This report is intended to engage educators of the greater Brunswick community with the Vital Signs program put forth by the Gulf of Maine Research Institute (GMRI). GMRI is one of the most highly respected and advanced institutions dedicated to marine ecosystem science and science education in the country. Their connection to real science and scientists is what makes their educational programs so exciting for students. Maine is fortunate to have GMRI as an educational resource as GMRI is attempting, through their innovative and technological advanced education programs, to “make Maine the most science literate state in the country”. Vital Signs is just one of their educational programs that targets Maine students. Although the program is often given to middle school students, it can be applicable to almost all science students or enthusiasts. This report will guide you through one ‘mission’ designed by Vital Signs which located in Brunswick that could potentially enhance your current science curriculum and program. GMRI and Vital Signs are always looking for feedback, so if you have any questions or feedback you should refer to their website: www.gmri.org

Guiding Principles of GMRI:
* Provide Opportunities for Authentic Science Learning
  * Engage All Learners
  * Develop Communities of Practice
  * Connections to Place

What is ‘Vital Signs’?

Vital signs is field-based science education program designed by the Gulf of Maine Research Institute aimed at promoting “civilian science” in middle school students. The main focus of the program is to get students involved with the process of identifying invasive species in their local community and communicating their data to real scientists. Scientists use the information provided by students and have been directing the research ‘missions’ that Vital Signs engages in.
How Vital Signs Works:

Vital Signs gives a lot of flexibility to teachers in how they want to engage with the program, as Vital Signs is meant to compliment existing work done in the classroom. The report will go into detail about ways to tailor fit the program to your setting, but there are three major steps in the process that every curriculum should incorporate. These steps are:

1. Choose Your Mission
2. Go Look for Species
3. Publish Your Data Online

There is an ongoing Vital Signs mission in Brunswick, ME with Scientists working for the Casco Bay Estuary Partnership at the Thomas Cove Salt Marsh. Ever since the culvert that runs under Adams road was enlarged in August of 2011, the amount of water in the Thomas Cove salt marsh has increased during high tide which has lead to an increase in the amount of salt on the surface and ground water. This is important to research on invasive species because these changes are expected to change which species are found in the salt marsh, and where they are found. The scientists are under going a 5 year monitoring program to see how the marsh plants change over time, but they need help to track invasive species that could potential begin to appear. That’s where student scientists can play a huge role!

The Research Question this Vital Sign Mission is trying to solve is:

Are phramites and other invasive plants increasing in a recently restored marsh in Brunswick?
Getting Started:

Vital Signs provides teachers with materials that can help guide you along in your class’ exploration of the salt marsh. Below is the species cards for the invasive species Phragmites, that the scientists are most concerned with in the Thomas Salt Marsh. Species cards are supposed to provide students with all of the necessary information needed to accurately assess whether or not the species that they are looking at is the invasive species. The ‘similar species section’ is supposed to alert the student about the possibility of similar species which could makes the identification of the species difficult and what makes detailed information on the species incredibility important in observations.

The Species Observation Sheets are located on the following pages. Look at the type of information that the sheets are asking students to look for along side the information provided on the species card.

The main objective is for students to use evidence to make a claim to whether they found an invasive species or not. What tools would your students need before observing to make these complex observations?
Species Survey: Upland Habitats

TEAM NAME: ____________________________________________
DATE: ____________________________

1. PLACE

* Without these data scientists can't use your observations.

Tell us where your study site is and what it looks like.

STUDY SITE PHOTO *
☐ Check this box after you take the best wide-shot photo you can.

Take a photo that helps everyone see where you are doing your study. No faces. Just the scene, please.

LOCATION OF STUDY SITE ON EARTH *
Enter the geographic address of your study site in decimal degrees. Please triple-check your entry to make sure all digits are right.

Latitude: ________
Longitude: ________

Make sure you record your latitude and longitude in decimal degrees, like this:
N 43.44712
W -70.78105

HABITAT *
☐ In a forest ☐ In a field ☐ In a developed area

Choose the major habitat that best describes the place where you are doing your investigation. Where are the plants or animals you are looking for living?

2. FIELD NOTES

Use this space to tell us what happens while you are collecting data.

I am happy because…

Questions and problems I ran into…

I see, hear, and smell…

My drawings and sketches…

I am surprised by what I found or didn’t find because…
3. SPECIES

* Without these data scientists can’t use your observations.

Tell us how you are doing your study, what species you are looking for, and whether or not you find it.

**SAMPLING METHOD** *
- [ ] Just looking around
- [ ] Quadrat (user-placement)
- [ ] Quadrat (randomized-placement)
- [ ] Transect
- [ ] Time search

Choose the method you are using to do your study.

**SAMPLING METHOD PHOTO** *
- [ ] Check this box after you take the clearest photo you can

Take a photo that helps everyone see the method you are using to collect data. No faces. Just show off your method.

**WHAT SPECIES ARE YOU LOOKING FOR?** *

Scientific name:

Common name:

Did you find it? *
- [ ] I think I found it
- [ ] I think I did not find it

Write the scientific name and a common name of the species you are looking for.

Back up your claim with evidence

Use written and photo evidence to prove that you either *found* or *did not find* the species you are looking for. The more evidence you provide, the stronger your case will be. Note: if you *did not find* it, prove that you looked carefully and explain how you ruled it out.

**Written evidence 1** *

Give one good reason you think you found or did not find the species you are looking for. Use your species identification resources to help you write your evidence statement.

**Photo evidence 1**: Take the clearest photo you can.

Take a photo that supports your written evidence.

**Written evidence 2**

Make a stronger case for your decision. Give a second reason that supports your claim.

**Photo evidence 2**: Take the clearest photo you can.

Take a photo that supports your written evidence.

