



Mare Brook Impairment & Stressors

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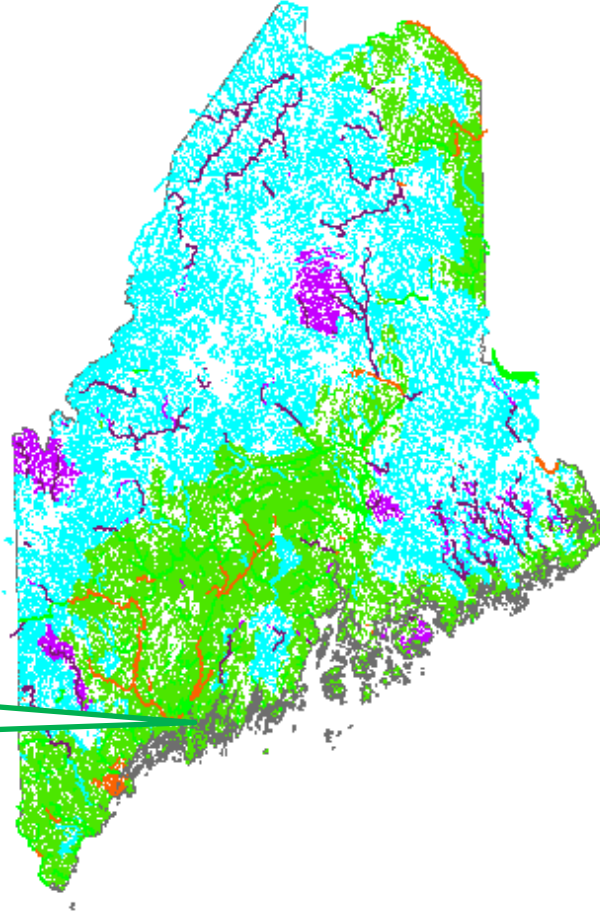
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Protecting Maine's Air, Land and Water

Maine streams have water quality goals according to Class



Mare Brook
is Class B



Class AA

Class A

Class B

Class C

Each Stream Class has criteria

Class AA

Class A

Class B

Class C

Dissolved Oxygen	Habitat	Aquatic Life (Biological)
as naturally occurs	free flowing and natural	as naturally occurs
7 ppm; or 75% sat.	natural	as naturally occurs
7 ppm; or 75% sat.	unimpaired	support all aquatic species indigenous to the receiving water; no detrimental changes to the resident biological community
5 ppm; or 60% sat.; 30-day avg. 6.5 ppm	habitat for fish and other aquatic life	support indigenous fish; maintain the structure and function of the resident biological community

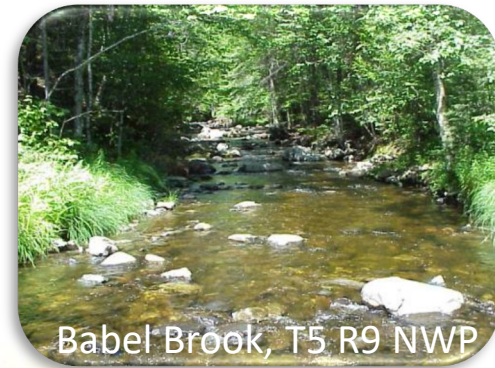


Aquatic life assessed with macroinvertebrate rock bags

- Place bags of rocks in stream in summer
- Leave for 4 weeks
- Retrieve bags and rub bugs into collection jars
- Bugs are picked out at lab
- Sent away for species analysis



