The Nature Conservancy
Rhode Island

BENTHIC VIDEO MONITORING IN THE PROVIDENCE RIVER ESTUARY: APPLYING CMECS TERMINOLOGY TO EVALUATE SITE SUITABILITY FOR HABITAT RESTORATION

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1. The Nature Conservancy RI
2. The Department of Environmental Management

The Nature Conservancy
Rhode Island

Intro

- Providence River Estuary
- Fish Habitat Enhancement and Benthic Video Monitoring
- Coastal and Marine Ecological Classification Standard (CMECS)

Methods

- Sampling
- CMECS
- Analysis

Results

- Substrate
- Water Quality
- Biota

Biotopes?

Next Steps

Providence River Estuary

- Location
- Historically productive then degraded
- Major water quality improvements in recent years
- Fish populations not well-monitored, limited data
- Sites

Fish Habitat Enhancement (FHE) Goals:

Establishing baseline for future monitoring and filling data gaps

Identify optimal restoration sites and techniques for FHE

Fish

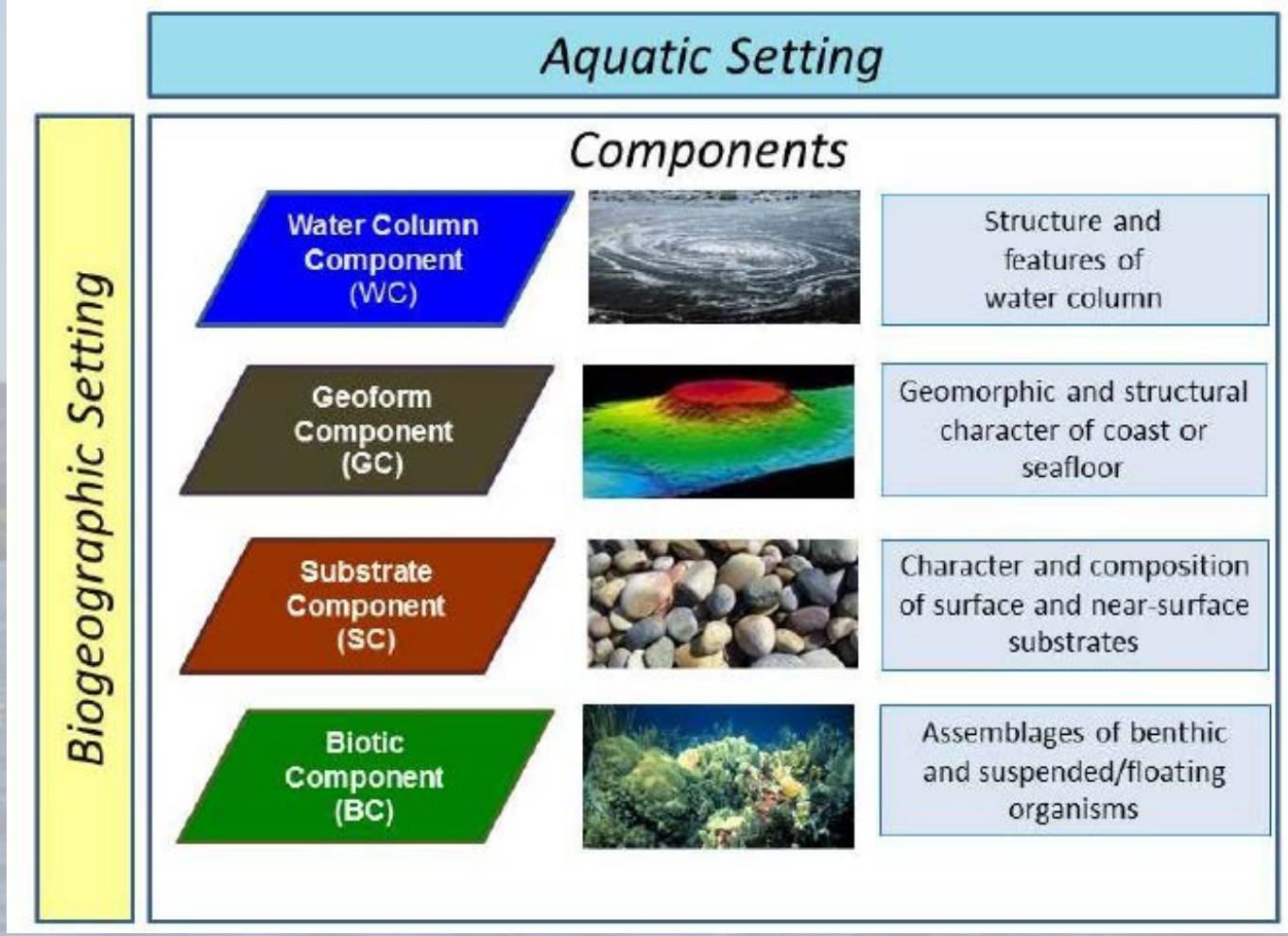
Water Quality

Substrate

Benthic Video Monitoring Goals:

Quantitative and standardized fish habitat classification to determine site suitability for different restoration methods

Coastal and Marine Ecological Classification Standard (CMECS)



- What is CMECS?
- Why are we using it?
- How are we using it?

Coastal and Marine Ecological Classification Standard (CMECS)

- Substrate Origin
- Substrate Class
- Substrate Subclass
- Substrate Group
- Substrate Subgroup

- Biotic Setting
- Biotic Class
- Biotic Subclass
- Biotic Group
- Biotic Community

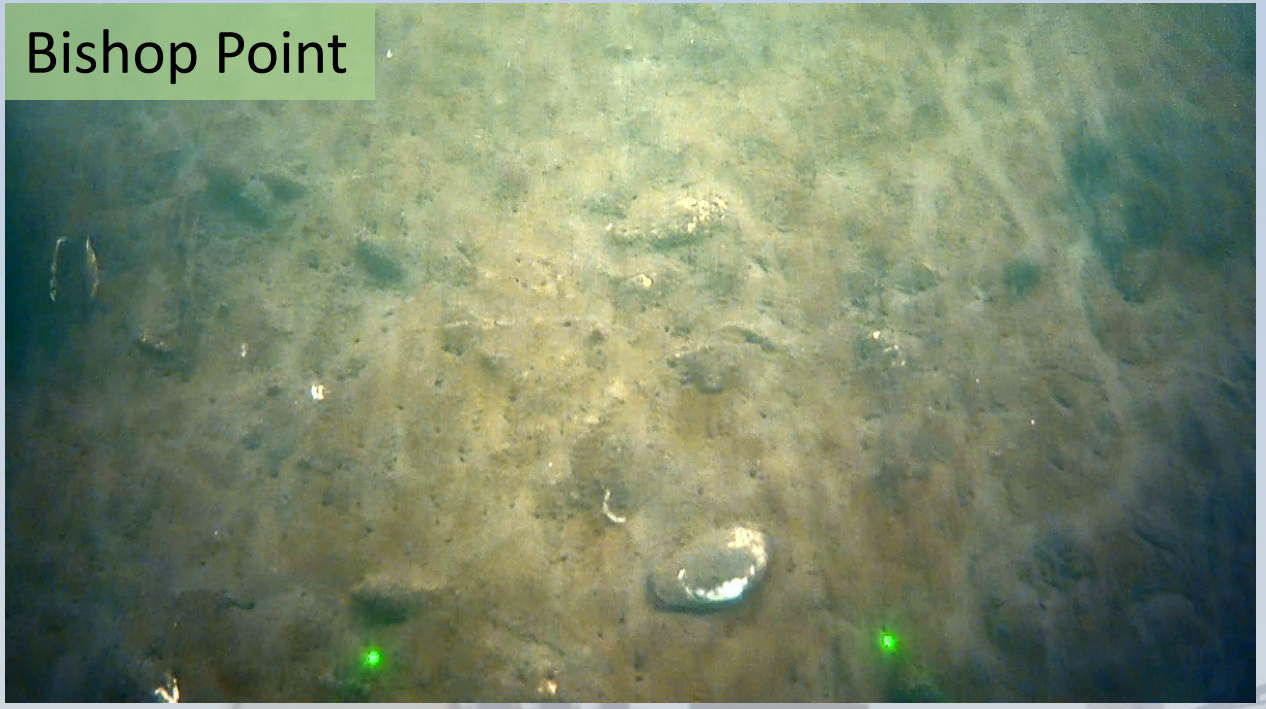
Water Component - Modifiers

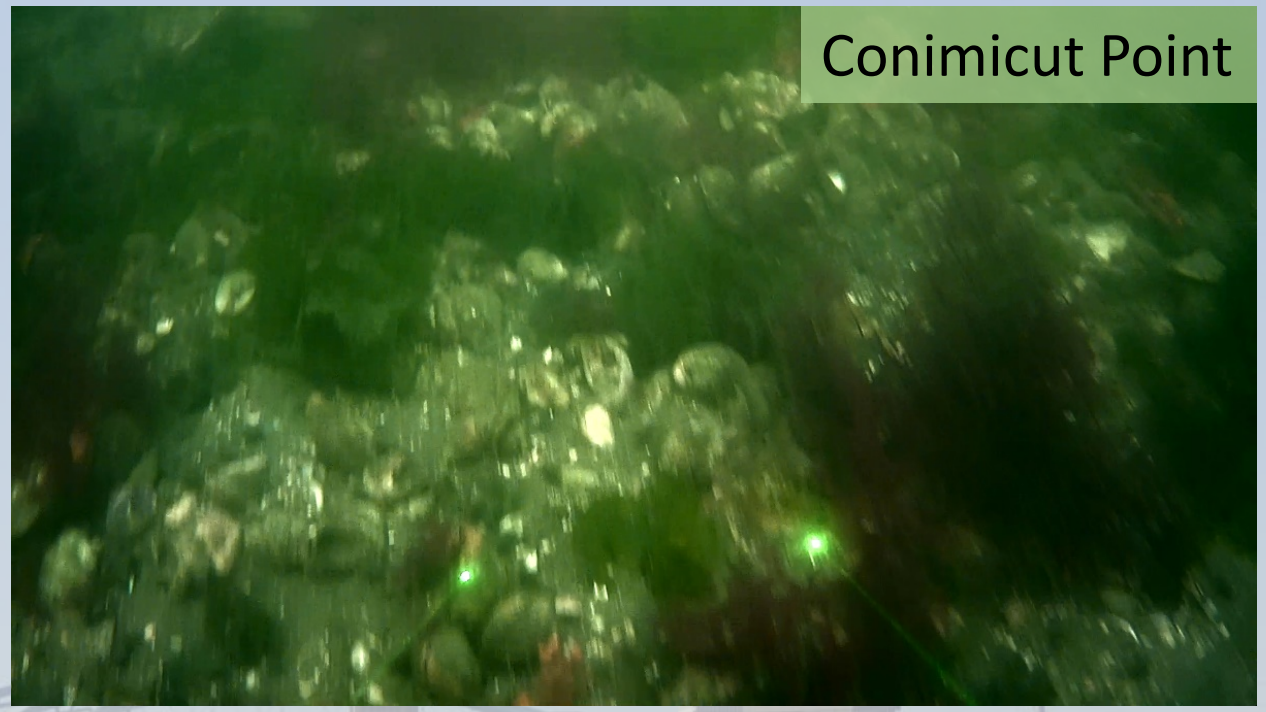
- What is CMECS?
- Why are we using it?
- How are we using it?

