Student-Led Garden Design

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State Arboretum of Virginia, University of Virginia

Workshop Agenda

- Share the garden projects and the process we used to shift to student led garden design.
- Design a garden in smaller groups.
- Test (2 or 3) of our designs outside.
- Explore activities created to help students research, design, and build a garden.

University of Virginia's
Blandy Experimental Farm
&
The State Arboretum of Virginia

Blandy's Mission:
To increase understanding of the natural environment through research and education

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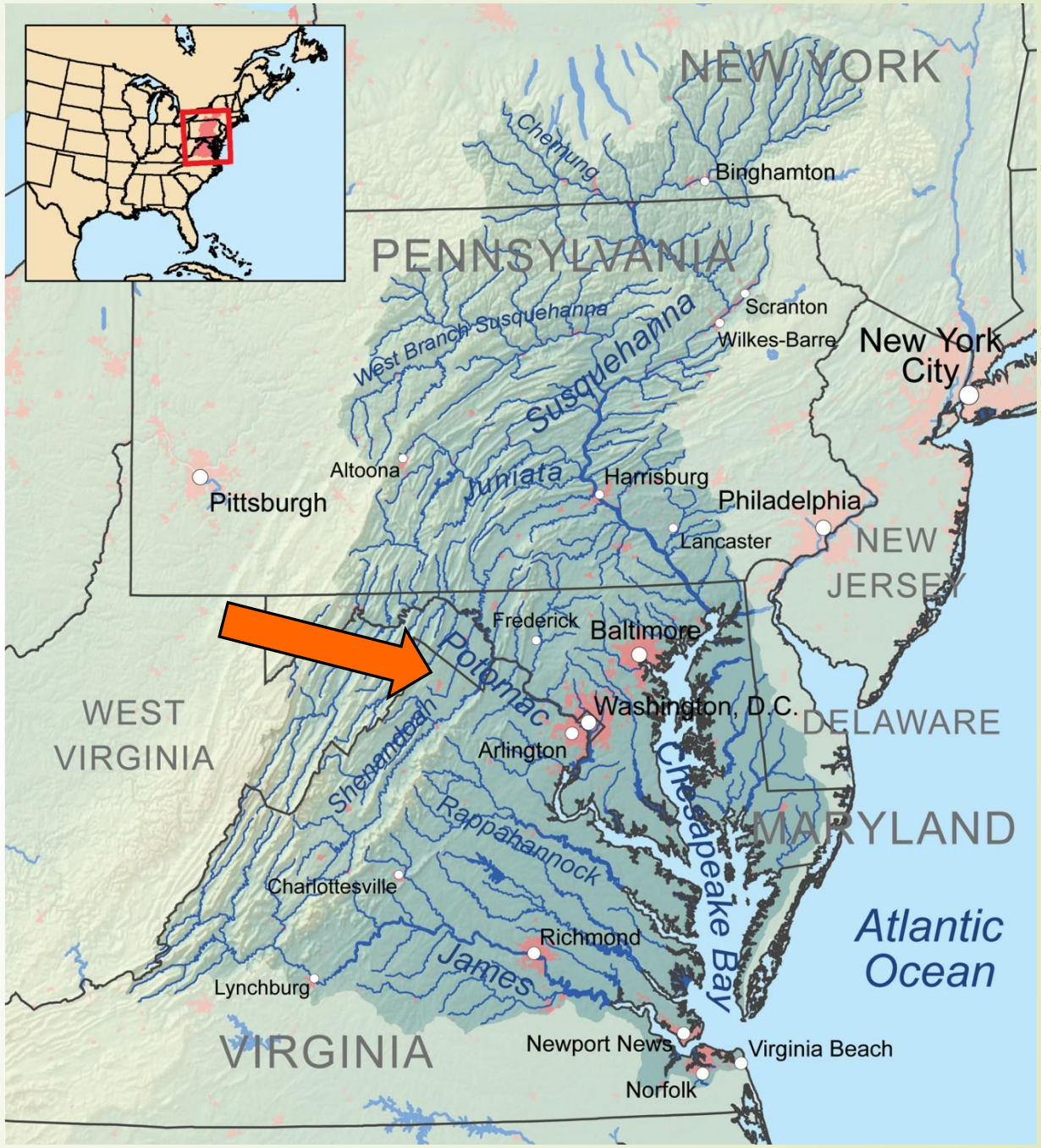
University of Virginia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State Arboretum of Virginia Education Programs

<u>Our program mission</u>: To stimulate scientific exploration, discovery, & stewardship of our natural world by fostering a learning community among preK-12 students, educators, & scientists