Class A Stream



Stoneflies

Dragonflies &
Damselflies

Mayflies

Beetles

Midges

Caddisflies

Color Code

Sensitive

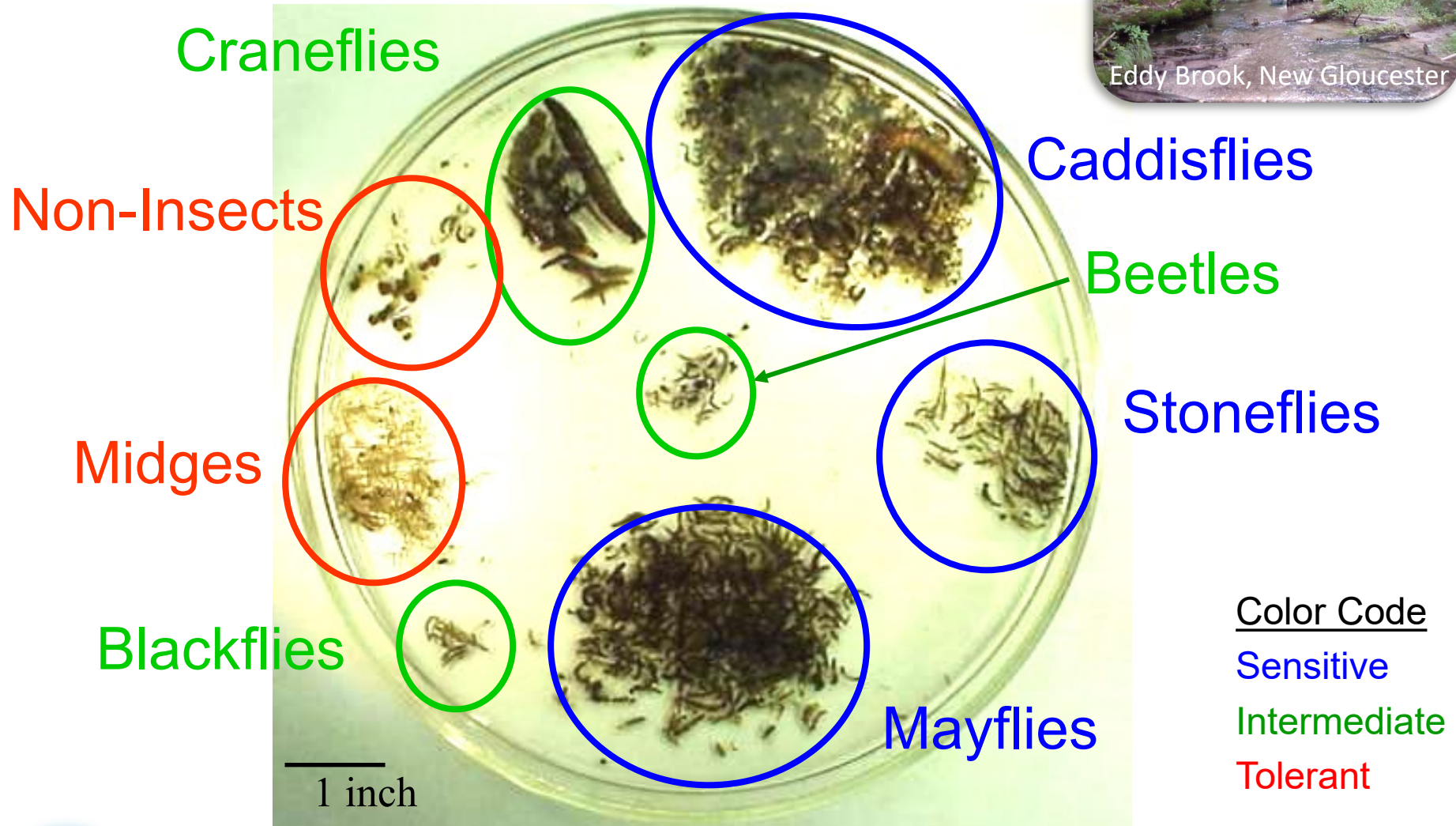
Intermediate

Tolerant

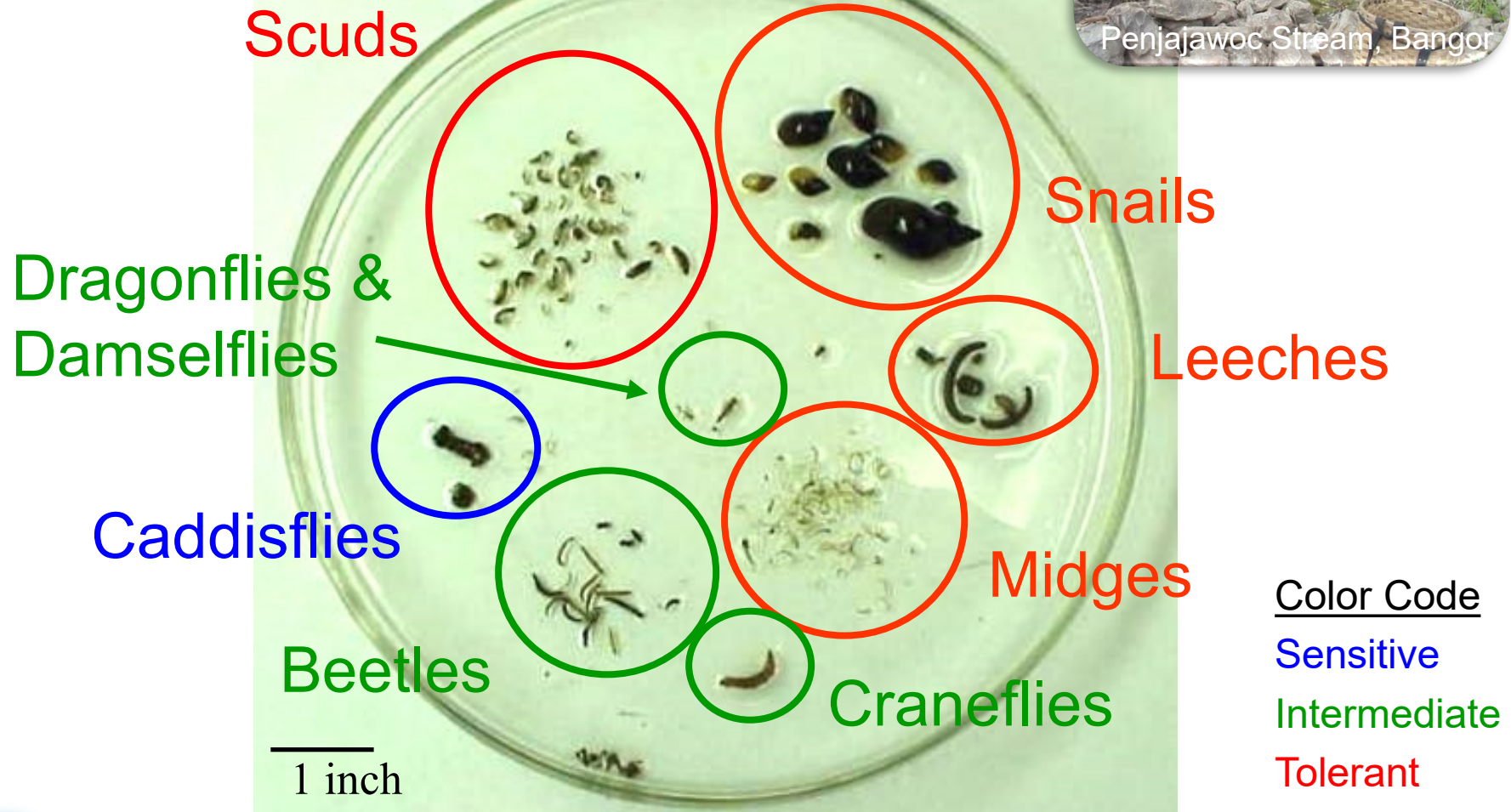
1 inch



Class B Stream



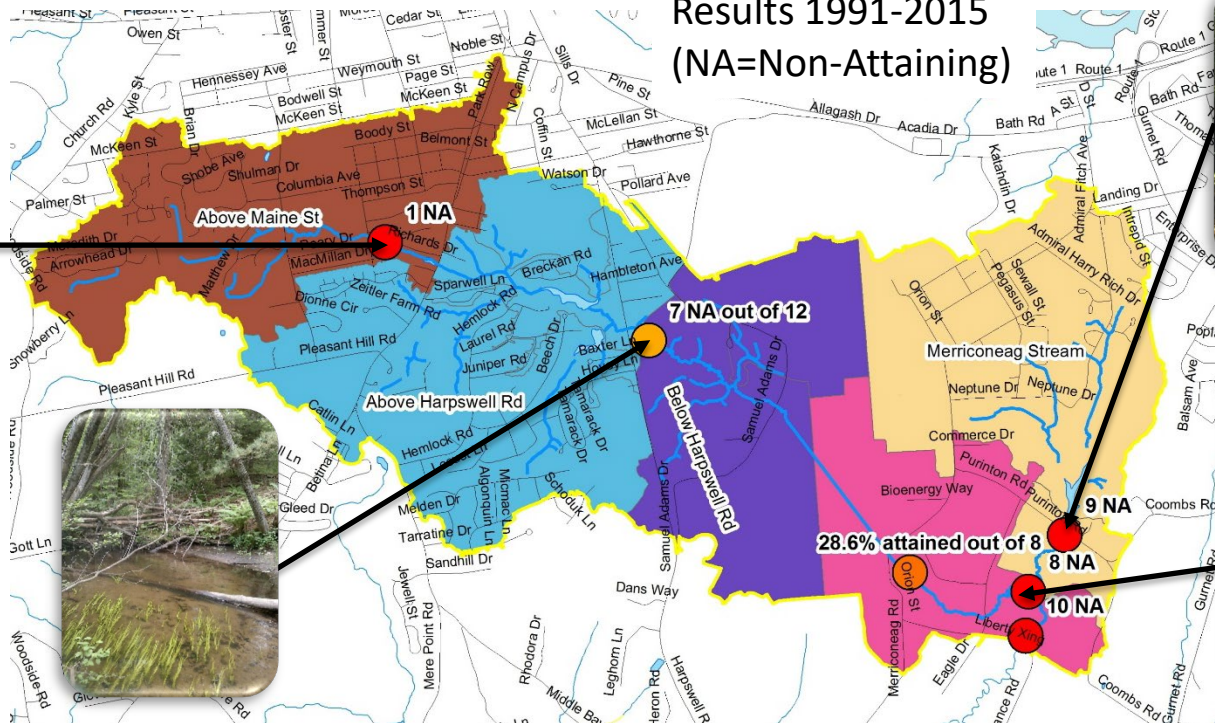
Non-Attainment Stream



Mare Brook is not meeting standards

- Aquatic life standard not being met
- Listed as Impaired

Macroinvertebrate
Results 1991-2015
(NA=Non-Attaining)



What to do to meet standards?

- First, why are bugs impaired?
 - Determine primary stressors
 - Connect to causes/sources of stressors
- Then, determine action plan to address stressors

Stressors to aquatic bugs

- High temperature
- Low dissolved oxygen
- Unnatural water velocity
- Altered physical habitat
- Altered food source
- Low recruitment potential
- Toxicity

Stressor

Environmental condition (pollutants or habitat) contributing to aquatic life impairment