Methodology – Sampling

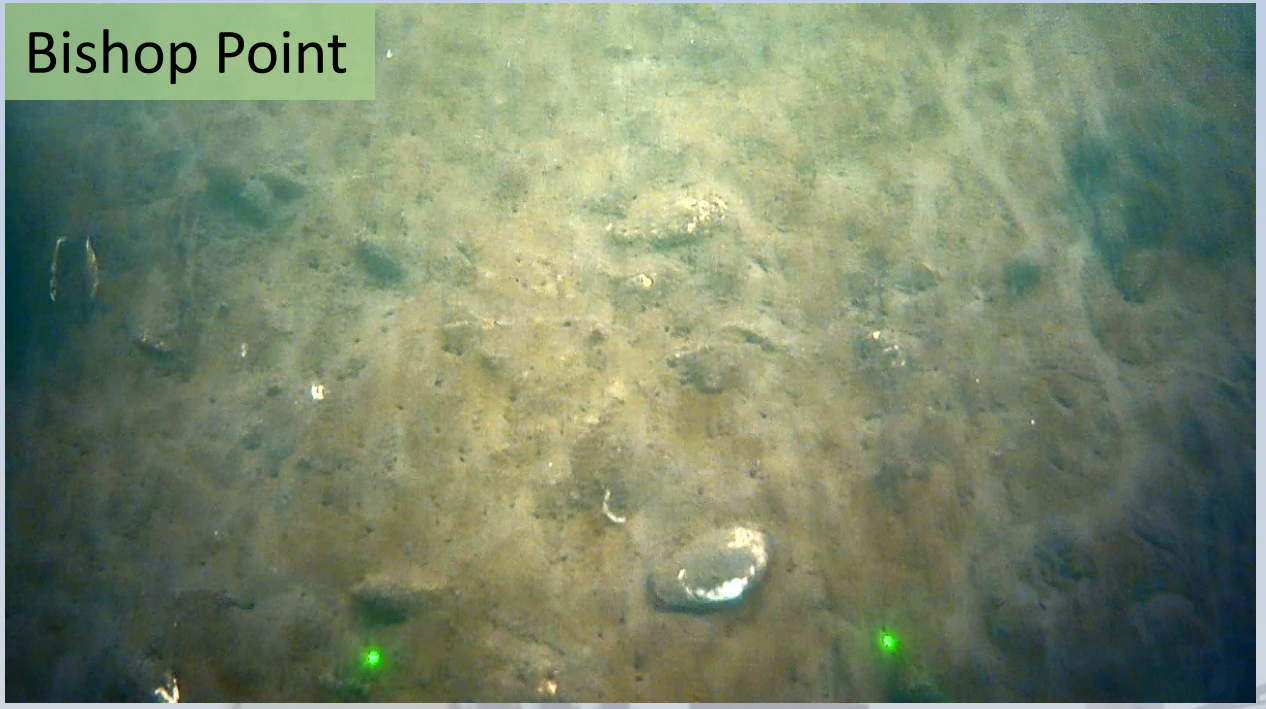
A) Eureka Manta 2; B) SeaView Camera; C) Lasers; D) LED lights

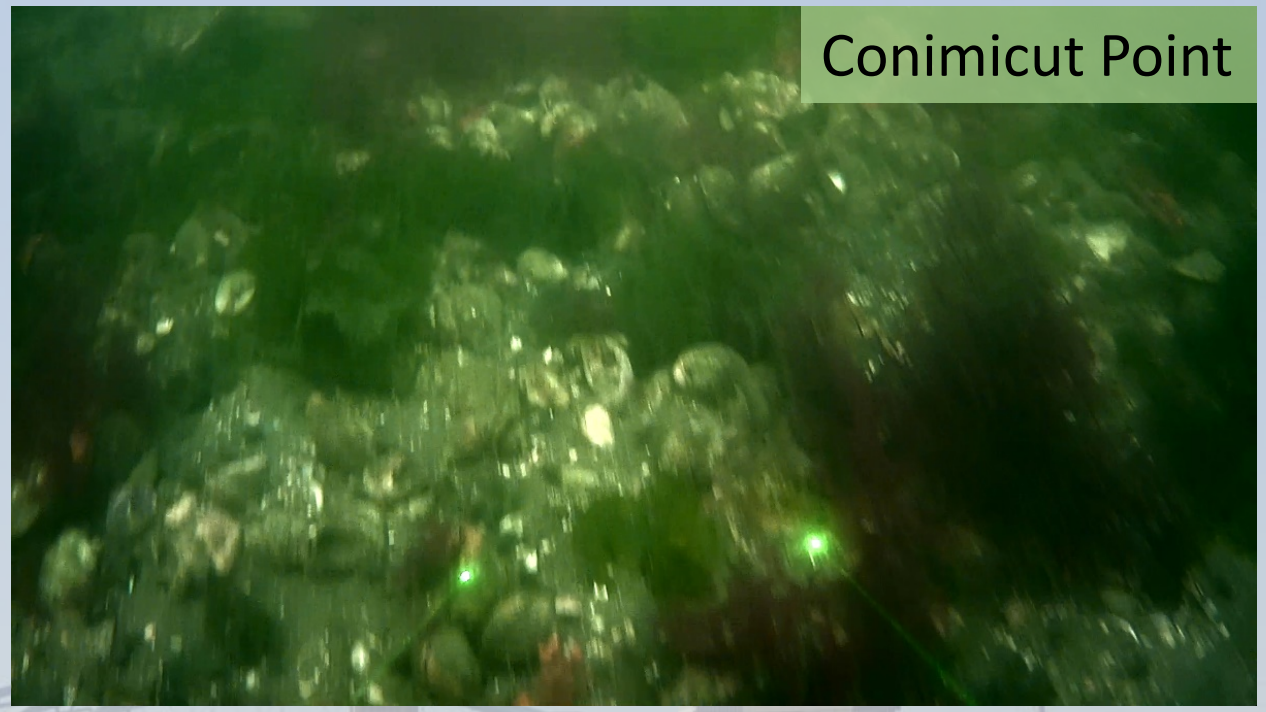
- Sled design
- Sampled June, August, September 2017
- Towed ~50’ behind boat for ~1/4 mile





Methodology – Analysis





Dominant Substrate:

Geologic (Class) → Unconsolidated Mineral Substrate(Subclass) → Fine(Group) → **Muddy Sand(Subgroup)**

Shell hash: trace

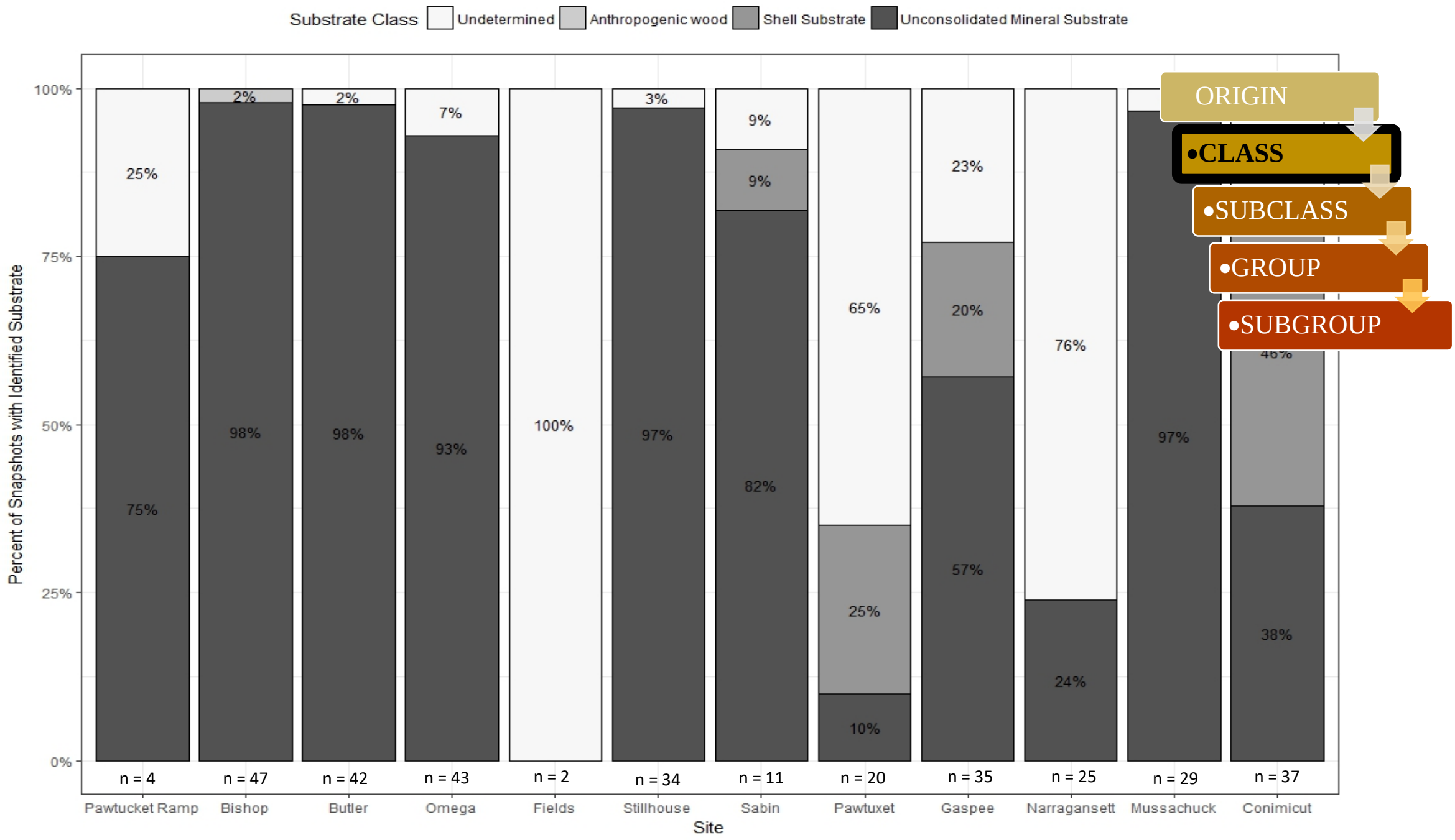
Dominant Biota:

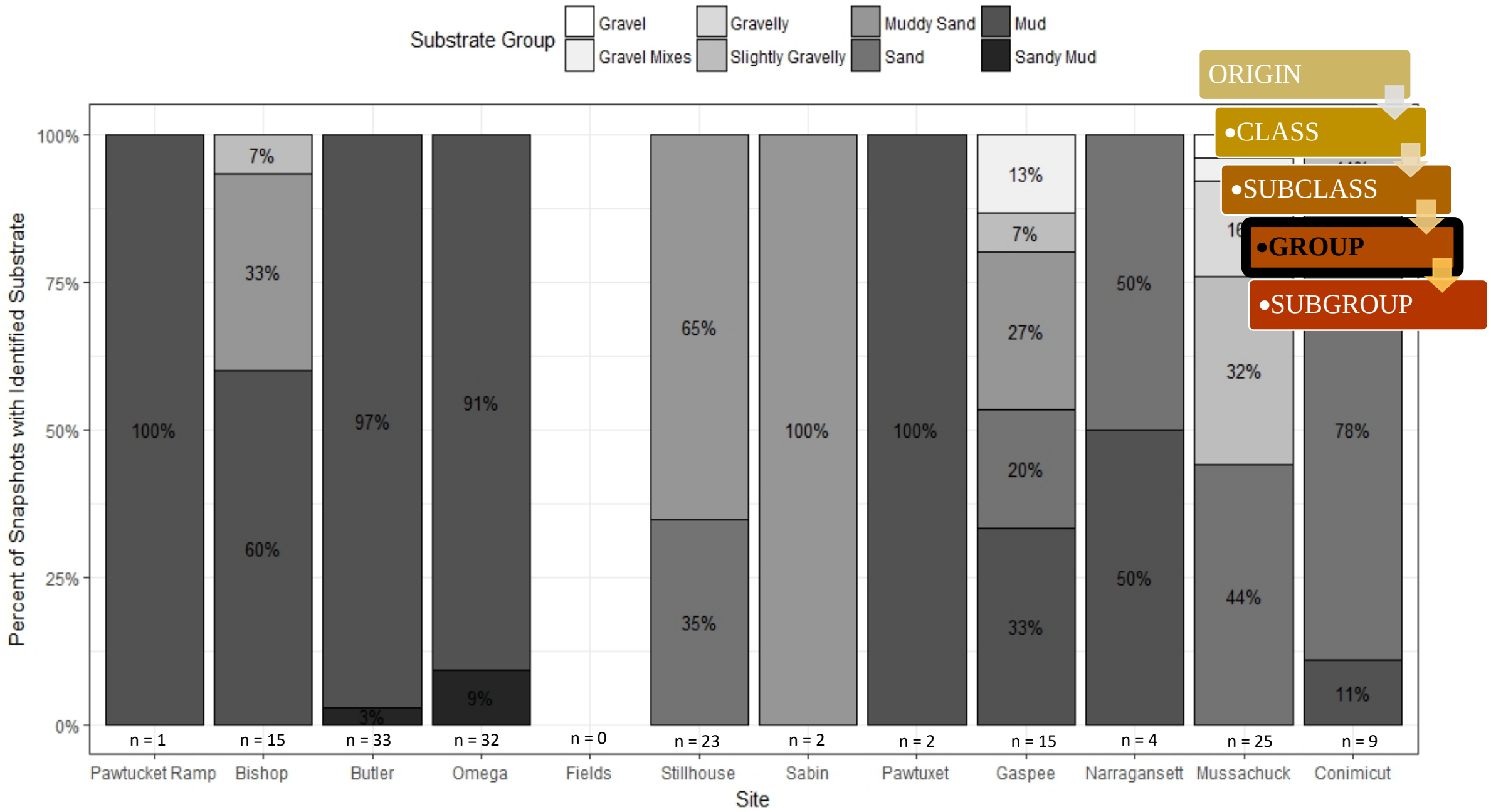
Benthic Attached → Faunal Bed → Soft Sediment Fauna → **Small Surface Burrowing Fauna**

Nassaridae (mud snails) : trace

Larger deep burrowing fauna: sparse

Gastropod trails: moderate low


Substrate Class
Undetermined
Anthropogenic wood
Shell Substrate
Unconsolidated Mineral Substrate
Percent of Snapshots with Identified Substrate
100%
75%
50%
25%
0%
25%
75%
2%
98%
2%
98%
7%
93%
100%
3%
97%
9%
9%
82%
65%
25%
10%
23%
20%
57%
76%
24%
97%
46%
38%
n = 4
n = 47
n = 42
n = 43
n = 2
n = 34
n = 11
n = 20
n = 35
n = 25
n = 29
n = 37
Pawtucket Ramp
Bishop
Butler
Omega
Fields
Stillhouse
Sabin
Pawtuxet
Gaspee
Narragansett
Mussachuck
Conimicut
Site
ORIGIN
•CLASS
•SUBCLASS
•GROUP
•SUBGROUP


Substrate Group
Gravel
Gravel Mixes
Gravelly
Slightly Gravelly
Muddy Sand
Sand
Mud
Sandy Mud
ORIGIN
•CLASS
•SUBCLASS
•GROUP
•SUBGROUP
Percent of Snapshots with Identified Substrate
100%
75%
50%
25%
0%
100%
7%
33%
60%
97%
3%
91%
9%
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20%
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50%
50%
32%
44%
78%
11%
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n = 23
n = 2
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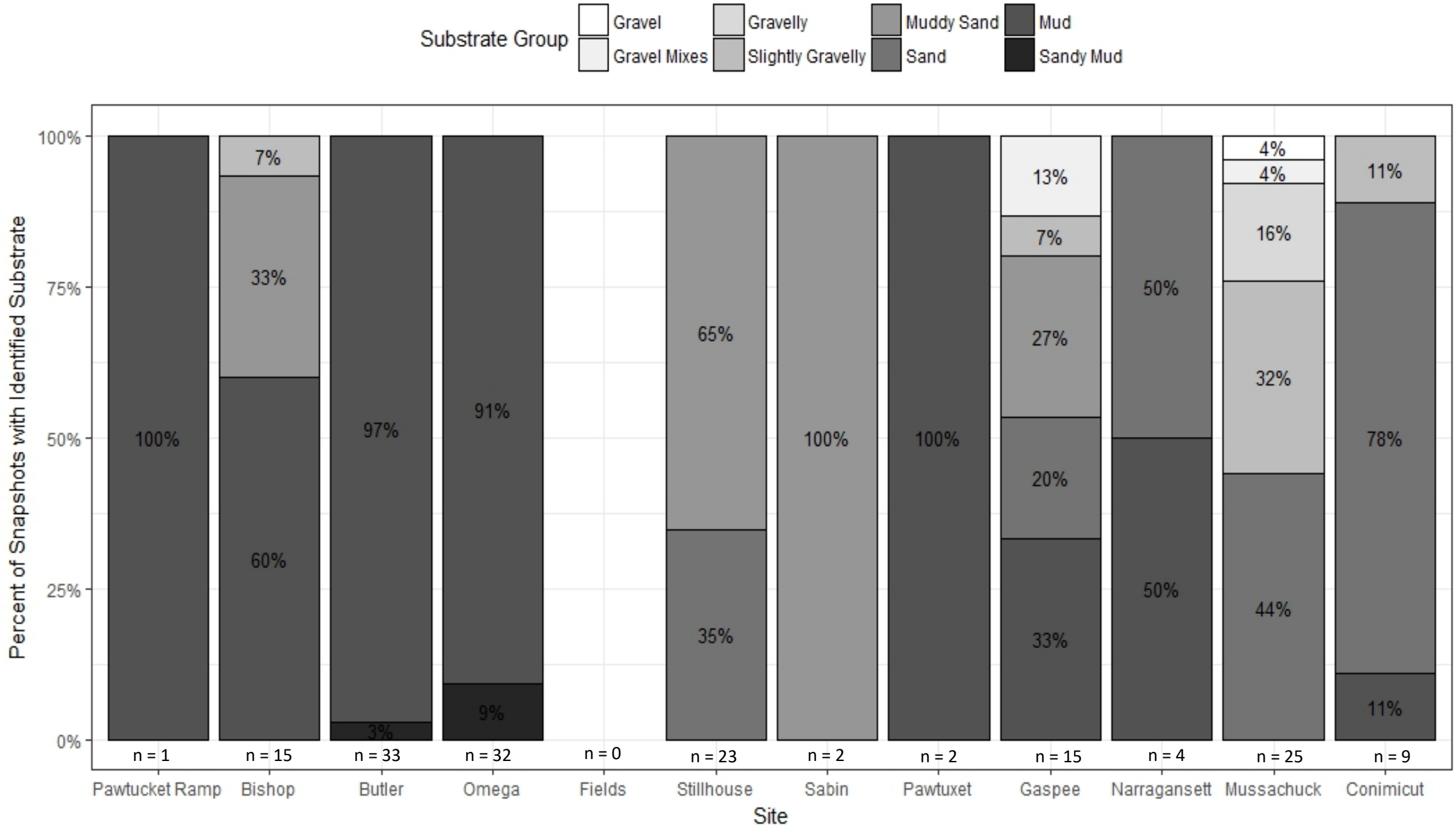
n = 15
n = 4
n = 25
n = 9
Pawtucket Ramp
Bishop
Butler
Omega
Fields
Stillhouse
Sabin
Pawtuxet
Gaspee
Narragansett
Mussachuck
Conimicut
Site