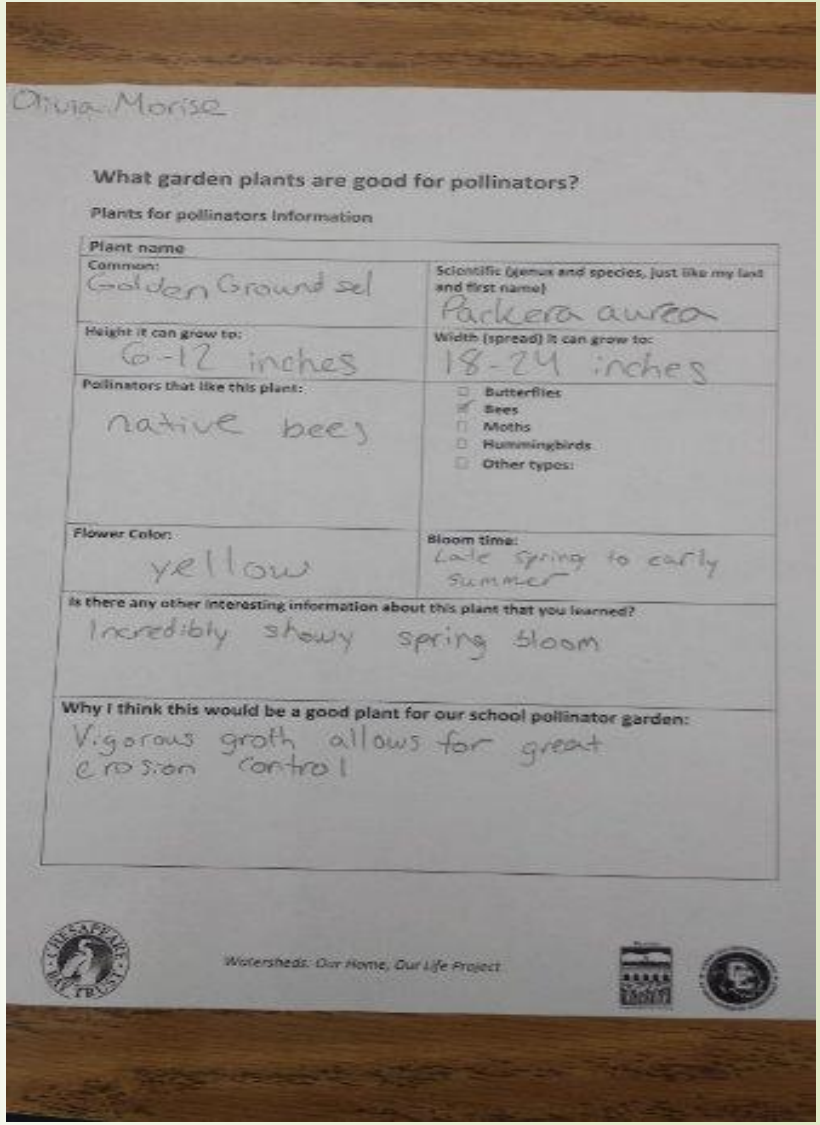
The Challenge:

- How can we facilitate STUDENT-LED garden planning, design, and planting?

The 4th grade garden site at their school
6 7' x 5' triangular raised beds

This project was funded through a grant from the Chesapeake Bay Trust, award # 13246

4th graders research & plan a pollination garden



Olivia Morise

What garden plants are good for pollinators?

Plants for pollinators information

Plant name	
Common: Golden Ground sel	Scientific (genus and species, just like my last and first name) Packera aurea
Height it can grow to: 6-12 inches	Width (spread) it can grow to: 18-24 inches
Pollinators that like this plant: native bees	☐ Butterflies ☑ Bees ☐ Moths ☐ Hummingbirds ☐ Other types:
Flower Color: yellow	Bloom time: Late Spring to early Summer

Is there any other interesting information about this plant that you learned?

Incredibly showy spring bloom

Why I think this would be a good plant for our school pollinator garden:

Vigorous groth allows for great erosion control

Watersheds: Our Home, Our Life Project

Researching plants for the pollination garden

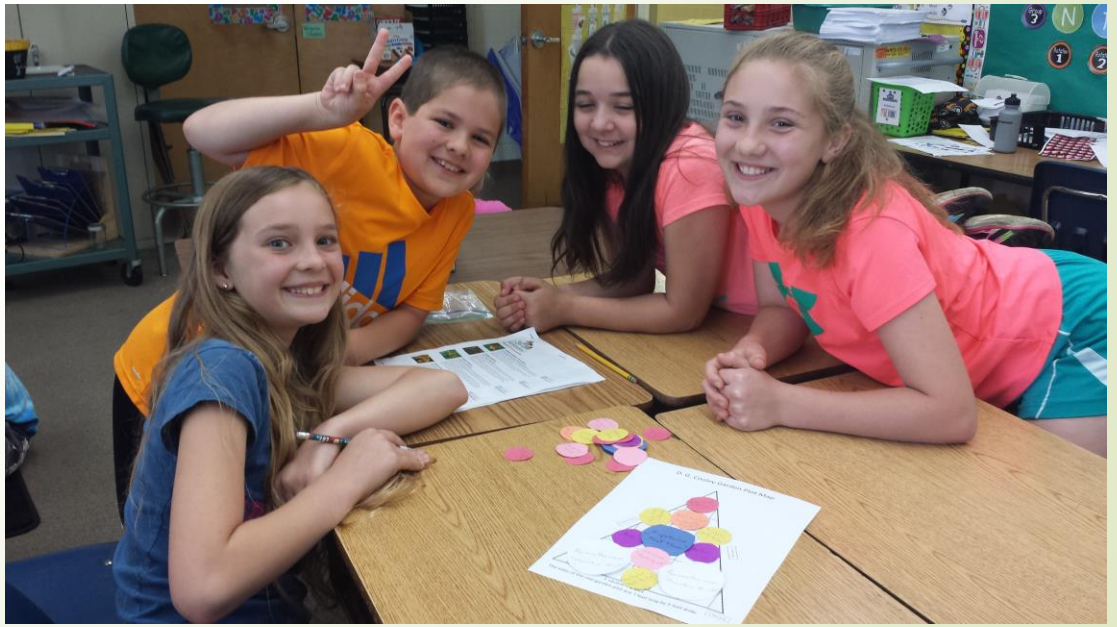
How much space does one plant need?

Pollination Station: Flower Pollinators

Student Names _____

Record Plant Name from label	
Observe a cluster of flowers for 30 seconds. Count the **number of all animal visitors** you see on the flower.	
Observe the same cluster of flowers for one minute. **Count the different types** of visitors (ex. Big bumblebee, red butterfly, stink bug.) You are not counting each organism but <u>type.</u>	
Choose **one insect** visiting the flower you are observing and **observe** it for **one minute**.	
What is the organism **doing**?	
Is the animal getting nectar or pollen? Doing something else?	(circle one) Nectar Pollen
Do you see **pollen** on the animal?	Yes No
Where is the pollen located?	
Describe any evidence that pollen is being moved from the flower.	


