Salt Marsh Science

Field Guide and Data Book

Name: _____

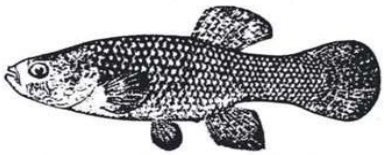
Team: _____

Location: _____

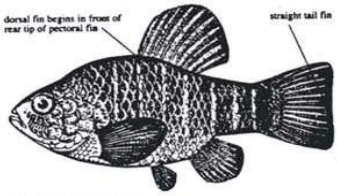
Date: _____

FISH OF THE ESTUARY

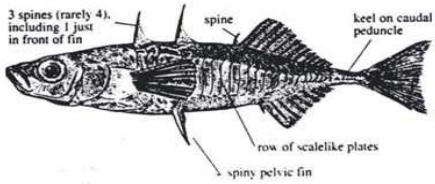
***FUNDULUS HETEROCLITUS*, Mummichog**
Max. 5-6 in.
Most are 3 ½ -4 in.



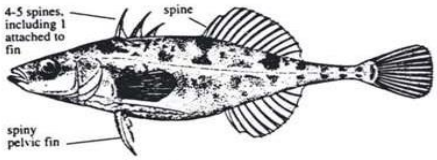
***CYPRINODON VARIEGATUS*, Sheepshead Minnow**
Max 3 in.



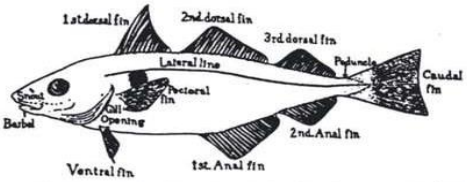
***GASTEROSTEUS ACULEATUS*, Three-spined stickleback**
Has 3 to 5 spines (note: there is also a Two-spined stickleback that has 5-6 bony plates).
Has many bony plates. (More than 6)
Max size 4 in.
Most < 3 in.



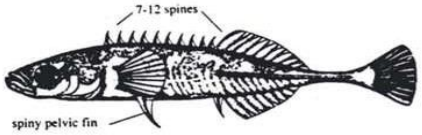
***APELTES QUADRACUS*, Four-spined stickleback**
Has 2 to 4 spines.
No bony plates.
1 ½ -2 ½ in.



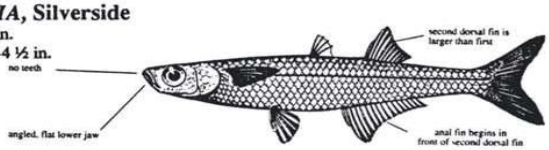
FISH DIAGRAM



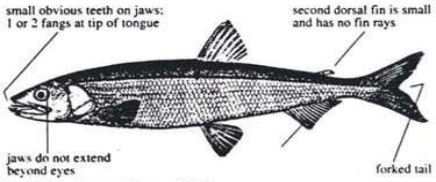
***PUNGITUS PUNGITUS*, Nine-spined stickleback**
Has 7 or more spines
Not more than 3 in.
Most are 2-2 ½ in.



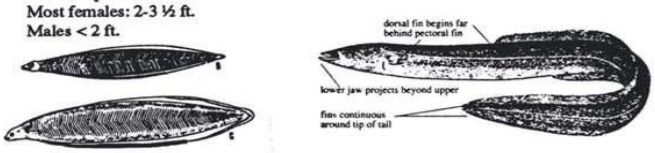
***MENIDIA*, Silverside**
Up to 5 ½ in.
Most are 4-4 ½ in.



***OSMERUS*, Smelt**
Max. 13-14 in.
Most 7-9 in.

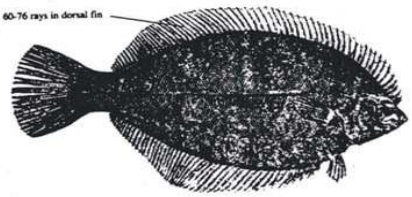


***ANGUILLA ROSTRATA*, American Eel**
Adults: up to 4 Ft.
Most females: 2-3 ½ ft.
Males < 2 ft.



***SYNGNATHUS*, Pipefish**
Max: 12 in.
Most are 4 to 8 in.

***PLEURONECTES AMERICANUS*, Winter Flounder**
Max. 23 inches
Most adults are 12-15 inches



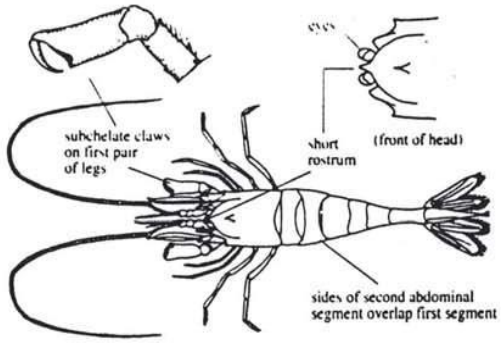
When identifying fish: Look at body shape, and presence and location of fins. For example, Smelt are easily identifiable from Silversides, when you notice that Silversides have two dorsal fins. (See fish diagram to learn fin names). Fish of the same species are often different sizes and colors. *Size and color are generally not good identifying features.*

If you are collecting fish in water of low salinity, you may catch fish not found on this chart. On your data form, you may simply label these "freshwater fish." If you have The National Audubon Society Field Guide To New England look in section on freshwater fish to identify other species.

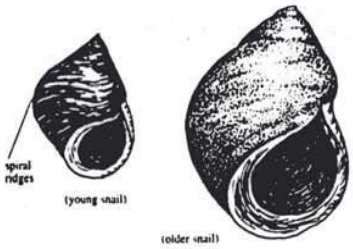
Shared with permission. **Credit: Fishes of the Gulf of Maine**