Substrate Group
Gravel
Gravel Mixes
Gravelly
Slightly Gravelly
Muddy Sand
Sand
Mud
Sandy Mud
Percent of Snapshots with Identified Substrate
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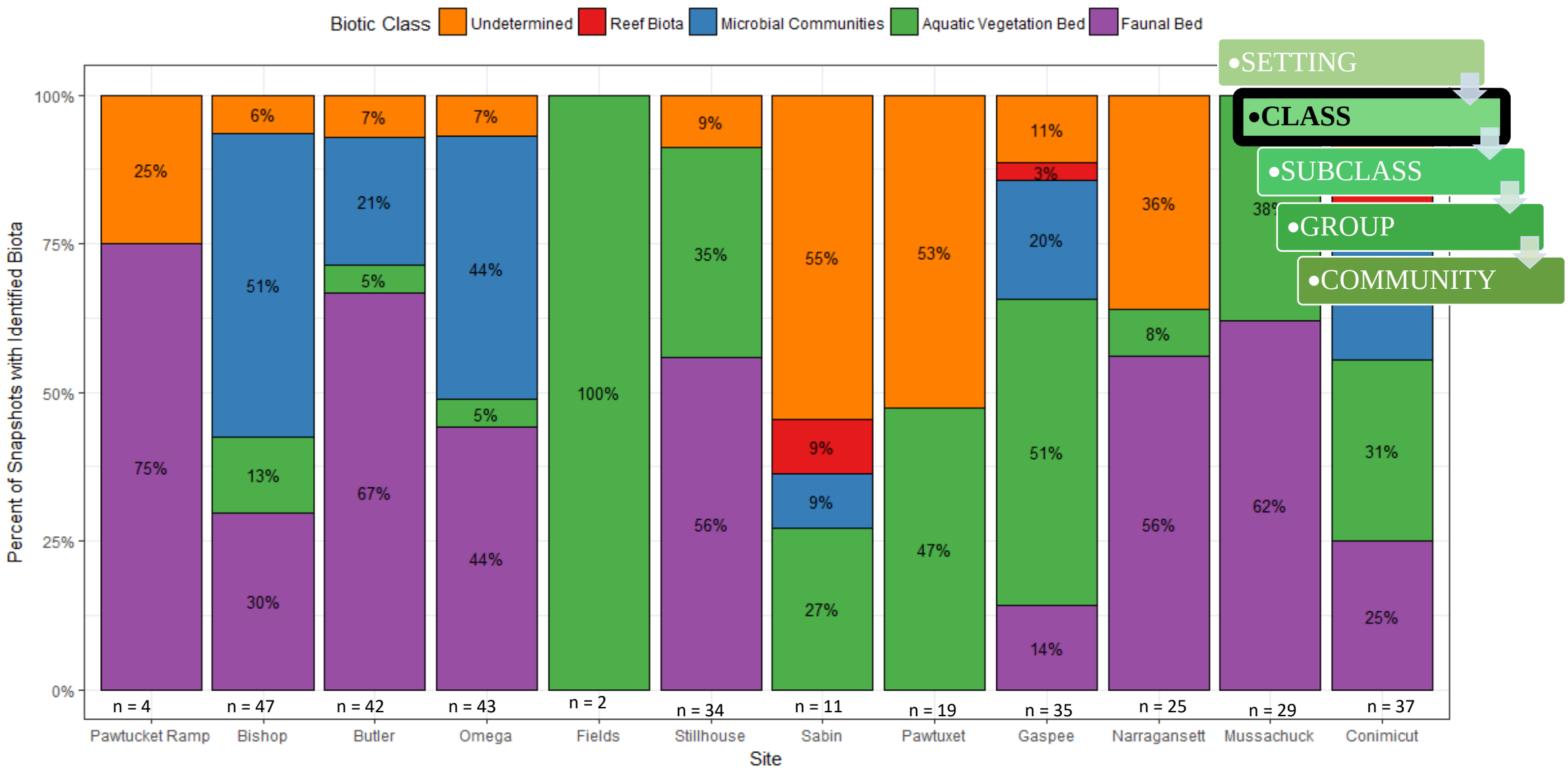
Site


Biotic Class
Undetermined
Reef Biota
Microbial Communities
Aquatic Vegetation Bed
Faunal Bed
Percent of Snapshots with Identified Biota
100%
75%
50%
25%
0%
25%
75%
6%
51%
13%
30%
7%
21%
5%
67%
7%
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100%
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n = 2
n = 34
n = 11
n = 19
n = 35
n = 25
n = 29
n = 37
Pawtucket Ramp
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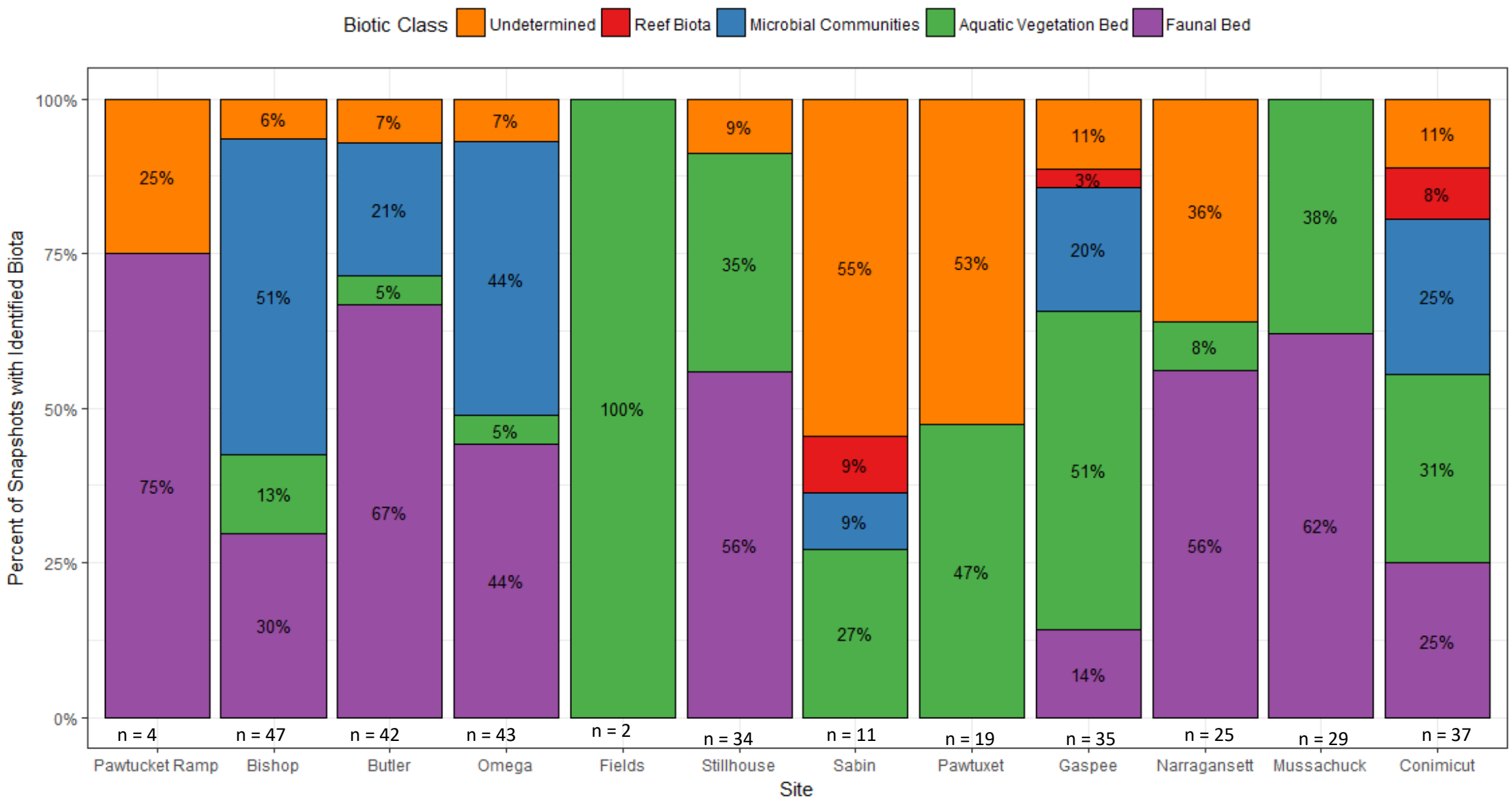
Sabin
Pawtuxet
Gaspee
Narragansett
Mussachuck
Conimicut
Site
•SETTING
•CLASS
•SUBCLASS
•GROUP
•COMMUNITY