**Written evidence 3**

Make the strongest case possible. Give a third reason that supports your claim.

**Photo evidence 3**: Take the clearest photo you can.

Take a photo that supports your written evidence.
A main goal of *Vital Signs* is to help students to think critically. *Critical thinking is meant to be self directed process which utilizes good reasoning while addressing a novel problem*. The program is designed to get students to observe species in the natural world and with the tools provided, make a claim to **whether or not** they think they have found an invasive species.

Some teachers using *Vital Signs* have found that their students have trouble producing answers that explain why they think the species observed is the invasive species in question, but also evidence to rule out the possibility of it being a ‘similar species’ listed on the card. Before you begin *Vital Signs* you may want to take the time to see where your students are in their scientific, research and writing skills. *Vital Signs* could be a training ground where critical thinking and writing are practiced, or it could build on skills already addressed in the classroom. Further more it could be beneficial if you practice outdoor observations before your first *Vital Signs* lesson so that the students have skills to fall back and utilize while performing the mission.

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**Angles you can take with Vital Signs in your classroom**

**A way to teach your class about Critical Thinking**

**A way to get your class to use critical thinking skills in an applied and meaningful way**

**A way to teach your class about research and observation**

**A way to get your class experience with the scientific method**

**A way to get your class excited about Science**
Things to think consider when using Vital Signs as a way to…

**teach your class about Critical Thinking**

The difference between the two species may not be very apparent out in the field and consequently the student’s explanation may not be rich enough for the scientists to use. Before going out into the field it may be worth doing in class guided observations so that the students have exposure with thinking critically and providing evidence to support their claims. Since Phragmites are not very recognizable it could be beneficial to bring in the species along side a couple other similar species.

A Sample Activity Could Be...

Bring into class a couple samples of: Phragmites, Milkweed, Ferns, Wheat grass, Cattails or other similar grasses found in Marshes.

Put the plants in different observation stations around the classroom and have the students go observe each station and list the interesting features that they notice about each plant.

Bring the students together and introduce the idea of a ‘mystery invasive species’ that is located among the different plants. Make sure to explain what an invasive species is and its significance to local ecosystems.

List the five qualities about pharamties that makes it stand out from all other grasses.

1. Tall, narrow, sword like leaves
2. Leaves that are 2-5cm wide and can be up to 1/2 m long
3. leaves that are much shorter than the stem
4. Stems that are hallow
5. Flowers that attach to the end of the stem. They are purple in the summer and gold in the fall

Have the students go through the observation stations with these five criteria in hand and have them come up with 3 reasons why they think their chosen grass is a Phargmites and 2 reasons why the other grasses are not Phragmites

Come back to the classroom and have students share their findings and reasoning
Things to think consider when using Vital Signs as a way to...

**get your class to use critical thinking skills in an applied and meaningful way**

If your classroom already has experience with critical thinking, if could be beneficial to push your students to look to outside resources as evidence to back-up their claim of the identification of the invasive species. In order to give them practice finding their own way to prove their claims, think about giving them options to the resources they could use. Have the species cards as an option, but do not guide their use of resources.

Think about having the students engage in a planning session before they go out into the field. Have them come up with steps to figure out how to identify the species. In this planning session, allow them to use their laptops and have available field guides and species cards so that their process is more student driven.

**An handout like this may be helpful for their initial plan for the field observations:**

The species I am looking for is called: ________________

Some characteristics of the species are:
________________________________________________________________________
________________________________________________________________________

Similar species that look like the invasive are:
________________________________________________________________________

I will be able to identify the invasive species over the similar species by:
________________________________________________________________________
________________________________________________________________________

The three main features I will be assessing the field will be:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Sources Cited:
Things to think consider when using Vital Signs as a way to...

to teach your class about research and observation

Vital Signs also provides an amazing opportunity for students to practice observation skills in a real field environment. If your students have never engaged in any kind of field science it will be important for you to ‘train’ them in the proper observation techniques. Vital Signs has already formulated an excellent lesson plan to train students to be able to: identify high quality data, identify similarities and differences between species, practice making claims that are supported evidence and how to make estimates amount how many of one species they see.

To See This Lesson Plan Click Here
Things to think consider when using Vital Signs as a way to...

**to get your class experience with the scientific method**

An amazing resource that Vital Signs provides is their online database which allows students to interact with professional scientists and other civilian scientists like themselves! The last step of every mission is to report your findings to the Vital Signs database. The students data is then reviewed by scientists, who report back to the students about their data and often ask follow up clarifying questions. While every class should make sure to put their data online, classes that are concentrating on the scientific method have the opportunity to use all of the information stored online to follow the real scientists’ methods. For the mission in Brunswick the scientists have already implied a question and hypothesis: species will change due to increase of salt water in the marsh. However, there is currently no activity on the mission online! This provides and opportunity for members of the Brunswick community to work together to develop their own scientific analysis.

If time is allotted, try to go out multiple times to the research site to see if your class can track any changes, or try to team up with other classes so that you could measure the change overtime. You could also compare findings of Phragmites, in different areas in the state to try to make analysis across different sites! Be Creative and have fun! This is an amazing tool to show science as a method! Use the Analysis: [Change Over Time Guide](#) provided by GMRI to assist you with the analysis.
Final Tips for Mission:
Phragmites in Brunswick's Thomas Cove salt marsh

Try to do your analysis in the late spring or early summer because that is when the Phragmites are most recognizable due to their purple flowers.

Encourage students to use their own skills to make observations about the data. Drawings and Videos can sometimes be more helpful than written prose to scientists. Allow student to be creative!

Have an area or issue that is of interest to you or your own class? You can build your own mission through the resources of Vital Signs, but it may be helpful to start with a program already in motion.

This report was written from an outside perspective through communication with GMRI staff, if you want more insight contact GMRI directly!