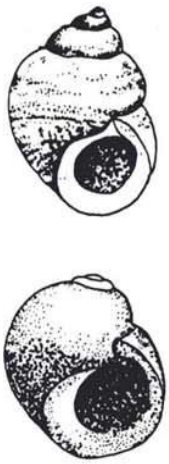
MARINE ANIMALS OF THE ESTUARY

***CRANGON SEPTEMSPINOSA*, Sand Shrimp**
< 6 cm.

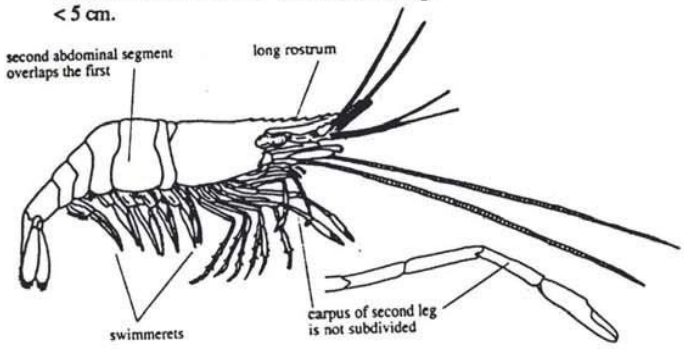


***LITTORINA*, Periwinkle**

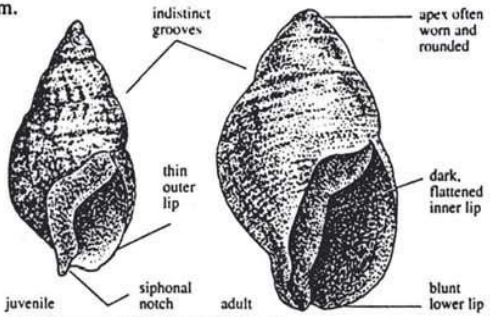




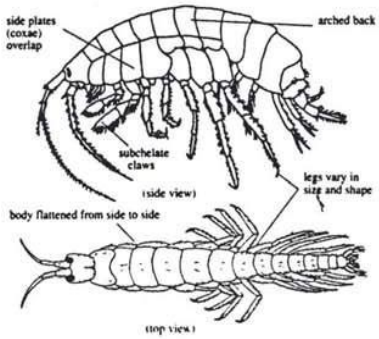
***PALAEMONETES* Grass Shrimp**
< 5 cm.



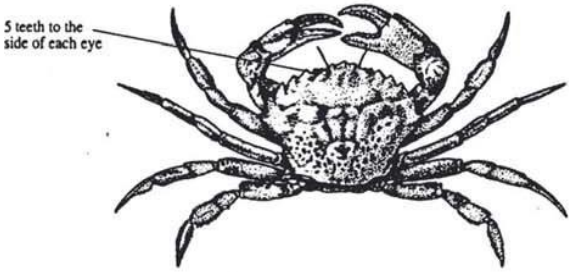
***ILYANASSA OBSOLETA*, Eastern Mud Snail**
< 2.5 cm.



Typical Gammarid Amphipod



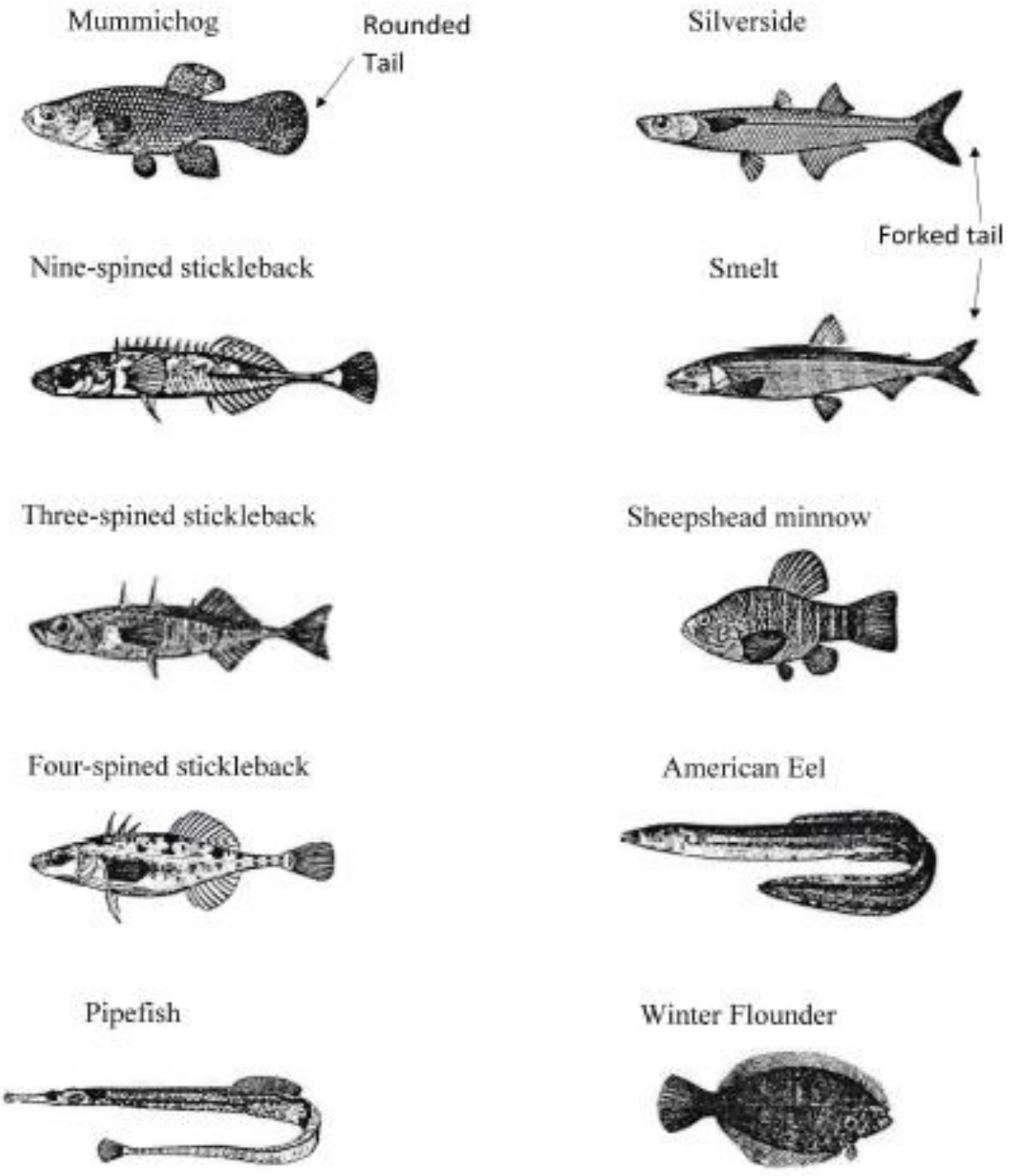
***CARCINUS MAENAS*, Green Crab**
shell width < 8 cm.



When identifying animals: Look at body shape. For example, Periwinkles are easily identifiable from Mud Snails, when you notice that Periwinkle shells are much more rounded than Mud Snail shells. Animals of the same species are often different sizes and colors. *Size and color are generally not good identifying features.*

If you are collecting animals in water of low salinity, you may catch animals not found on this chart. On your data form, you may simply label these "freshwater animal." If you have The National Audubon Society Field Guide To New England look in section on freshwater animals to identify other species.

FISH OF THE ESTUARY

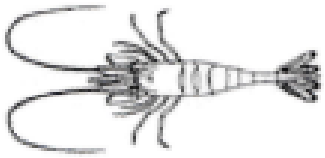


Shared with permission.