Biotic Class
Undetermined
Reef Biota
Microbial Communities
Aquatic Vegetation Bed
Faunal Bed
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100%
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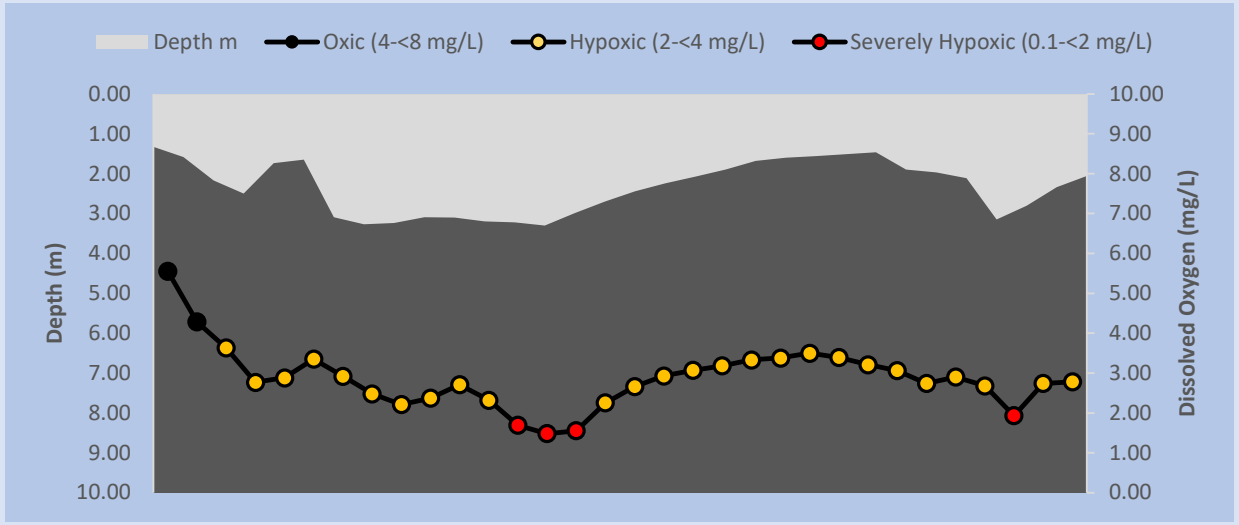
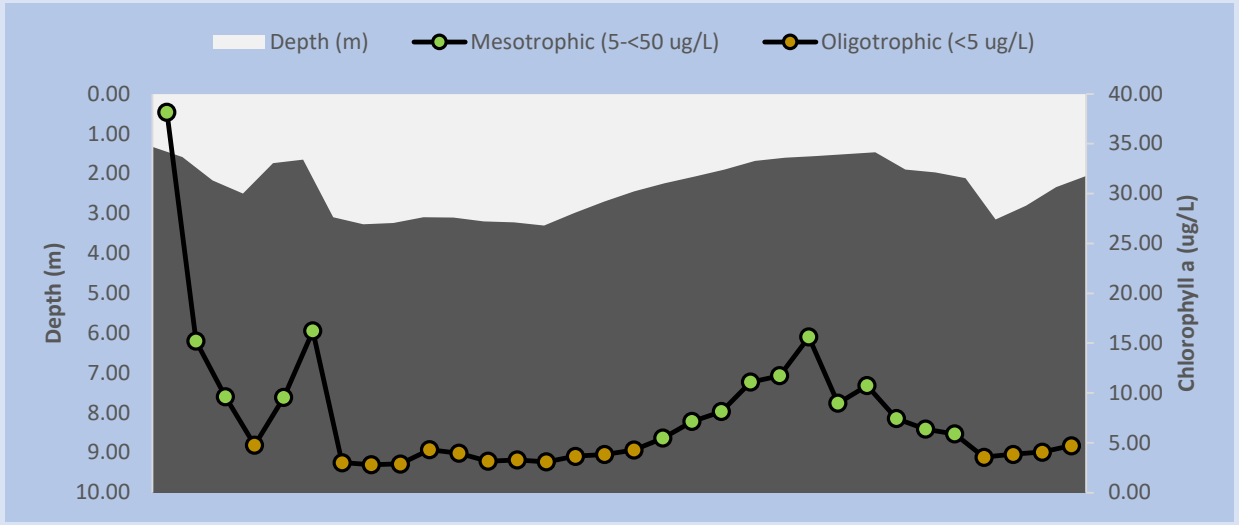
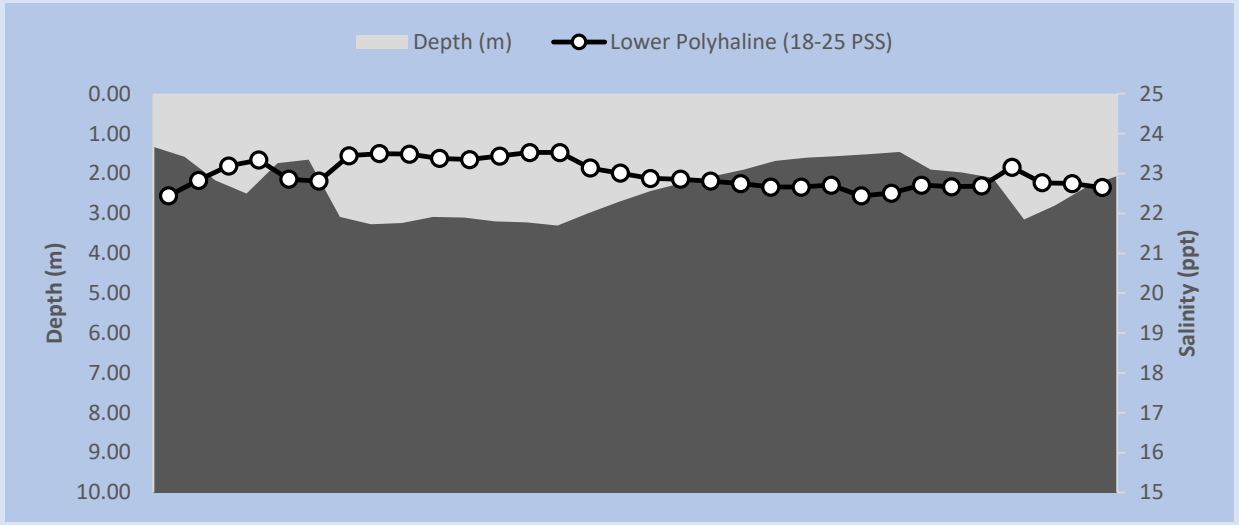
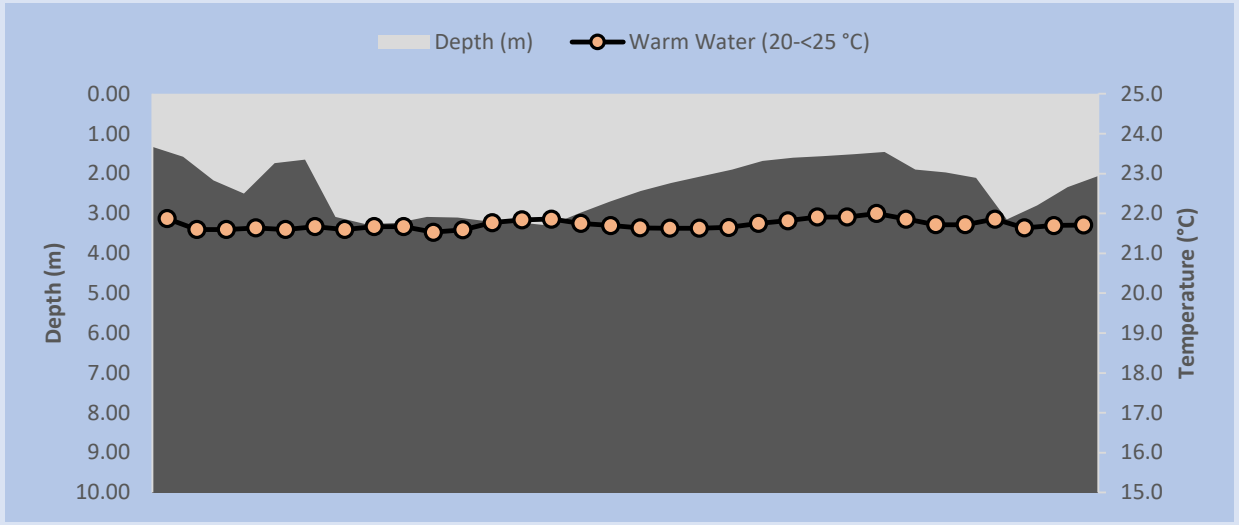
Gaspee
Narragansett
Mussachuck
Conimicut
Site

Water Component – Bishop Point Sept. 2017





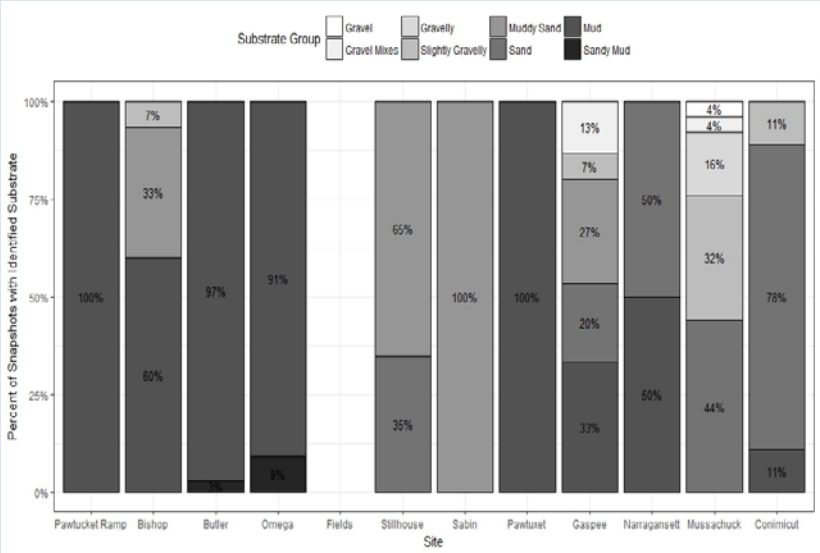




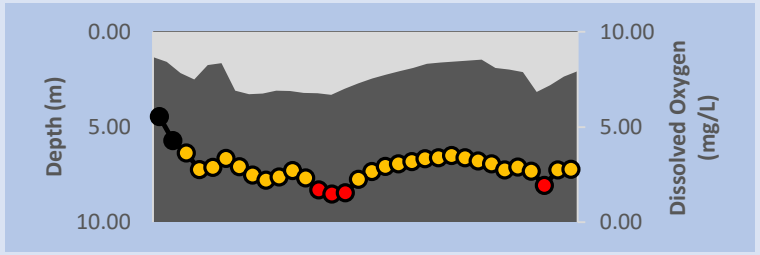
Next Steps

Results

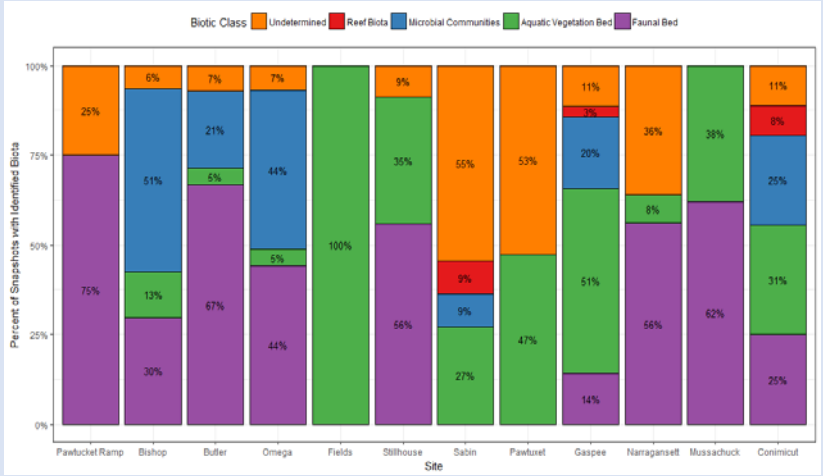
Substrate



Water Quality



Biota



Biotope formation

The Nature Conservancy
Rhode Island

Thank You!