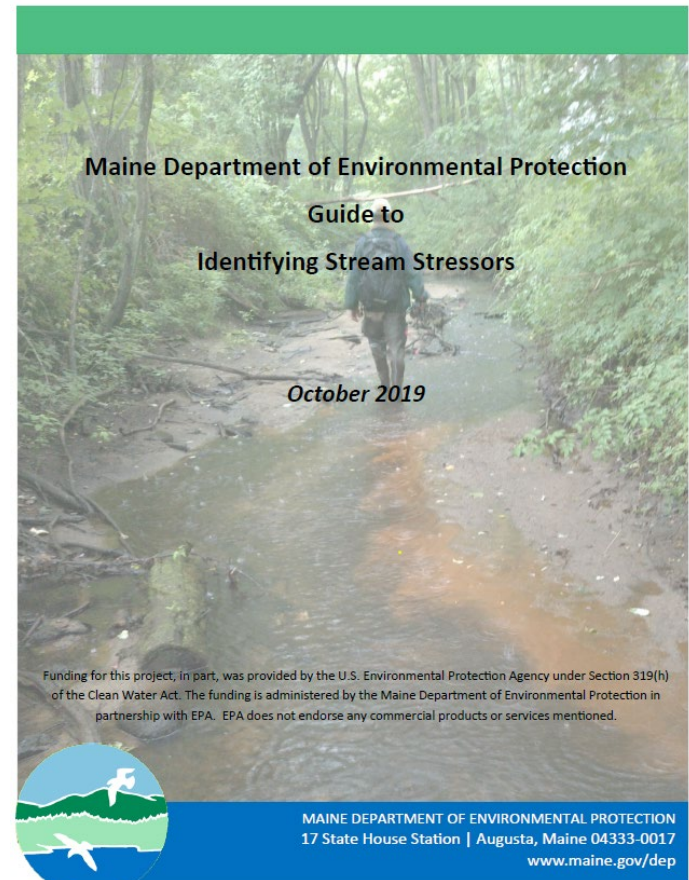


Photo credit: John Field



Stressor analysis conducted using multiple data sources

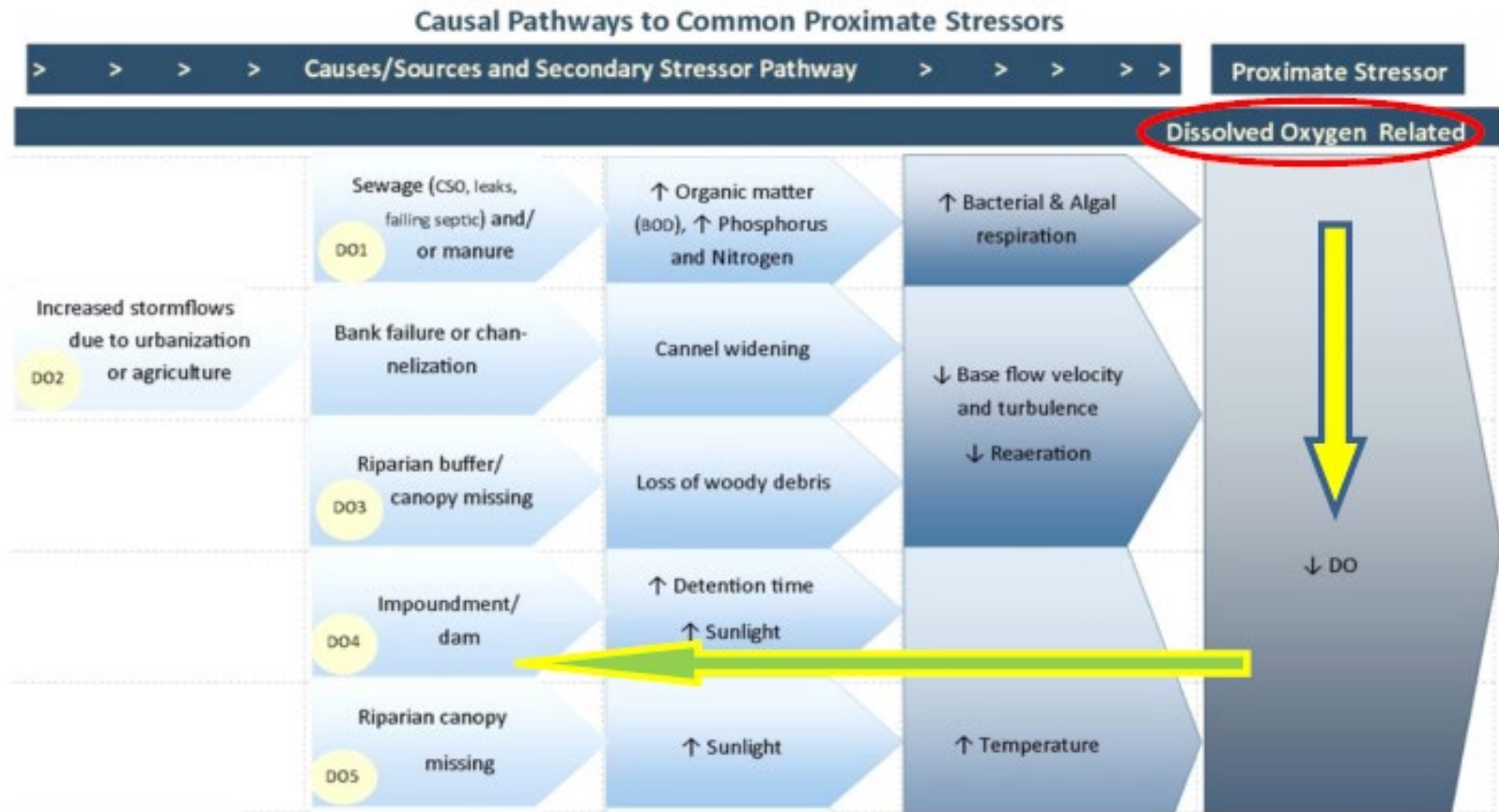
- Aquatic bug sampling
- Continuous sampling devices
- Instantaneous sampling
- Instream geomorphic assessment
- Toxics reports