Credit: Fishes of the Gulf of Maine

MARINE ANIMALS OF THE ESTUARY

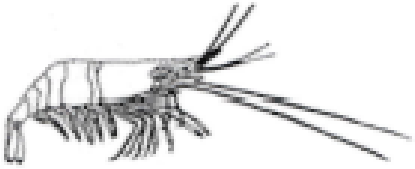
Sand Shrimp (sandy color)



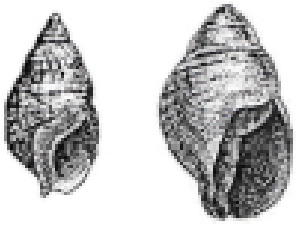
Periwinkle

Grass Shrimp (Glass Shrimp)

(clear color)

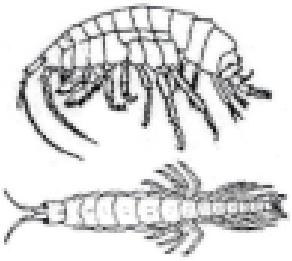


Eastern Mud Snail



Green Crab

Typical Gammarid Amphipod



When identifying animals: Look at body shape. For example, Periwinkles are easily identifiable from Mud Snails, when you notice that Periwinkle shells are much more rounded than Mud Snail shells. Animals of the same species are often different sizes and colors. *Size and color are generally NOT good identifying features.*

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Mass Audubon

Plum Island Ecosystems Long Term Ecological Research

Common Plants of the Salt Marsh Identification Key

By Elizabeth Duff 1997

Please note: not all salt marsh plants are included in this key.
You may want to adapt this key, as you find additional species on your site

1a Plant has long grasslike leaves. (Leaves grow straight to a point.) 8
1b Leaves are not straight and grasslike, or plant does not have a recognizable leaf.....2

2a Plant is fleshy. (If you squeeze a leaf or segment, your fingers get wet from the stuff inside) 3
2b Plant is not fleshy. 4

3a Plant does not have an obvious leaf.....Common Glasswort (*Salicornia europea*)
3b Plant has numerous small leaves.....Sea blite (*Suaeda*)

4a Plant has a twig-like brown stem, and is a small shrub.....Marsh Elder (*Iva frutescens*)
4b Plant does not have a woody stem.....5

5a Leaves are triangular..... Orach (*Atriplex*)
5b Leaves are not triangular.....6

6a Plant grows straight with leaves growing along stem.....7

6b Leaves grow at the base of the plant. The top branches and grows many tiny lavender flowers.....Sea Lavender (*Limonium carolinianum*)

7a Plant grows single stem. Leaf is narrow, then widens, then narrows again to a rounded point. Plant grows golden yellow flowers in the fall. .....Seaside goldenrod .....(*Solidago sempervirens*)
7b Stems are single or forked. Leaf is straight and narrow, tapering to a point. Plant grows purple daisy-shaped flowers in the fall .... Aster (*Aster*)

8a Plant stem is triangular. The plant grows flowers that resemble miniature pine cones. .....Saltmarsh Bulrush (*Scripus*)
8b Stem is not triangular.....9

9a Leaves grow only from the base of the plant. 10
9b Leaves grow along the stem.....11

10a Leaf grows ¼ to ½ inch wide, and up to 6 feet high. Plant grows brown spikes at the top.....Narrow leaved cattail (*Typha angustifolia*)
10b Plant leaf is less than ¼ inch wide, and grows numerous small greenish flowers on a spike. Plant grows from 8-32 inches tall. Seaside Arrow Grass (*Triglochin maritimum*)

11a Plant has numerous leaves growing all the way up the stem.....12

* 11b Plant has few leaves (4 or less) and/or leaves grow only part way up the stem.....13

*Please note: Salt marsh hay may have more than 4 leaves, but the leaves are widely spaced.

12 has 3 choices

12a Plant leaf is wide, greater than ½ inch. Stem is round and hollow. Plant grows a large silky plume at the top. Plant can be 6 ½- 14 feet high... Phragmites (*Phragmites australis*)

12b Plant leaf is narrow. (Less than 1/8 inch.) Plant has many leaves growing in two directions, like a lot of V's on the stem. Leaves are light green, and can be flattened out. ..... Spikegrass (*Distichlis spicata*)

12c Plant leaf is about ¼- ½ inch wide. Plant grows 1-8 feet high. Plant grows tall close to water. Leaves are dark green or yellowish green Leaves feel rough. Plant flower and seeds grow hugging the center of the plant. Saltmarsh cordgrass (*Spartina alterniflora*)

13a Plant stem is, solid, and round. Flower/seed pods are round, and form from the side of the stem, rather than at the very end. .....Black Grass (*Juncus gerardi*)

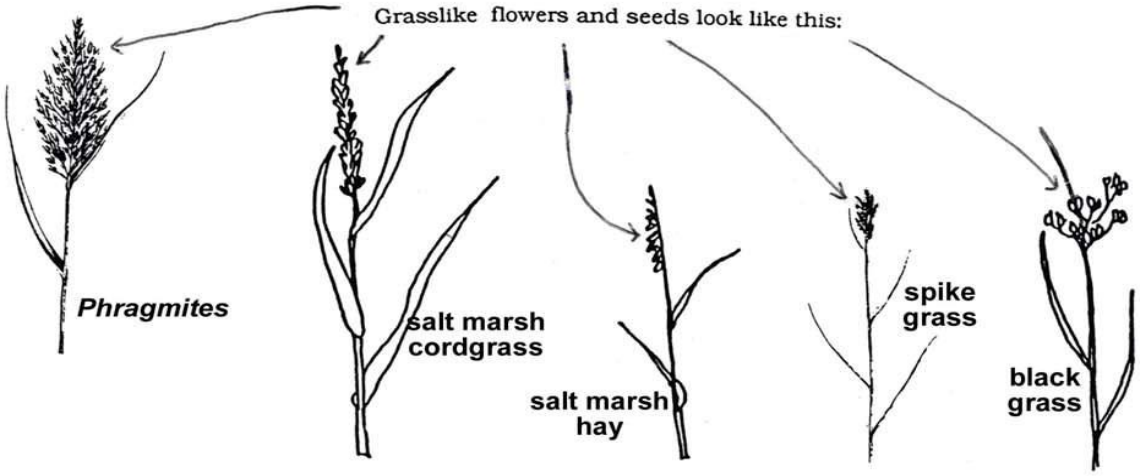
13b Live plant stem is generally green and jointed. Plant flower and seeds grow on the very end of the stem..... 14

14a Plant leaf is about ¼- ½ inch wide. Plant grows 1-8 feet high. Plant grows tall close to water. Leaves are dark green or yellowish green Leaves feel rough. Plant flower and seeds grow hugging the center of the plant. Saltmarsh cordgrass (*Spartina alterniflora*)

14b Leaf is extremely skinny (It looks like it might fit through a needle eye.) Its sides curve inward. Plant flower and seeds grow on one side of a stalk, (like the teeth on a comb.) ....Saltmeadow cordgrass (*Spartina patens*)

Additional saltmarsh/brackish water plants not included in this key are: Purple loosestrife, marsh fern, silverweed, amaranth, and numerous upland grasses, and upland species.