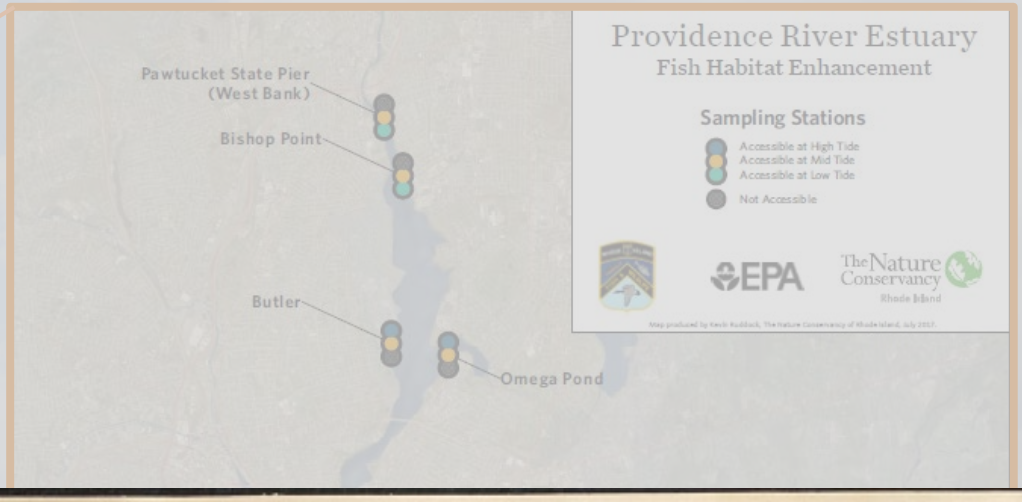
U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

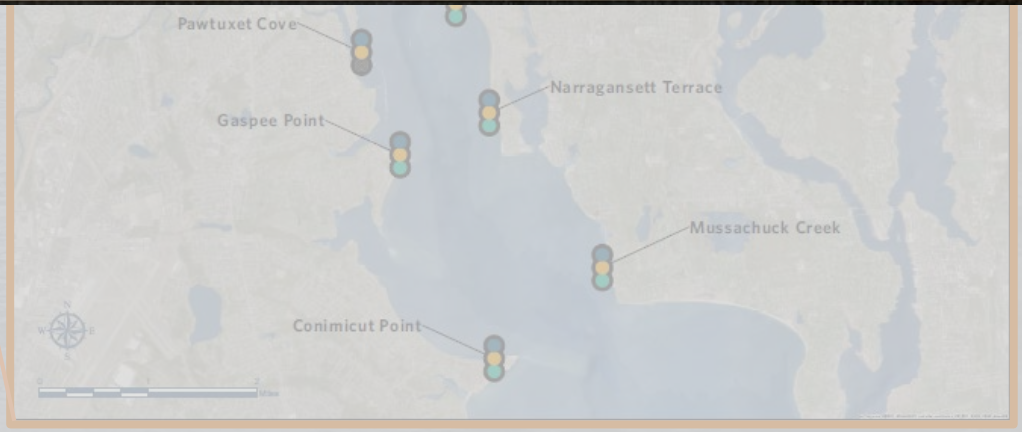
RIDEM

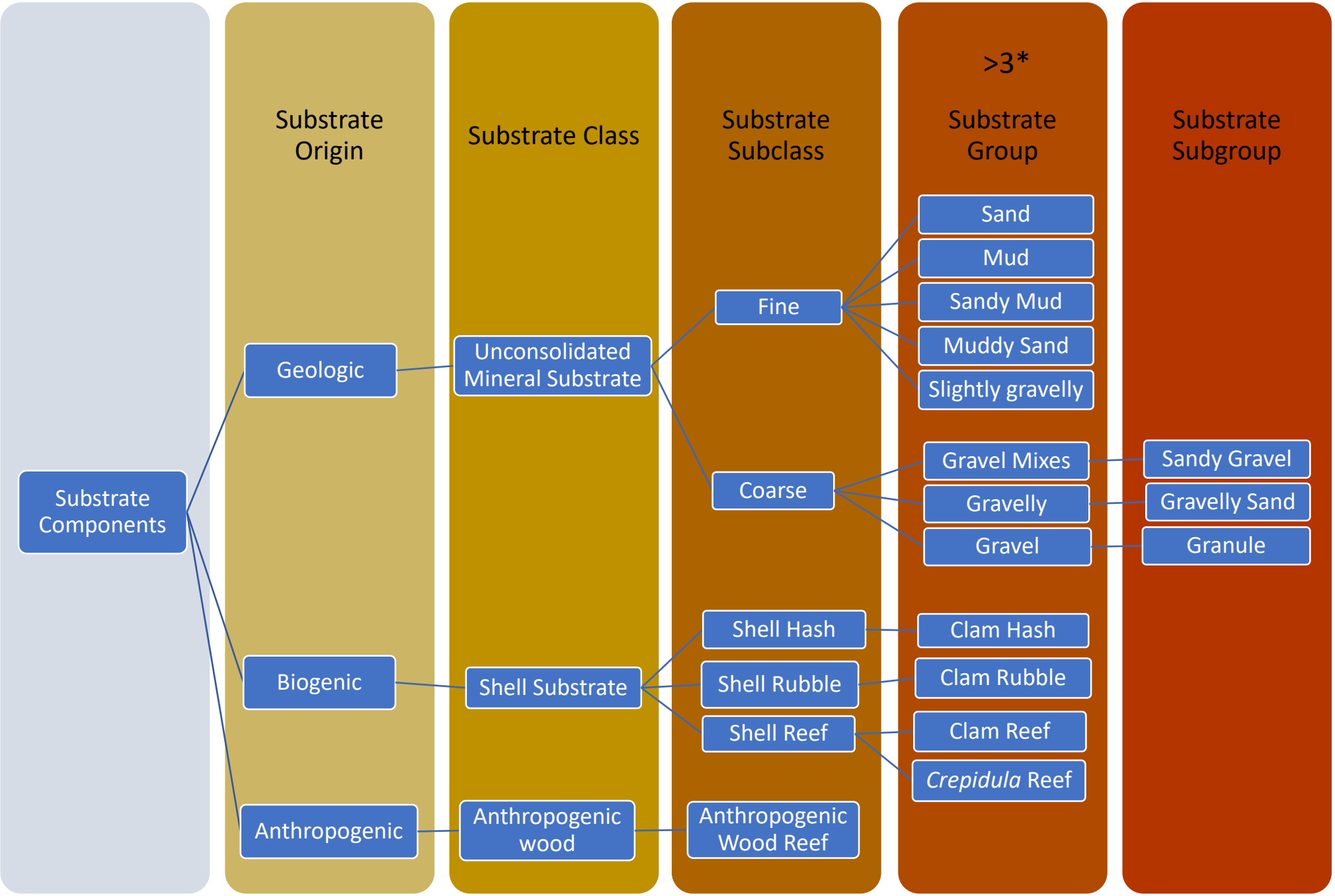
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