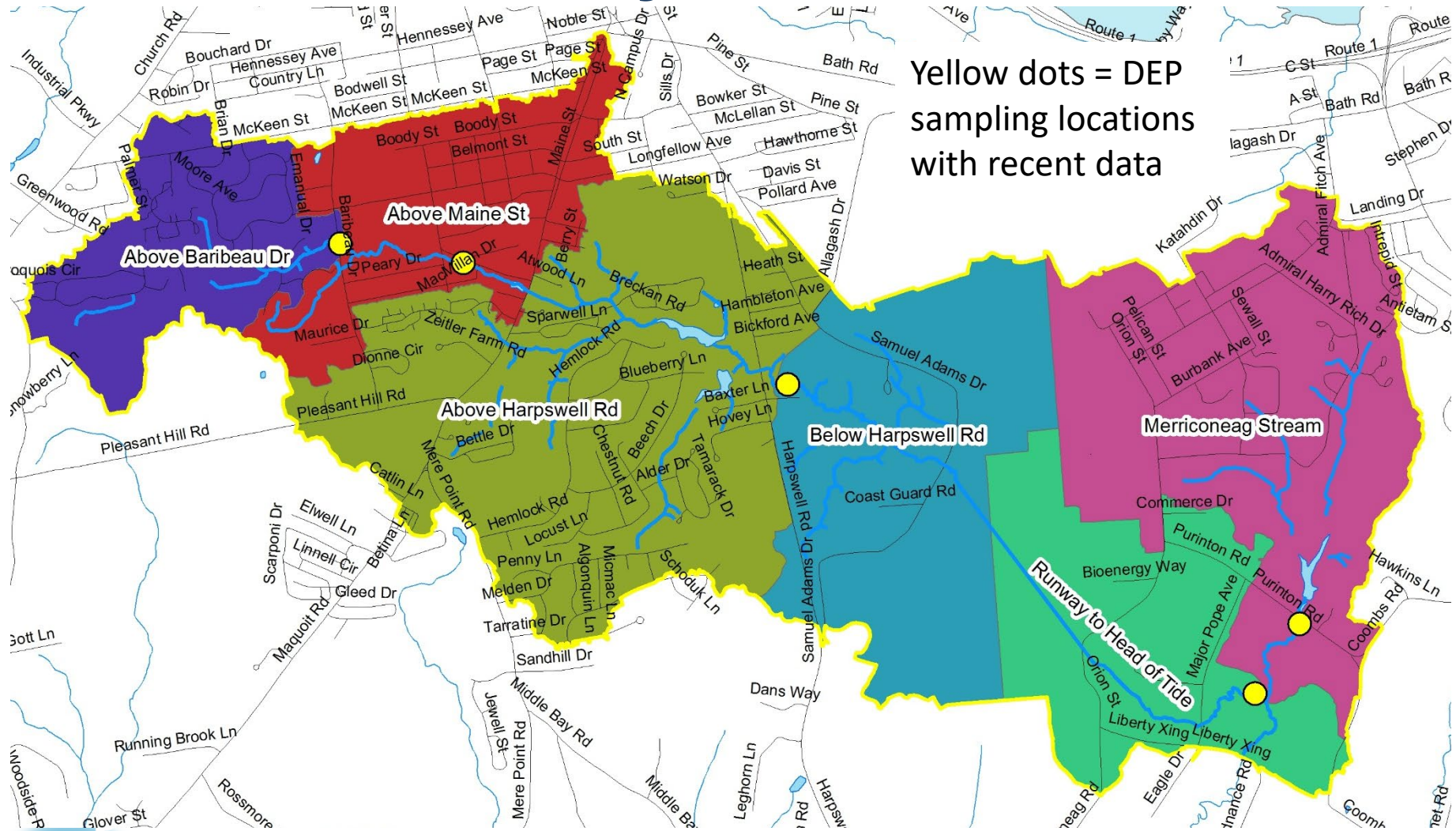
Stream Stressor Guide available at:
www.maine.gov/dep/land/watershed