Grasslike flowers and seeds look like this:



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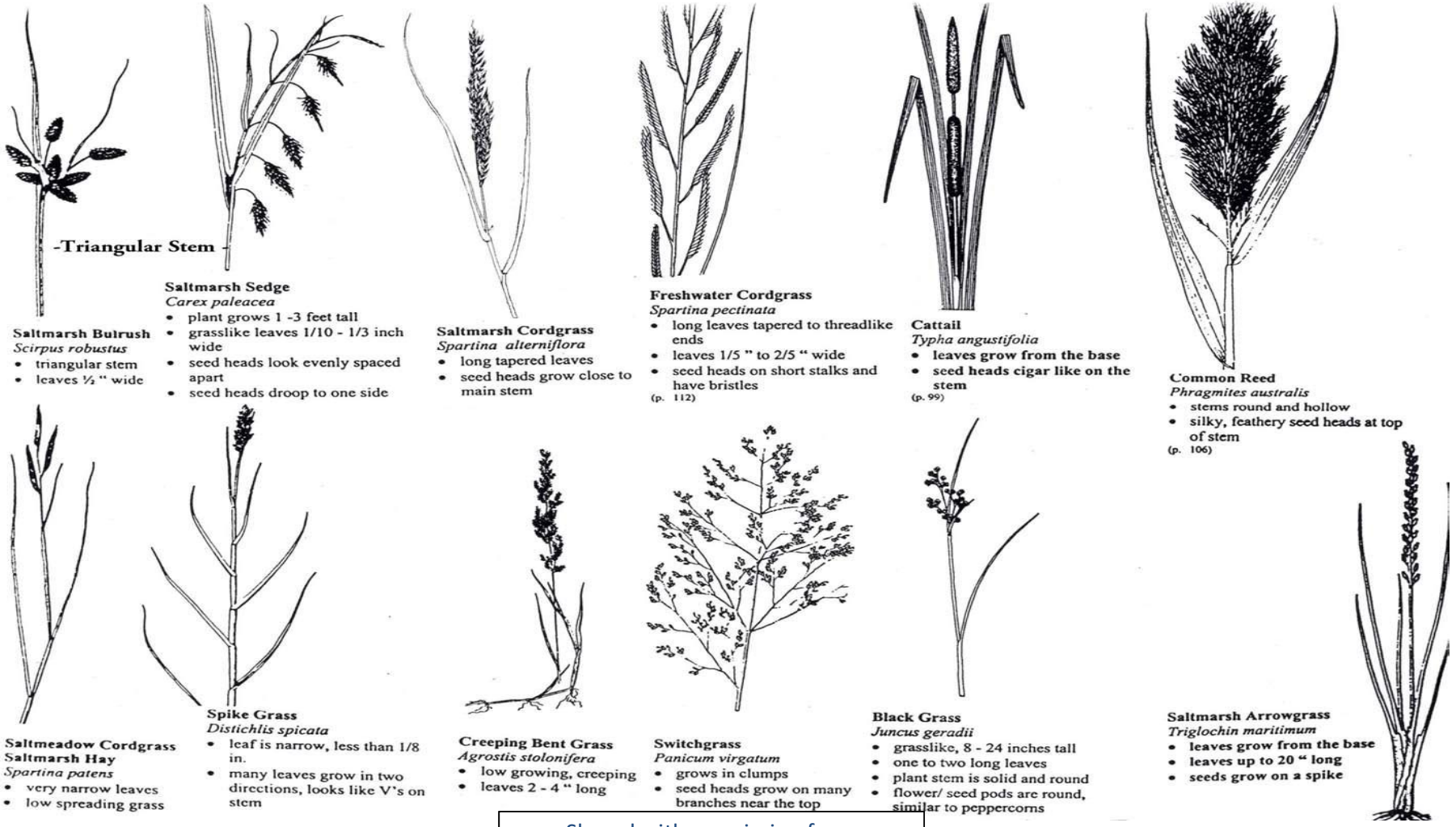
A Field Guide to Coastal Wetland Plants of the Northeastern United States
Courtesy of Ralph Tiner
University of Massachusetts Press



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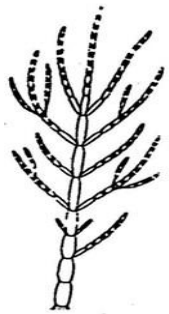
Brackish Marsh Plants (Not grasses)



Glasswort
Salicornia europaea
- fleshy
- stems jointed

Sea Blite
Suaeda linearis
- fleshy
- fleshy leaves, flat on one side, rounded on other

Sea Milkwort
Glaux maritima
- low growing, creeping
- leaves round tipped up to 4/5" long and ¼" wide

Wild Morning Glory
Calystegia sepium
- grows like a vine, up to 10 feet long
- triangular shaped leaves

(p. 223)

Marsh Orach
Atriplex patula
- arrowhead shaped leaves
- very small flowers in ball shaped clusters

(p. 127)

Umbrella Sedge
Cyperus filicinus
- grass-like and low growing
- stems have three edges
- long thin leaves extend from bottom of flower

(p. 177)

Silverweed
Potentilla egedii
- leaves grow from the base
- leaves silvery hairy beneath
- leaves toothed and increase in size toward the tip

(p. 136)

Smartweed
Polygonum punctatum
- stem jointed
- leaves taper at both ends
- small green or white flowers on spikes

(Invasive Species)

Purple Loosestrife
Lythrum salicaria
- candlestick flowers, purple
- leaves are heart shaped at one end

Water Hemp
Amaranthus cannabinus
- stem smooth
- tiny seeds grow along the stem on spikes

Saltmarsh Aster
Aster subulatus
- daisy-like flowers
- leaves clasp the stem
- leaves grow alternately (not across form each other)

Seaside Goldenrod
Solidago sempervirens
- leaves grow along the stem
- leaves 4 - 16 inches long
- flowers at the top of stem, yellow

Marsh Elder
Iva frutescens
- twig-like brown stem
- is a small shrub

Leaves are opposite (grow in pairs)

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University of Massachusetts Press

Field Trip 1: Exploration
Salt Marsh Colors

Directions: Using colored pencils or crayons, draw the natural features of the area, capturing the different shades of color of the salt marsh. Add as much detail as possible: focusing on the different colors, rather than on every blade of grass. (Suggested time: 10-15 minutes)

Marsh Mapping: (Trip 1)

Directions: Record the following on your map:

Natural features:	**Human Impact:**
-Different Vegetation types.	-Houses, roads, parking lots
-Wildlife	-Ditches, Culverts (Pipes)
-Water	-Litter

Create a key on your map to indicate what the symbols you are using mean.

Is this a Tidal Restriction?

Mass Audubon Scientists are studying marshes where there are tidal restrictions. Where the tide has been restricted, *Phragmites* often grows. If you discover a tidal restriction, you have found one clue explaining the growth of *Phragmites.*

Measure or estimate and record the channel width and the crossing width.
Channel Width Upstream _____ Downstream _____
Pipe or culvert width upstream _____ Downstream _____

Observe and record using the following Restriction Classification Scheme.