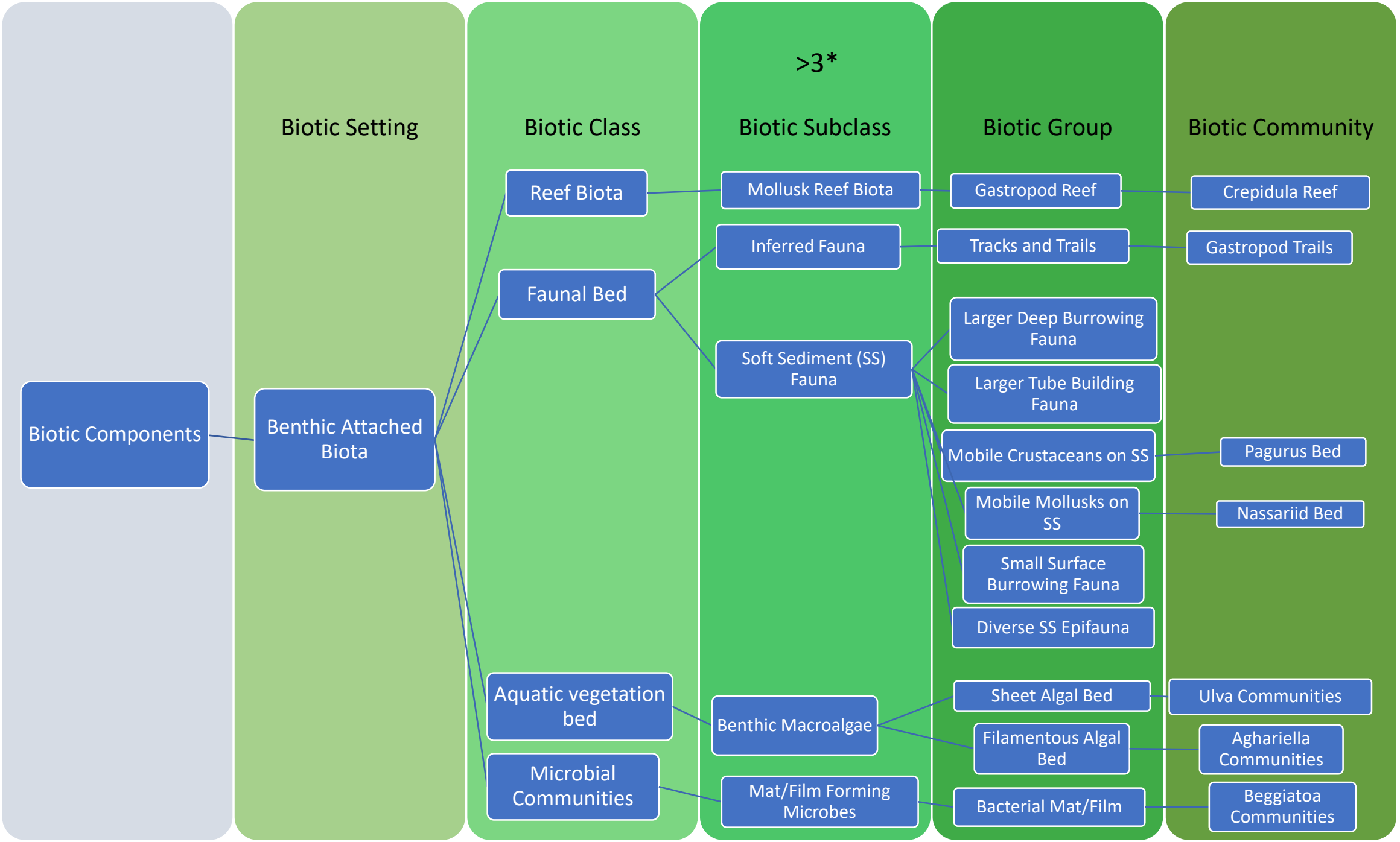
The Narragansett Bay Commission

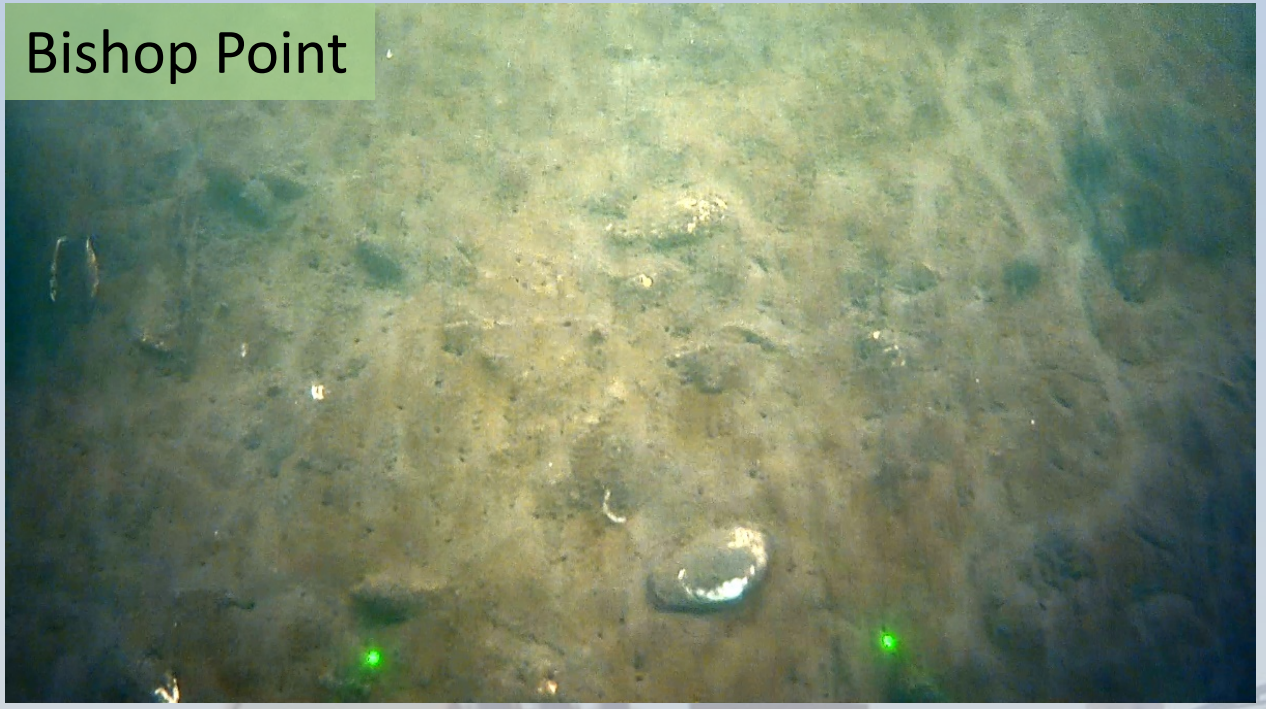
Providence River Estuary

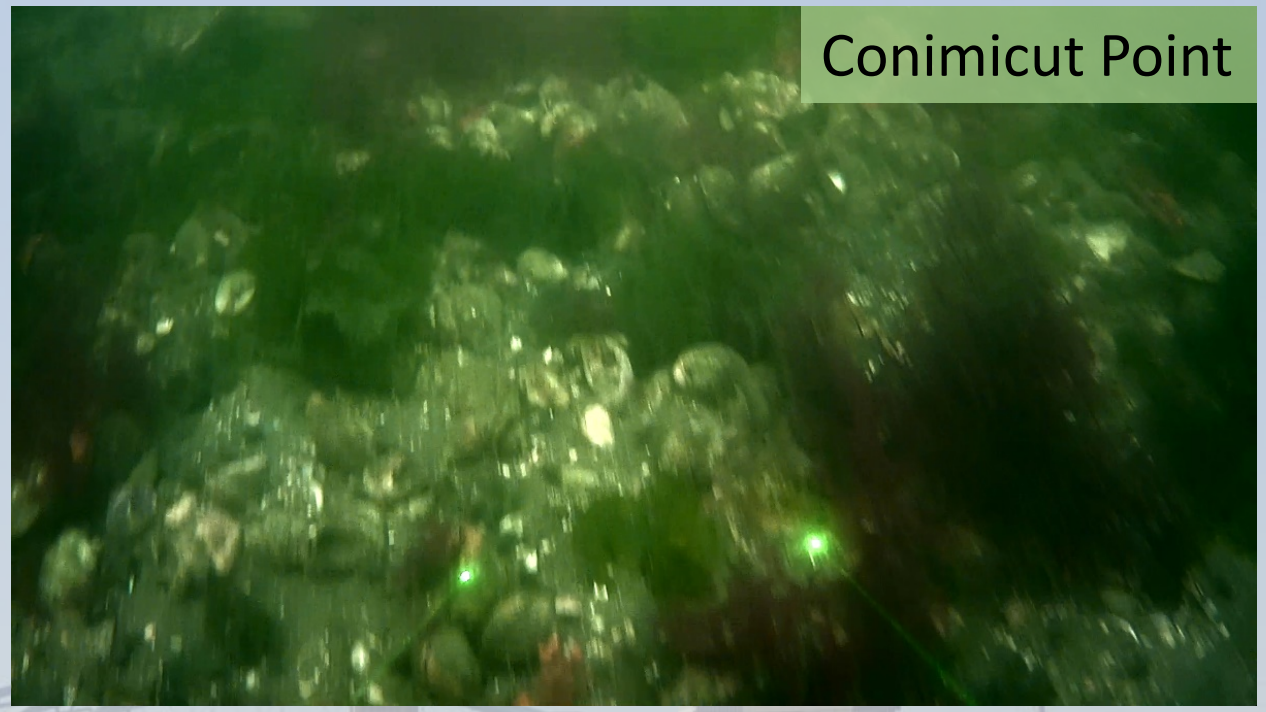


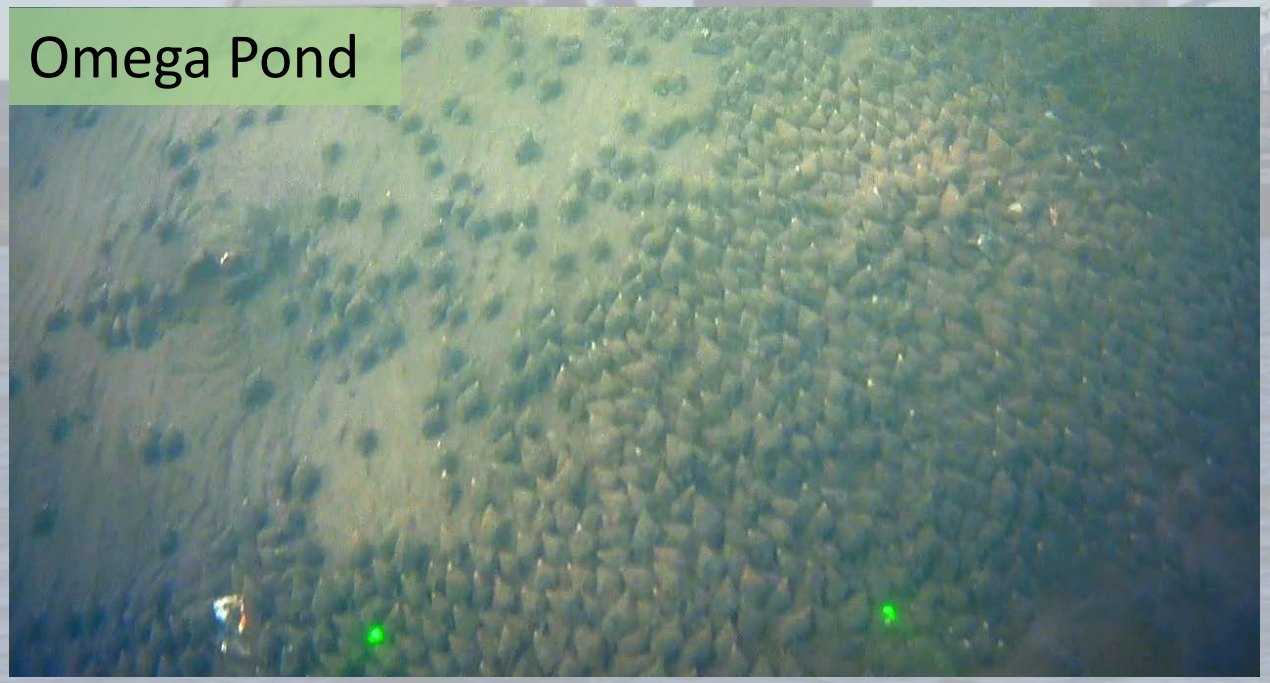


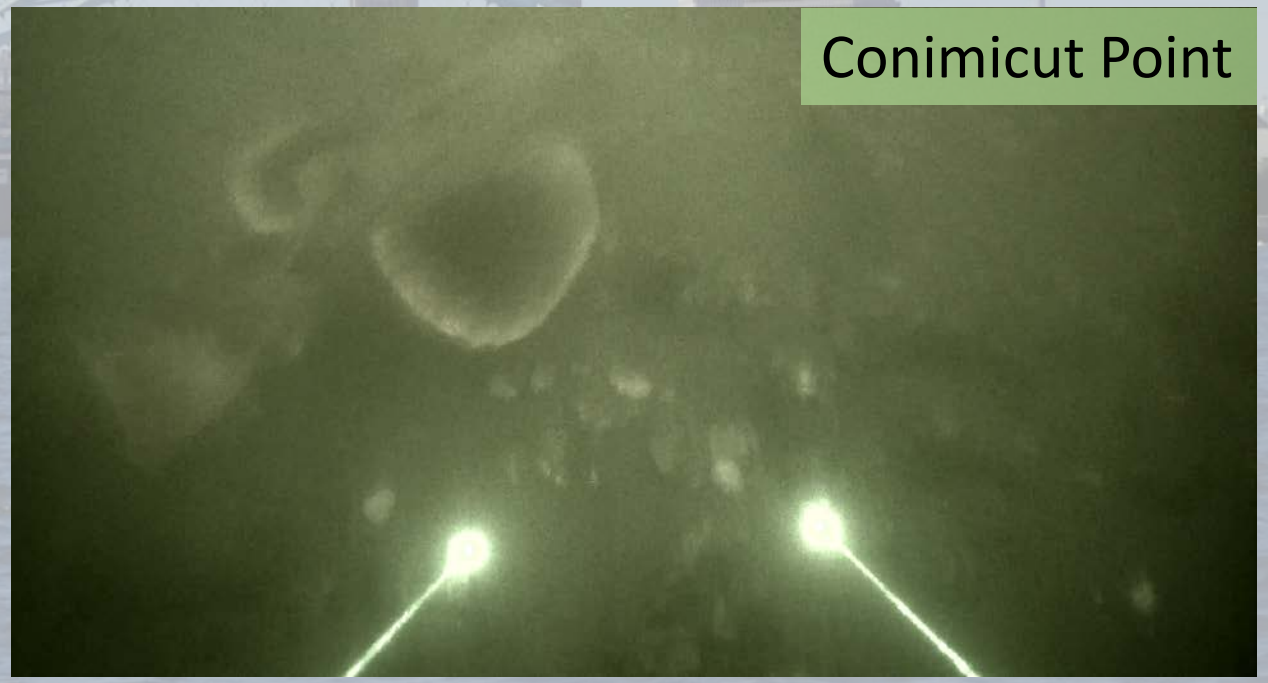

Substrate Components
Substrate Origin
Substrate Class
Substrate Subclass
>3*
Substrate Group
Substrate Subgroup
Geologic
Biogenic
Anthropogenic
Unconsolidated Mineral Substrate
Shell Substrate
Anthropogenic wood
Fine
Coarse
Shell Hash
Shell Rubble
Shell Reef
Anthropogenic Wood Reef
Sand
Mud
Sandy Mud
Muddy Sand
Slightly gravelly
Gravel Mixes
Gravelly
Gravel
Clam Hash
Clam Rubble
Clam Reef
Crepidula Reef
Sandy Gravel
Gravelly Sand
Granule