DEP & Technical Advisory Committee determined causal pathways

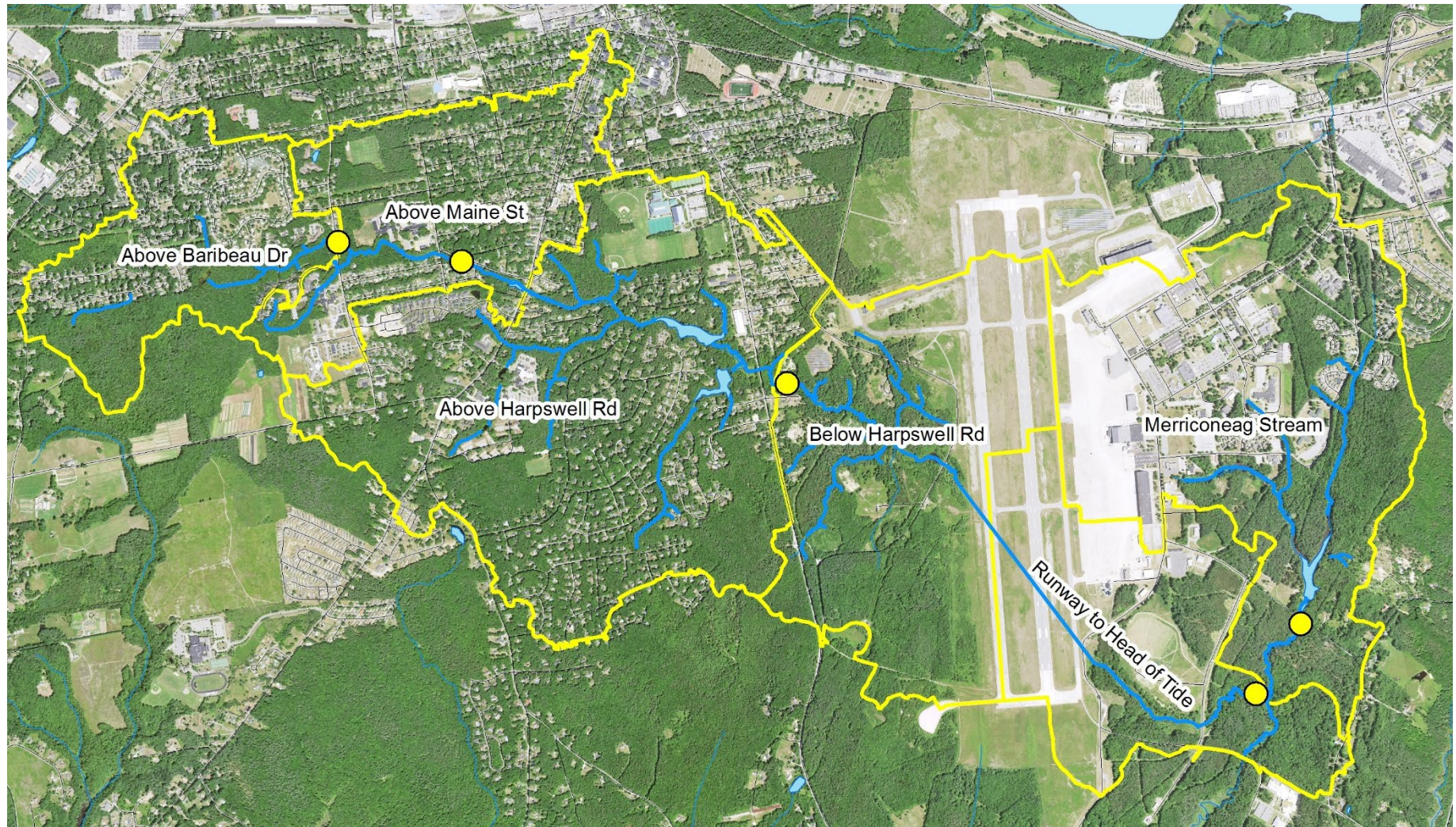


Mare Brook stressor analysis was conducted by stream sections



Yellow dots = DEP
sampling locations
with recent data

Mare Brook stressor analysis was conducted by stream sections



Mare Brook sections have similar and different stressors

Subwater-shed / Section	Temp	Velocity	Dissolved Oxygen	Altered Physical Habitat	Low Recruitment Potential	Toxicity	Other
Above Baribeau Dr		V3	DO7, DO8	H23			
Above Maine St		V7, V8		H1, H2, H3, H12, H23		T05 <i>possible</i>	Bacteria?
Above Harpswell Rd	T1 <i>possible</i>			H1, H3, H23	LR5		
Below Harpswell Rd				H3, H14, H23	LR4 <i>possible</i>		
Runway to Head of Tide				H1, H2, H12, H14, H24	LR5	T06	
Merriconeag Stream	T1			H1	LR5	T06	



Primary Stressor for all Sections was Altered Physical Habitat

> > > > Causes/Sources and Secondary Stressor Pathway > > > >

Proximate Stressor

Altered Physical Habitat

Urbanization, agriculture
and/or alteration of natural
drainage patterns

H1

Increased stormwater
runoff

Loss of floodplain &
wetland storage

H2

Undersized &
misaligned culverts

H3

Armored
streambanks

H4

↑ Frequency,
magnitude and/or
longer duration
erosive channel
forming flows

Focusing of very high
velocity flows

Deflected energy

↑ Frequent
disturbance of
substrate & loss of
substrate
downstream
↓ gravel & sand
habitat
↑ bottom scoured
to marine clay