Classification	Channel Vs. Culvert Opening	Upstream	Downstream
1	River Width < Opening Width	1	1
2	River Width = Opening Width	2	2
3	River Width 1 to 2 x Opening Width	3	3
4	River Width 2.1 to 5 x Opening Width	4	4
5	River Width over 5x Opening Width	5	5
Classification	**Evidence of Flow Restriction/Erosion**		
1	Unrestricted/no pooling	1	1
2	Flow detained/slight erosion	2	2
3	Minor pooling/ erosion present	3	3
4	Significant pooling/significant erosion present	4	4
5	Major pooling/major erosion present	5	5

Definitions:

Erosion: Is the wearing a way of sediments. (If tidal flow is restricted by a culvert, the speed of the water can increase as it goes through the culvert. This can increase erosion, as the water comes through with great force, wearing away the banks.)

Pooling: A pool of water is standing water (as opposed to flowing water in a river.) Pooling occurs when a pipe is too small. The water stands still, unable to flow through.

	Vegetation Comparison		
1	Upstream = Downstream	1	1
2	Upstream slightly different than downstream	2	2
3	Upstream different than downstream	3	3
4	Upstream much different than downstream	4	4
5	Upstream completely different than downstream	5	5

Vegetation Comparison: When the tidal range is reduced, the upstream habitat may no longer be dominated by salt marsh grasses, but instead may contain less salt tolerant species such as Common Reed (*Phragmites australis*) or freshwater species such as cattails (*Typha sp.*) In extreme cases, the habitat may evolve into shrub or forested swamp, and the former wetland may be invaded by upland species.

Salt Marsh Observations:

Record your observations of the following feel free to make comparisons:

COLORS:

TEXTURES:

SHAPES:

SMELLS:

SOUNDS:

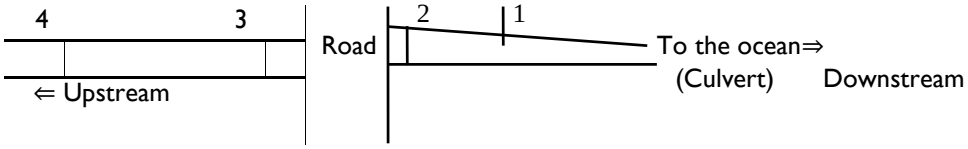
FEELINGS: (How does it feel to your feet, your skin, your emotions, etc.)

FISH DATA SHEET

Suggested App: Tide Charts Near me: https://play.google.com/store/apps/details?id=me.tidesnear.free&hl=en_US

Location: _____ **Date** _____ **Tide: Spring Neap**

Mass Audubon is studying to see if the size and species of fish differ upstream and downstream of a tidal restriction (an area where a small culvert prevents full tidal flow.)



If you are trapping fish upstream and downstream of a culvert, use the following labeling system:

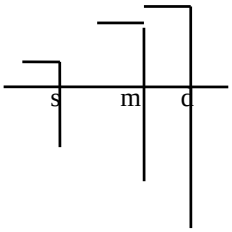
1. Furthest downstream (closest to the ocean)
2. Downstream of a culvert
3. First trap upstream of a culvert
4. Furthest upstream of a culvert (Furthest away from the ocean.)

Predict: A. Will there be more fish upstream or downstream?

Explain your answer _____

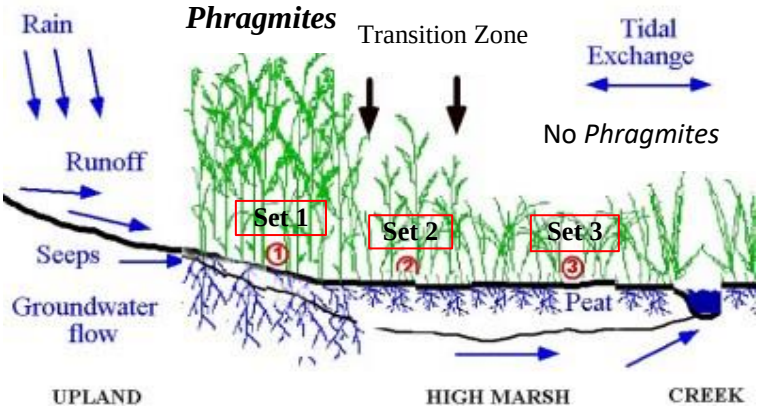
Time trap set	Time Trap Pulled	Total Time	Fish trap #	What species are present?	How many of each	Total volume of each species	Average volume of one fish. (ml)
				Downstream			
Biggest	Mummichog		Trap 1				
Smallest	Mummichog						
Set	Pulled	Total					
			Trap 2				
Biggest	Mummichog						
Smallest	Mummichog						
Set	Pulled	Total		**Upstream**			
			Trap 3				
Biggest	Mummichog						
Smallest	Mummichog						
Set	Pulled	Total					
			Trap 4				
Biggest	Mummichog						
Smallest	Mummichog						

SALINITY FIELD DATA SHEET



Shallow=5-20 cm
Medium=35-50 cm
Deep=65-80 cm

Date _____
Location: _____
Excel file name: _____well.xls
We do not know if shallow, medium, or deep water has the most impact on *Phragmites*. We are measuring salinities at different depths, and locations to see what impact it is having on the plant life.



1. **Make predictions:** Circle where do you think salinity will be greatest?
   Shallow Medium Deep
   Explain your prediction.

_____

_____

2. Wells are located at 3 different locations (See Diagram). Where do you think the greatest salinity levels will be found? (Circle one)

   1. In the *Phragmites* 2. In the transition zone 3. In the salt marsh grasses, with no *Phragmites*

3. Explain your predictions: Why do you think so?

_____

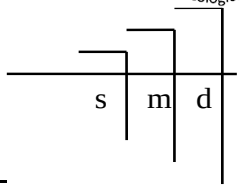
4. Measure salinity. Be sure to double check you are reading it accurately. Have members in your group double-check your answer

Set	**Transect 1**		**Transect 2**
Set 1.1 (in *Phragmites*)	Shallow_____ Medium_____ Deep_____ Notes:	Set 1.2	Shallow_____ Medium_____ Deep_____ Notes:
Set 2.1 (transition)	Shallow_____ Medium_____ Deep_____ Notes:	2.2	Shallow_____ Medium_____ Deep_____ Notes:
Set 3.1 (no *Phragmites*)	Shallow_____ Medium_____ Deep_____ Notes:	3.2	Shallow_____ Medium_____ Deep_____ Notes:
Set 5.1 (no *Phragmites*)	Shallow_____ Medium_____ Deep_____ Notes:		**Salinity: Background Information** Salinity is how salty the water is. The saltier the water is, the higher the salinity in parts per thousand. Something that is 20 grams salt out of a total of 1000 ml of water is written $20^0/_{00}$. We think that *Phragmites* has difficulty growing in high salinities (greater than $20^0/_{00}$) ($20^0/_{00}$ is the same as 2%).
Set	**Transect 3**		
1.3	Shallow_____ Medium_____ Deep_____ Notes:		
2.3	Shallow_____ Medium_____ Deep_____ Notes:		
3.3	Shallow_____ Medium_____ Deep_____ Notes:		