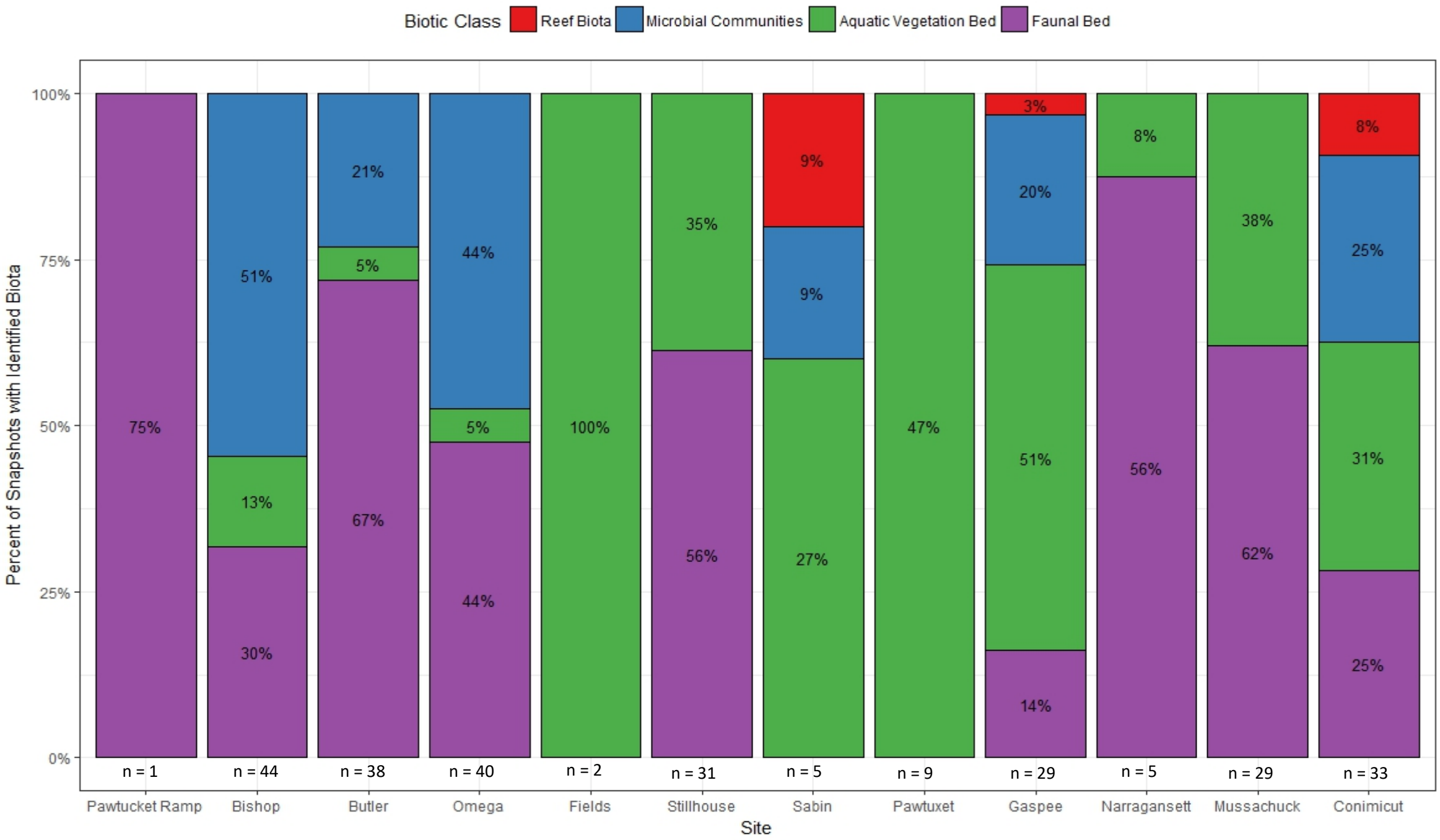

Biotic Setting
Biotic Class
>3*
Biotic Subclass
Biotic Group
Biotic Community
Biotic Components
Benthic Attached Biota
Reef Biota
Faunal Bed
Aquatic vegetation bed
Microbial Communities
Mollusk Reef Biota
Inferred Fauna
Soft Sediment (SS) Fauna
Benthic Macroalgae
Mat/Film Forming Microbes
Gastropod Reef
Tracks and Trails
Larger Deep Burrowing Fauna
Larger Tube Building Fauna
Mobile Crustaceans on SS
Mobile Mollusks on SS
Small Surface Burrowing Fauna
Diverse SS Epifauna
Sheet Algal Bed
Filamentous Algal Bed
Bacterial Mat/Film
Crepidula Reef
Gastropod Trails
Pagurus Bed
Nassariid Bed
Ulva Communities
Aghariella Communities
Beggiatoa Communities


Bishop Point


Conimicut Point


Omega Pond


Conimicut Point


Biotic Class
Reef Biota
Microbial Communities
Aquatic Vegetation Bed
Faunal Bed
Percent of Snapshots with Identified Biota
100%
75%
50%
25%
0%
75%
30%
13%
51%
67%
5%
21%
44%
5%
44%
100%
56%
35%
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n = 1
n = 44
n = 38
n = 40
n = 2
n = 31
n = 5
n = 9
n = 29
n = 5
n = 29
n = 33
Pawtucket Ramp
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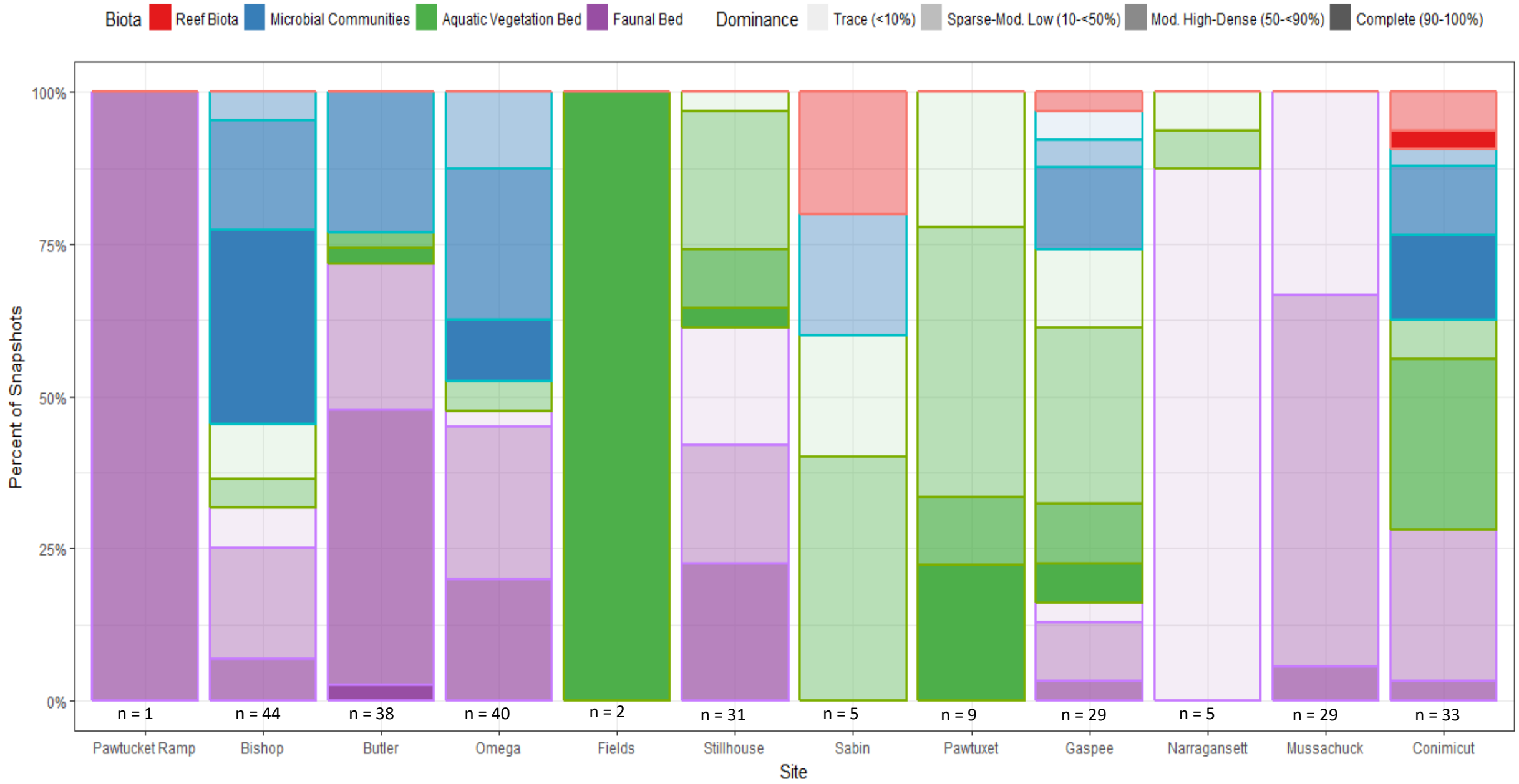
Narragansett
Mussachuck
Conimicut
Site


Biota
Reef Biota
Microbial Communities
Aquatic Vegetation Bed
Faunal Bed
Dominance
Trace (<10%)
Sparse-Mod. Low (10-<50%)
Mod. High-Dense (50-<90%)
Complete (90-100%)
Percent of Snapshots
100%
75%
50%
25%
0%
n = 1
n = 44
n = 38
n = 40
n = 2
n = 31
n = 5
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n = 29
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