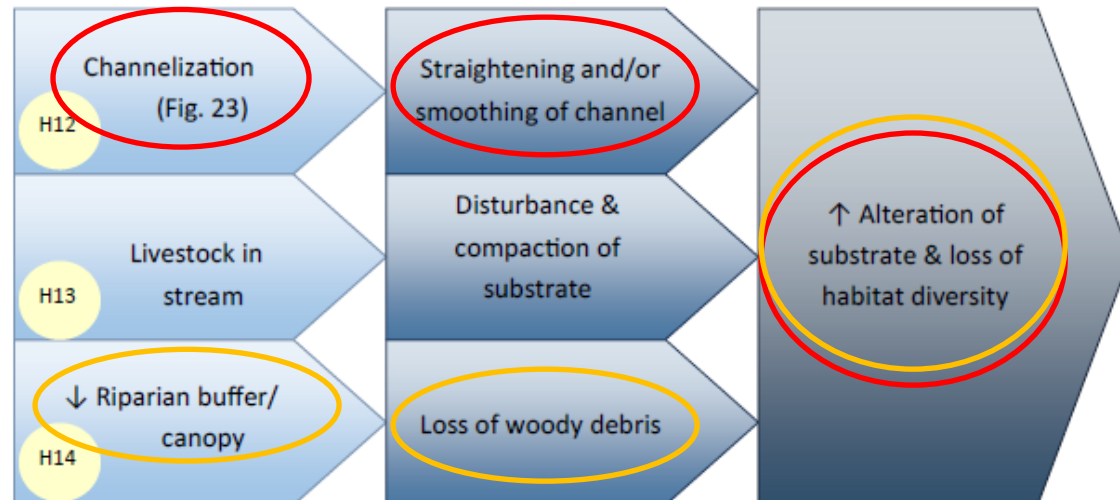


Primary Stressor for all Sections was Altered Physical Habitat

> > > > Causes/Sources and Secondary Stressor Pathway > > > >

Proximate Stressor

Altered Physical Habitat Continued



Primary Stressor for all Sections was Altered Physical Habitat

> > > > Causes/Sources and Secondary Stressor Pathway > > > >

Proximate Stressor

Altered Physical Habitat Continued

Urbanization, agriculture or alteration of natural drainage patterns
H20

Elevated stormflows

Livestock in stream
H21

Channelization (Fig. 24)
H22

Channel widening

↓ Flow velocity

↑ Unnatural deposition of sediment

Ponding upstream of undersized culverts
H23

↓ Flow Velocity

↑ Deposition of sediments on upstream habitats

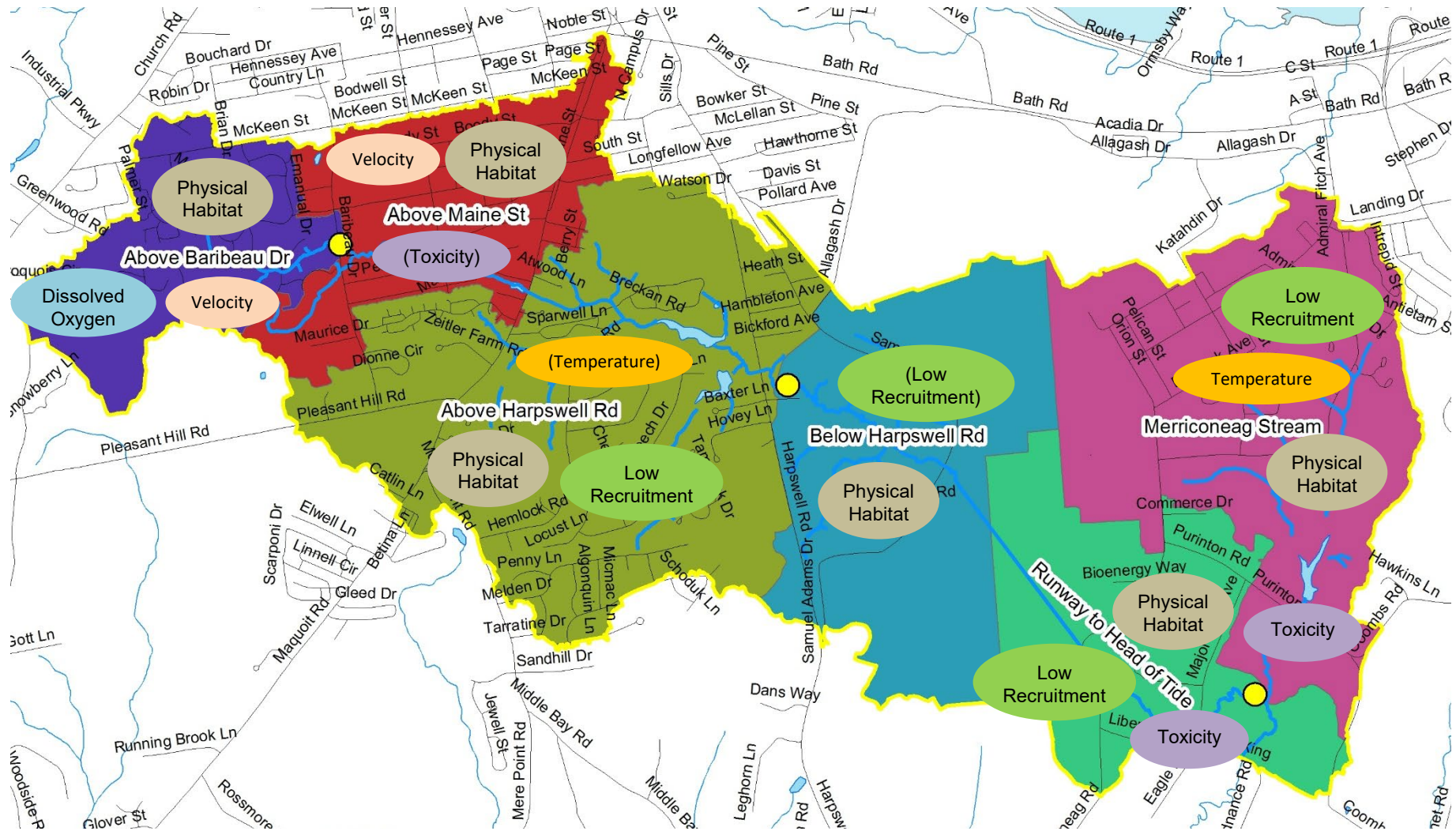
Stream underground for long distances
H24