SALINITY FIELD DATA SHEET

Date: _____

Location:_____



Shallow = 5-20 cm
Medium = 35-50 cm
Deep = 65-80 cm

Locate on the map which transect you are sampling. Record the number here. Transect # _____

1. **Make predictions:** Circle where do you think salinity will be greatest?
   Shallow Medium Deep

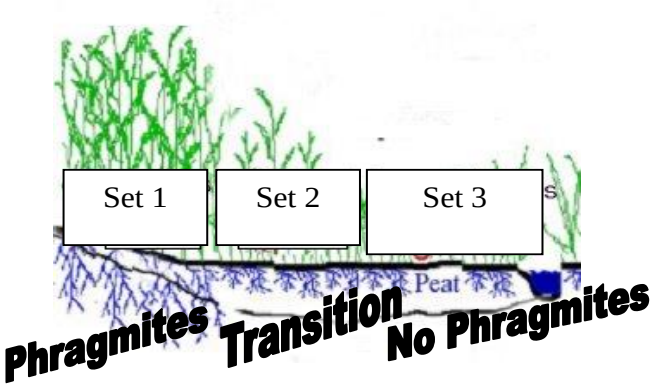
Explain your prediction. I think the _____ well will have the highest salinity because

_____

Salinity	Transect Number_____	Notes
Set 1 (In *Phragmites*)	Shallow _____ Medium _____ Deep _____	
Set 2 (transition)	Shallow _____ Medium _____ Deep _____	
Set 3 (No *Phragmites*)	Shallow _____ Medium _____ Deep _____	

2. Wells are located at 3 different locations. (See Diagram.) Where do you think the greatest salinity levels will be found? (Circle one)

Set 1. In the *Phragmites.* Set 2. Transition Set 3. In the salt marsh grasses with no *Phragmites.*



Explain your prediction. Why do you think so?
I think the set # _____ will have the highest salinity level because

_____

_____

___

3. Measure and record your answers above. Check the salinity scale. What category (or categories) is your salinity?

_____ Hyperhaline (Superhigh >35 ppt) _____Polyhaline (High 19-35 ppt) _____Mesohaline (Medium 5-18 ppt) _____Oligohaline (Low <5 ppt)_____ Fresh (0-.05 ppt)

4. Salt marsh scientists noticed that *Phragmites* has a hard time growing in salinity greater than 18 ppt. Is this trend supported at your site? What evidence can you give?

_____

Salinity Background Information: Salinity is how salty the water is. The saltier the water is, the higher the salinity. Most refractometers measure salinity in parts per thousand. Something that is 20 grams salt out of a total 1000 ml of water is written 20 $^{0}/_{00}$. We think that *Phragmites* has difficulty growing in high salinities (greater than 20 $^{0}/_{00}$) (20 $^{0}/_{00}$ is the same as 2 %.)

FIELD DATA SHEET for VEGETATION TRANSECT

LOCATION _____ Date _____ Teacher _____

Directions:

1. On your data sheet, circle the meter assigned to you. Record all of your data in that row.
2. Find your meter.
3. Look directly below the meter tape for plants.
4. Notice how many different plants are on your meter.
5. Identify each different kind of plant, using the identification key, pictures, or field guide.
6. If you have a question, ask!
7. Record on the sheet P for present in the row your meter is, when a plant is present.
8. If an "other" plant is present, record the name of the plant at the top of the column and mark P for present.
9. Measure the two tallest plants on your meter, record the type, and height in cm.
10. Give your group leader your data.

Distance	Height of tallest *Phragmites* on each meter.	Phragmites (*Phragmites australis*)	Saltmarsh cordgrass (*Spartina alterniflora*)	Saltmarsh Hay (*Spartina patens*)	Spike grass (*Distichlis spicata*)	other	other	other	other	other	other
along line											
0 to 1											
1 to 2											
2 to 3											
3 to 4											
4 to 5											
5 to 6											
6 to 7											
7 to 8											
8 to 9											
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24 to 25											

We are particularly interested in the height of the following plants: *Phragmites*, purple loosestrife, cattail and salt marsh cordgrass. Please record the height of the tallest of these species on your transect.

FIELD DATA SHEET for VEGETATION TRANSECT Teacher's Version

LOCATION _____ Date _____ Teacher _____

Directions:

1. On your data sheet, circle the meter assigned to you. Record all of your data in that row.
2. Find your meter.
3. Look directly below the meter tape for plants.
4. Notice how many different plants are on your meter.
5. Identify each different kind of plant, using the identification key, pictures, or field guide.
6. If you have a question, ask!
7. Record on the sheet P for present in the row your meter is, when a plant is present.
8. If an "other" plant is present, record the name of the plant at the top of the column, and mark P for present.
9. Measure the two tallest plants on your meter, record the type, and height in cm.
10. Give your group leader your data.

We are particularly interested in the height of the following plants: *Phragmites*, purple loosestrife, cattail and salt marsh cordgrass. Please record the height of the tallest of these species on your transect.

Distance	Height of tallest *Phragmites on each meter.*		Phragmites (*Phragmites australis*)		Salt marsh cordgrass (*Spartina Alterniflora)*		Saltmarsh Hay (*Spartina patens*)		Spike grass (*Distichlis spicata*)		other		other		other		other		other		other	
0 to 1																						
1 to 2																						
2 to 3																						
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22 to 23																						
23 to 24																						
24 to 25																						

If you are collecting data on more than one day, copy student's data into one column on one day, and the other column on the next, so you can compare. On the second day (or later) have student double-check any discrepancies.

Sample Sheet Filled in: FIELD DATA SHEET for VEGETATION TRANSECT

LOCATION _____ Date _____ Teacher _____

Directions:

1. On your data sheet, circle the meter assigned to you. Record all of your data in that row.
2. Find your meter.
3. Look directly below the meter tape for plants.
4. Notice how many different plants are on your meter.
5. Identify each different kind of plant, using the identification key, pictures, or field guide.
6. If you have a question, ask!
7. Record on the sheet P for present in the row your meter is, when a plant is present.
8. If an "other" plant is present, record the name of the plant at the top of the column, and mark P for present.
9. Measure the two tallest plants on your meter, record the type, and height in cm.
10. Give your group leader your data.

We are particularly interested in the height of the following plants: *Phragmites*, purple loosestrife, cattail and salt marsh cordgrass. Please record the height of the tallest of these species on your transect.

