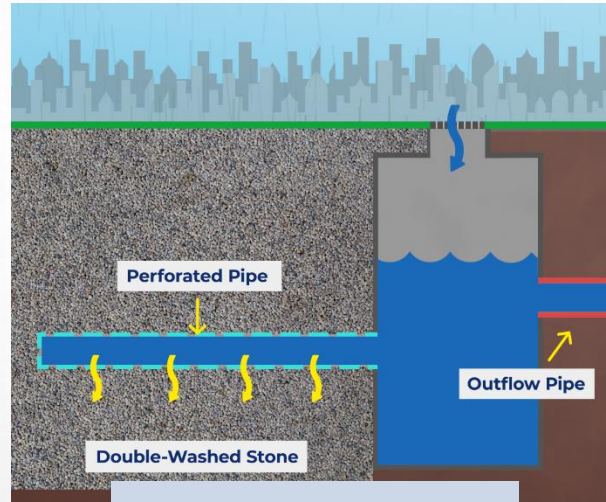
MID/LOWER WATERSHED BMPS

- Right-sized culverts
- Armored/vegetated culvert outlets
- Vegetated or rock WQ swales
- Bioretention basin/rain gardens
- Sediment forebays
- Deep sump/leaching catch basins
- Underground WQ trenches attached to catch basins

WHAT IS A STORMWATER BEST MANAGEMENT PRACTICE?

PRINCIPLES

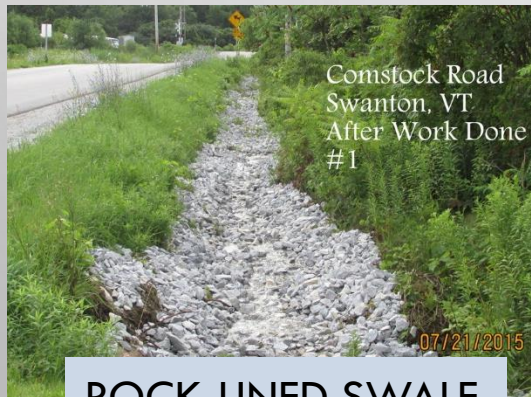
- TREAT STORMWATER CLOSE TO THE SOURCE
- PROVIDE FILTRATION, TREATMENT, AND INFILTRATION
- MIMIC NATURAL SYSTEMS



WATER QUALITY TRENCH



WATER BAR & TURNOUT



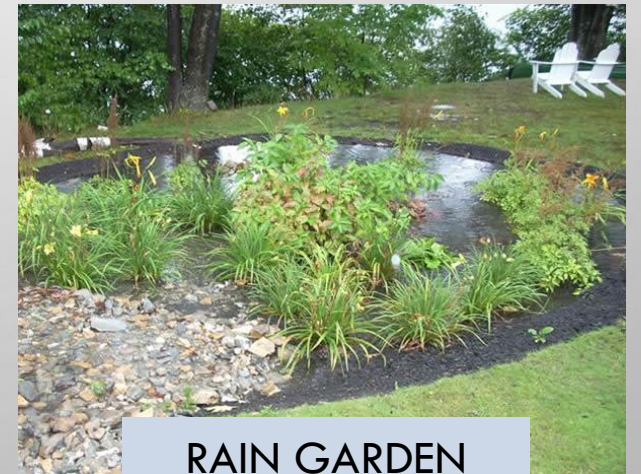
ROCK-LINED SWALE



WATER QUALITY SWALE



ROCK APRON



RAIN GARDEN

OPPORTUNITIES FOR IMPROVING WATERSHED MANAGEMENT

VOLUNTARY RESIDENTIAL-SCALE BMPS

- Rain barrels
- Disconnect downspouts
- Driveway BMPs: impervious, proper drainage
- Vegetated/rock-lined drainage swales
- Rain gardens
- No lawn clippings in brook
- Riparian buffers w/ native plants
- Dog waste removal

EDUCATION & OUTREACH

- Integrate flood resilience and water quality into all Town planning and management
- Provide education around installed BMPs
- Work with landowners on residential BMPs

POLICY

- Stormwater regulations
- River corridor zoning

MAINTENANCE

- BMP operations & management plan
- Highway Department ongoing BMPs: street sweeping, catch basin cleaning, reduced salt application

MONITORING

- Water quality monitoring plan
- Monitoring for E. coli and sediment



FUNDING

MassDEP 604b GRANT

- Determine nature, extent, and causes of WQ problems
- Preliminary designs
- Support future s.319 grant implementation projects

MassDEP s.319 GRANT

- Restore & protect WQ
- Implementation projects
- Zoning projects allowed
- Match required

OTHER SOURCES OF FUNDING/SUPPORT

- [MUNICIPAL VULNERABILITY PREPAREDNESS \(MVP\)](#)
- [LONG ISLAND SOUND FUTURES FUND](#)
- LWA FUNDS
- [TOWN CH. 90 FUNDS](#)
- TOWN CAPITAL FUNDS
- TOWN WETLAND MITIGATION FUNDS
- TOWN CPA FUNDS
- [FEMA HAZARD MITIGATION GRANT](#)
- VOLUNTEER TIME FOR PUBLIC OUTREACH AND MONITORING

FRCOG HAS FUNDING TO ASSIST WITH GRANT PROPOSALS

NEXT STEPS

- REVIEW THE **DRAFT KEYUP BROOK WATERSHED-BASED PLAN** WHEN IT IS POSTED TO THE TOWN OF ERVING WEBSITE (NOVEMBER 1)
- EMAIL YOUR COMMENTS ON THE DRAFT WATERSHED BASED PLAN TO TAMSIN FLANDERS AT TFLANDERS@FRCOG.ORG BY FRIDAY, DECEMBER 1ST
- SEND US IMAGES OF UNTREATED STORMWATER RUNOFF, EROSION, OR SEDIMENTATION ON YOUR PROPERTY

October – November

30-day public comment period

Winter

Submit WBP to DEP

Winter

Apply for 604b grant funding to further study watershed

Spring/Summer

Approval of WBP

A scenic photograph of a river flowing through a dense forest. The river is dark and calm, reflecting the surrounding greenery. Large, smooth rocks are scattered along the banks, creating a rocky shoreline. In the foreground, there are several vibrant red flowers, likely cardinalis, and tall green grasses. The background is filled with lush green trees, some with bright yellow-green foliage, suggesting a late summer or early autumn setting. The overall atmosphere is peaceful and natural.

QUESTIONS?