↓ Available habitat

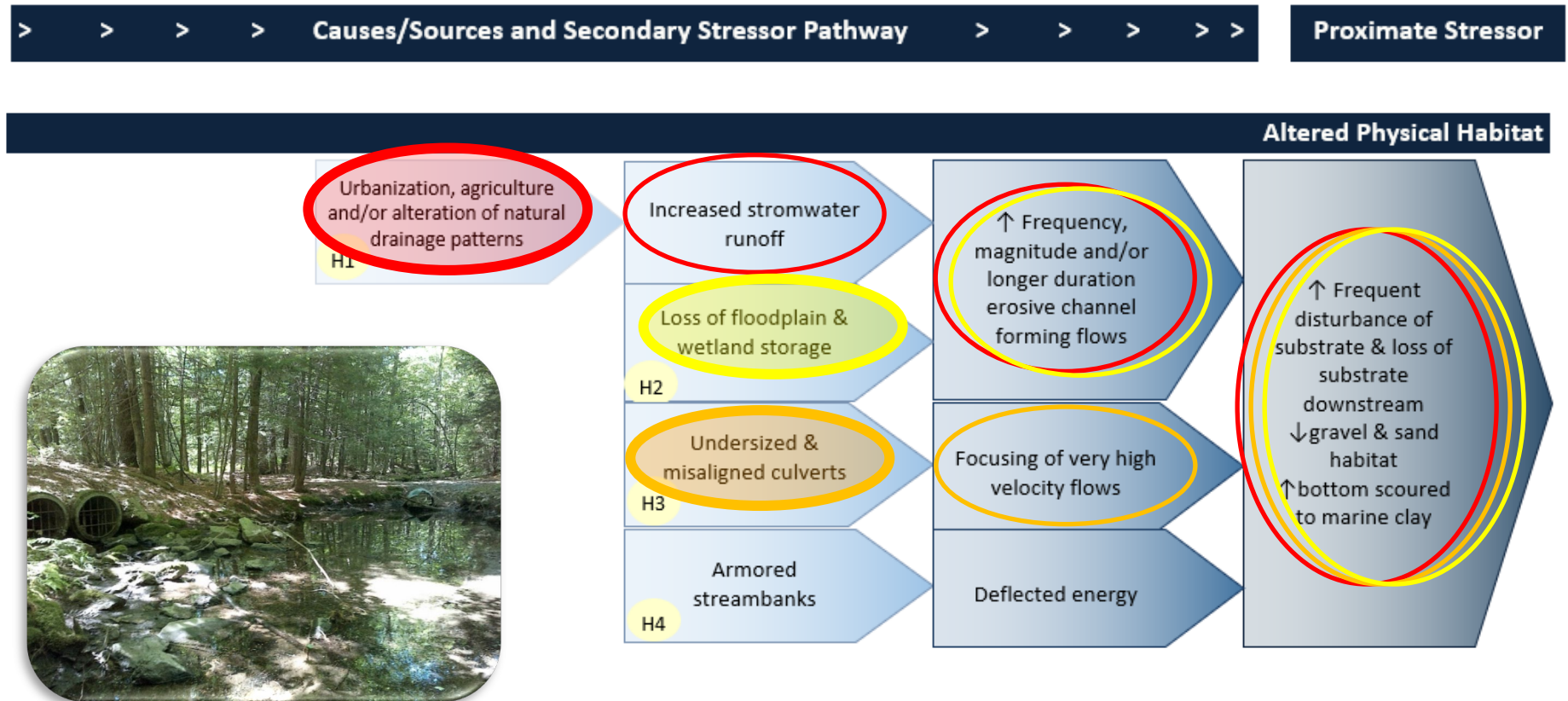


Photo credit: John Field

Stressors by Stream Section



Determine Cause/Source of Stressor



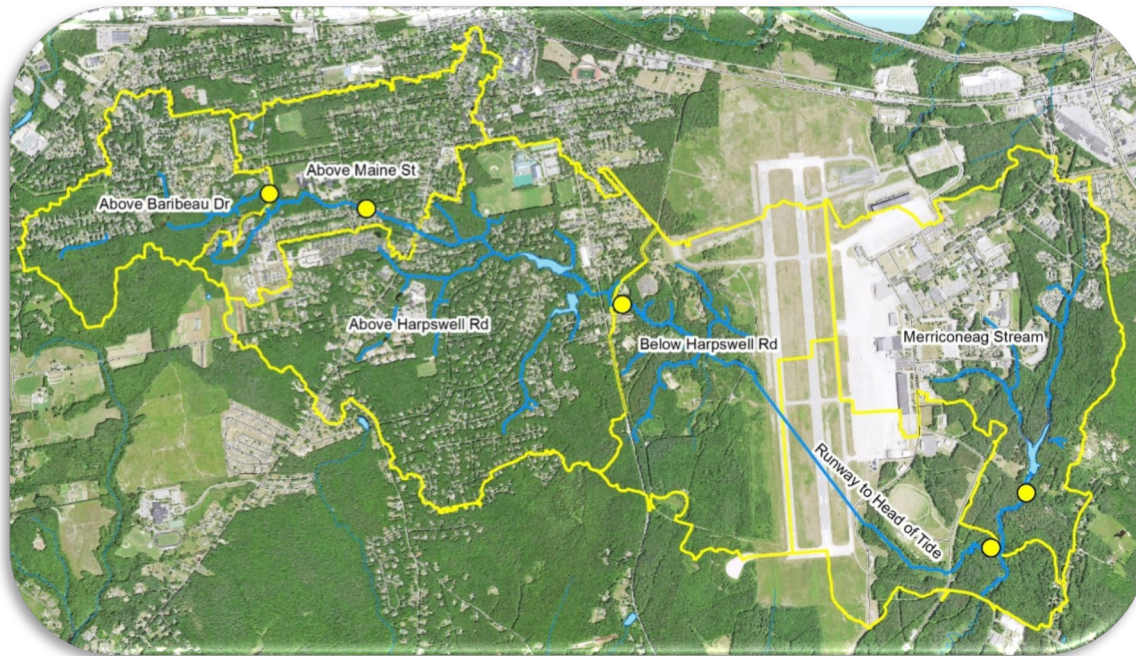
Mare Brook Stressor Causes/Sources

Subwatershed / Section	Culverts undersized and/or misaligned	Loss of floodplain access	Urbanization and/or alteration of drainage	Channelization	Toxicity	Dams and inadequate fish stream crossing	Other
Above Baribeau Dr	X						Nutrients from runoff
Above Maine St	X	X	X	X	(X)		Increased stormflow from urbanization
Above Harpswell Rd	X		X			X	
Below Harpswell Rd	X					X	Decreased riparian canopy
Runway to Head of Tide		X	X	X	X	X	Decreased riparian canopy
Merriconeag Stream			X		X	X	



Next Steps

- Determine action items from causes/sources
- Prioritize action items
- Develop timeline and plan





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