Distance along line	Height of tallest *Phragmites* on each meter	Phragmites (*Phragmites australis*)	Saltmarsh cordgrass (*Spartina alterniflora*)	Saltmarsh hay (*Spartina patens*)	Spike grass (*Distichlis spicata*)	Other Black grass	Other Glass-wort	Other Purple loose-strife	Other Sea lav-ender	Other
0 to 1	250	P						P 167		
1 to 2	244	P						P 165		
2 to 3	256	P						P 164		
3 to 4	225	P								
4 to 5	225	P								
5 to 6	220	P								
6 to 7	213	P		P						
7 to 8	200	P		P			P			
8 to 9				P			P			
9 to 10	175	P		P						
10 to 11				P					P	
11 to 12				P						
12 to13				P		P				
13 to 14				P		P				
14 to 15				P		P				
15 to 16				P						
16 to 17				P		P			P	
17 to 18				P		P				
18 to 19			P 33	P		P	P			
19 to 20			P34	P			P			
20 to 21			P 35	P						
21 to 22			P36	P						
22 to 23			P 37	P						
23 to 24			P 38	P						
24 to 25			P 39	P						

FIELD DATA SHEET for VEGETATION TRANSECT: Brackish Marsh

LOCATION _____ Date _____ Teacher _____

Questions: Is *Phragmites* spreading? Is the area that is a monoculture (where only *Phragmites* is growing) spreading? How fast? Is it growing tall and healthy or short and stunted? Did restoration efforts help? Compare your data to past years to notice. Directions:

1. Observe your plant sample closely. Be sure you know recognize the traits that are unique to your plant. Note how it looks both when in blossom (or with seed head) and without.
2. Look along the transect for your plant. If you do not see it immediately in a meter, pull aside other plants or wrack to look more closely. If you are in doubt ask for help!
3. Record a "P" in every meter that you find it.
4. Report your findings to your group leader. Make sure they record your data accurately.
5. If you are doing *Phragmites*, Make sure you measure the height in centimeters.
6. If you are doing some other plant, and it is the tallest plant on some meters, measure its height too
7. If you have extra time, do another plant

Distance along line	Ht. of tallest *Phragmites* (in cm.) (star which plant is tallest)	Phragmites (*Phragmites australis*)	Cattail (*Typha angustifolia*) **Please record Height.**	Creeping Bent Grass (*Agristus stolinifera*)	Goldenrod (*Solida go semperv irens*)	Silverweed (*Potentila anserina*)	Salt marsh Bulrush	Saltmarsh sedge	Saltmarsh Cord-grass (*Spartia alerniflora*)	other	other
0 to 1											
1 to 2											
2 to 3											
3 to 4											
4 to 5											
5 to 6											
6 to 7											
7 to 8											
8 to 9											
9 to 10											
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16 to 17											
17 to 18											
18 to 19											
19 to 20											
20 to 21											
21 to 22											
22 to 23											
23 to 24											
24 to 25											

We are particularly interested in the heights of: *Phragmites*, purple loosestrife, cattail, and saltmarsh cordgrass.

FIELD DATA SHEET for VEGETATION TRANSECT: Brackish Marsh Teacher's Version

LOCATION _____ Date _____ Teacher _____

Questions: Is *Phragmites* spreading? Is the area that is a monoculture (where only *Phragmites* is growing) spreading? How fast? Is it growing tall and healthy or short and stunted? Did restoration efforts help? Compare your data to past years to notice.

Teacher Directions:

- Make sure you are familiar with the plants and can help the students identify them accurately. Assign each pair one or two plants. (Assign similar plants to the same pair, pointing out differences, to avoid confusing one with the other.)
- Review the site prior to your visit, and bring in plant samples that you do not recognize to identify in advance.
- **Suggested book:** A Field Guide to Coastal Wetland Plants of the Northeastern United States by Ralph W. Tiner Jr.
- *Use the double columns to double check one group against another.* You want to compile one set of accurate data.
- Know your students. Who needs an "easy" plant? Who is attentive to details and will look hard for a rare one.
- **Remember: What is most important is we get the *Phragmites* data accurately. Double check that data yourself.**

1. Observe your plant sample closely. Be sure you know recognize the traits that are unique to your plant. Note how it looks both when in blossom (or with seed head) and without.
2. Look along the transect for your plant. If you do not see it immediately in a meter, pull aside other plants or wrack to look more closely. If you are in doubt ask for help!
3. Record a "P" in every meter that you find it.
4. Report your findings to your group leader. Make sure they record your data accurately.
5. If you are doing *Phragmites*, make sure you measure the height in **centimeters.**

Distance	Height of tallest *Phragmites on each meter.*		Phragmites (*Phragmites australis*)		Salt marsh cordgrass (*Spartina Alterniflora*)		Saltmarsh Hay (*Spartina patens*)		spike grass (*Distichlis spicata*)		other		other		other		other		other		other	
0 to 1																						
1 to 2																						
2 to 3																						
3 to 4																						
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Bird and Vegetation Observations:

Mass Audubon and Dr. Charles Redington author of *Plants in Wetlands Redington Field Guide* are interested in knowing how birds interact with different plants (vegetation). Please observe how birds are using plants. Are they nesting in cattails and *Phragmites* in the cordgrasses, do they use blades of these grasses to make nests, are they resting on these plants. Do they use these plants to hide in?

If you have many species of birds that you are observing have people in your team choose different species to observe, so you can collect information on each species.

Type of Bird	How many do you see? (Keep a tally.)	What is it doing?	What type of plant is it using/on/near? (A short grass, *Phragmites*, upland)	What is it using the vegetation for? (Nesting, resting, hiding, eating etc.)

Invertebrates/Vegetation Study

Date _____

Many creatures live on the salt marsh. A closer look will help you observe them.
Using a hula hoop or rope to de-mark the area you are studying, count how many creatures you can find on the vegetation, on the surface of the marsh, and in the mud. You might find spiders, insects, snails, crabs and more!

ANIMALS

Draw and/or name what you see.	How many? (Keep a tally)	Where did you find it? (On the surface of the ground, in the mud, under water)	How is it interacting with plants? (Eating, walking on, resting, making a nest/web, hiding in, etc.)	What kind of plant is it using? (Please be as specific as you can.) (What kind of grass)

Additional Questions:

What additional scientific questions do you have? How could you investigate those questions? Think of at least 3 questions including:

A) A question you could research on the internet or elsewhere.

B) A question you could ask a professional scientist.

C) A question you can design a study to investigate.

D) Explain the method of your study (Use additional paper if necessary).

List 5 things that are good (+) and bad (-) about this salt marsh.

(+)	(-)
i. –	i. –
ii. –	ii. –
iii. –	iii. –
iv. –	iv. –
v. -	v. -

Explain one of your (+) and one of your (-) answers.

(+):

(-):

Marsh Memories:

How has your knowledge and feelings about salt marshes changed?

I used to think salt marshes were .....

_____

_____

_____

And now I know the salt marsh is.....

_____

_____

_____

What actions do recommend to take to help improve and protect the salt marsh in your town?

a. _____

b. _____

c. _____

What additional questions would you like to investigate on the salt marsh?

a. _____

b. _____

c. _____

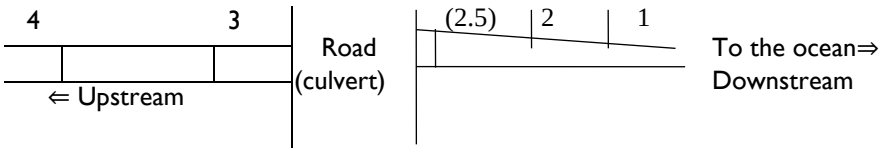
FISH: CLASS COMPARISON

Name: _____ Date: _____

Location: _____ Class:_____

Class comparison:

Write the number of fish present in each trap location:



Location	Trap 1		Trap 2		Trap 3		Trap 4.	
Fish Species	Number	Ave. Vol.	Number	Ave. Vol.	Number	Ave. Vol.	Number	Ave. Vol.
Mummichog								
Silverside								
3 Spined Stickleback								
4 Spined Stickleback								
9 Spined Stickleback								
Sand Shrimp								
Shore (grass) shrimp								
Eel								
Crab								
Other:								
Total # organisms								
Total Volume								
Total # of species								

1. Which trap had the most fish? _____
2. Which trap had the greatest average volume of fish? _____
3. Which trap had the greatest variety of species?
4. What are possible explanations for these results?

_____

_____

_____

_____

5. Design a graph that would be helpful in communicating your results. Graph this data.

CLASS VEGETATION ANALYSIS

Name: _____

Location: _____ Date data taken _____ Class _____

Make a graph showing the vegetation present along the total transect. Be sure to make a key for your graph.

Distance in Meters	01	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Phragmites																									
Cordgrass																									
Saltmarsh Hay																									
Spike Grass																									
Glasswort																									
Bulrush																									
wrack																									
Sea blite																									
Orach																									
Goldenrod																									
Other:																									

1. In how many meters is *Phragmites* present? _____
2. What percent of the total number of meters, is *Phragmites* present in? _____
3. Compare this graph with information collected last year, or to information from anther school. How are they the same? How are they different?

_____

_____

4. We are investigating whether *Phragmites* is spreading, and how fast. What do you think the vegetation will look like next year? Use a code, or different color to draw in your prediction. Explain why you think it will look like that.

_____

_____

5. What are 2 questions you can answer from looking at this graph?

_____

_____

6. What more do you want to know, now that you have seen this information?

_____

_____

CLASS SUMMARIES

Summarize your findings:
See below for an example of a summary of the vegetation data.

Sample Vegetation Summary:

At the Rockport site, near route 127, Mass Audubon staff found 5 meters of *Phragmites* on their 25 meter vegetation transect. Twenty percent of the total transect had *Phragmites* present. The tallest *Phragmites* plants were 306 cm and 269 cm. Mass Audubon staff noticed three other grasses present, and two other herbaceous plants. Wrack was present along 9 meters (36%) of the transect. Cordgrass was present on 52% of the transect (13 meters) and saltmarsh hay was present on 92% of the transect (23 meters). Spike grass was present on 8 meters, or 32%.

Discussion: Because a ditch is present along this transect at 9-10 meters, bringing in water with high salinity, I expect that the *Phragmites* stand will not expand much further into the marsh, unless further sedimentation raises the elevation further. Nearby storm drains are access points for sedimentation (sand and dirt is pushed onto the marsh from the road), raising the elevation (height) of the marsh. This seems to cause favorable conditions for the growth of *Phragmites*. Questions to investigate include: How large an area did this increased sedimentation impact and how high has sedimentation raised the elevation? Taking soil cores to compare the sediments and measuring elevation on the marsh will help answer these questions.

Wrack is spread far along the transect. This may indicate that the tide flows into the *Phragmites* stand at least occasionally. Some wrack was just a few strands of grasses, others were large mats of mixed grasses. In the future, I want to record comments to indicate these differences. Large mats of wrack will kill vegetation underneath, if left there for long periods of time. This may lead to changes in vegetation over time.

1. Write paragraphs summarizing your fish data, vegetation data, and salinity data.

2 What patterns are you finding, through studying your data?

3 What additional questions do you have?

4 Which of these questions could you investigate, and how?

5 What interactions between plants and animals have you observed on the salt marsh?

6 What special project would your school like to investigate, in addition to this study?

7 What questions do you want students in other schools to investigate with you?

When you have summarized the information, please send it to Mass Audubon. We will share it with other schools.

Post-trip activities:

Have students compile and discuss the data:

Vegetation

1. Post all vegetation data on the board, and have students graph it, and answer the questions at the bottom of the vegetation analysis page. You may have students work individually, in pairs, or in groups.
2. Discuss their findings. Was the data collection accurate? (Did students collect the same information from the same sites?)
3. If you have data from a previous year: Is the *Phragmites* area growing? What are student's predictions for the future?
4. What more do students want to know?

Fish data:

1. Have students who have data from different fish traps post the information on the board.
2. Note which fish traps had the most fish. Discuss possible reasons why. List all hypotheses.
3. What is impacting your fish traps?

Salinity:

Notice patterns: Where was the salinity the highest? Lowest? What was the highest salinity in the *Phragmites* stand?

Tides:

Did the tide enter the transition zone (where there are mixed vegetation and *Phragmites*)? Did it enter the *Phragmites* stand? How high was the tide? Use the tide chart to figure: how many days of the year have a tide that height, or greater?

Summarize and share: Summarize and share what you are learning. Students may choose the best summaries to post to other schools. Use the graphs to help illustrate your points.

Additional Questions:

Discuss:
(Owning the questions)
What are additional questions that students have? Which questions can you answer through observation? Research using books, internet or interviews, or through further investigation.

Design a new study:
Decide which question(s) are ones students can investigate, and with them design a study to investigate that question. If you have questions about the design of your study, feel free to contact Liz Duff and Robert Buchsbaum, at Mass Audubon for advice.

Conduct your study.

Analyze your data: Summarize what you are finding.

Share your methods and results with others: Use email or the internet to let other schools know what you are studying. They may be able to help you collect data!

Optional Extensions:
(Useful for assessment)

A Plan out and create a slide show of your site.
Take photographs of your site. Get the photos on a floppy shot disk. Add text to the disk, and create a slide show of your site.

B. Make a field guide to the creatures and plants that you find on your site.

C. Make an identification key for identifying animals, or upland plant species on your site.

D. Design a poster or brochure explaining why this area is important to your town. Include historical uses, and current day uses. Explain possible threats to this habitat, and ways of protecting and restoring it.

E. Design a project of your own, get it Ok'd by your teacher, and do it!

Technology:

Teachers have found this project provides excellent reasons to integrate technology.

The following is a brainstorm created by Rockport teachers for creating a web site. Also enclosed is an assignment, using the internet for research purposes.

The Massachusetts Audubon Salt Marsh Science Web site provides an opportunity for you to learn more about Salt Marsh Science, to compare your data with data collected by other schools, and to link your web site to.

This web site includes a "Murder in the Tidepool" for your students to investigate, Upcoming Events, Data Summaries, Graphs, and Additional Resources.