US NATIVE
LITTLE LANTERNS
PERENNIAL
WILD AGERATUM
GOLDEN BACHOFF



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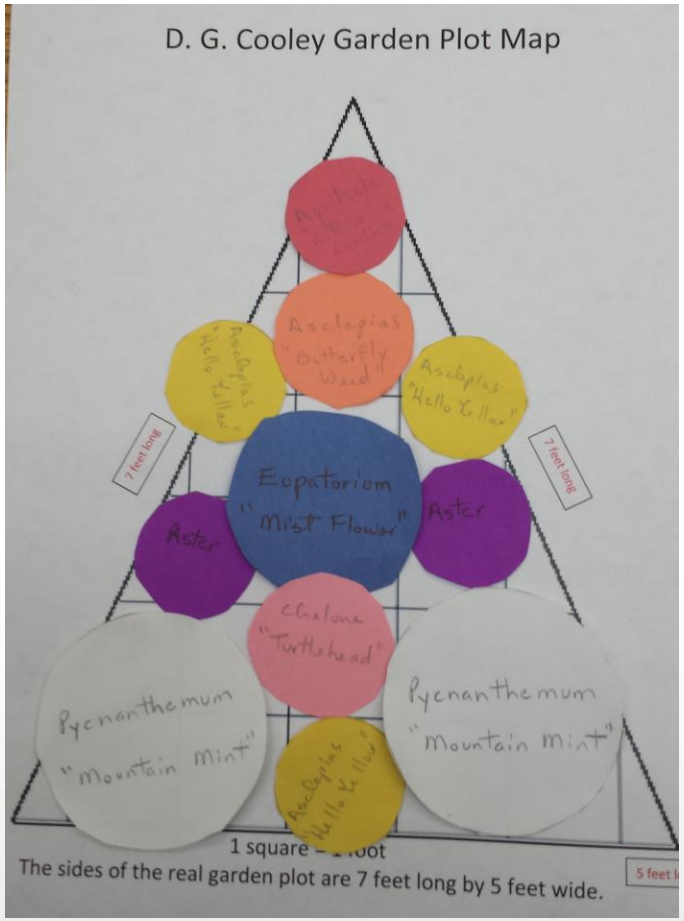
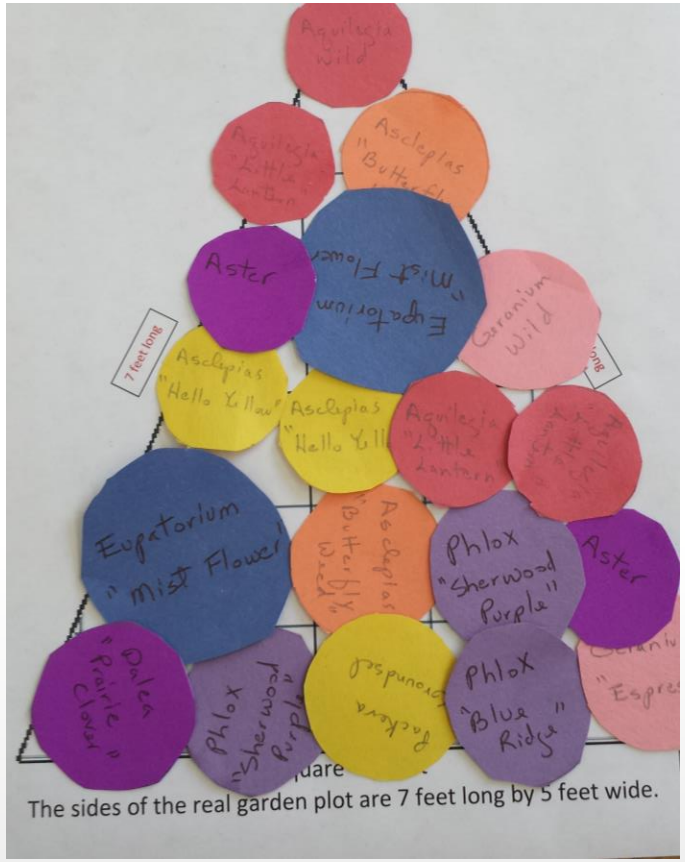
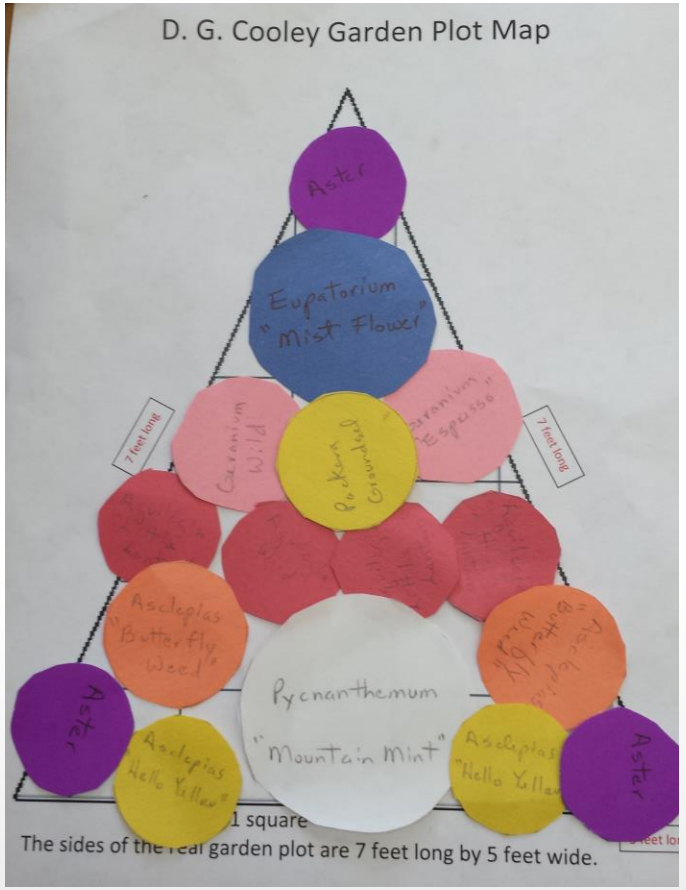

D. G. Cooley Garden Plot Map
Asclepias "Butterfly Weed"
Asclepias "Hello Yellow"
Eupatorium "Mist Flower"
Aster
Chelone "Turtlehead"
Pycnanthemum "Mountain Mint"
7 feet long
1 square
The sides of the real garden plot are 7 feet long by 5 feet wide.


Eupatorium "Mist Flower"
Aster
Asclepias "Hello Yellow"
Phlox "Sherwood Purple"
Phlox "Blue Ridge"
Dalea "Prairie Clover"
The sides of the real garden plot are 7 feet long by 5 feet wide.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7 feet long
1 square
The sides of the real garden plot are 7 feet long by 5 feet wide.

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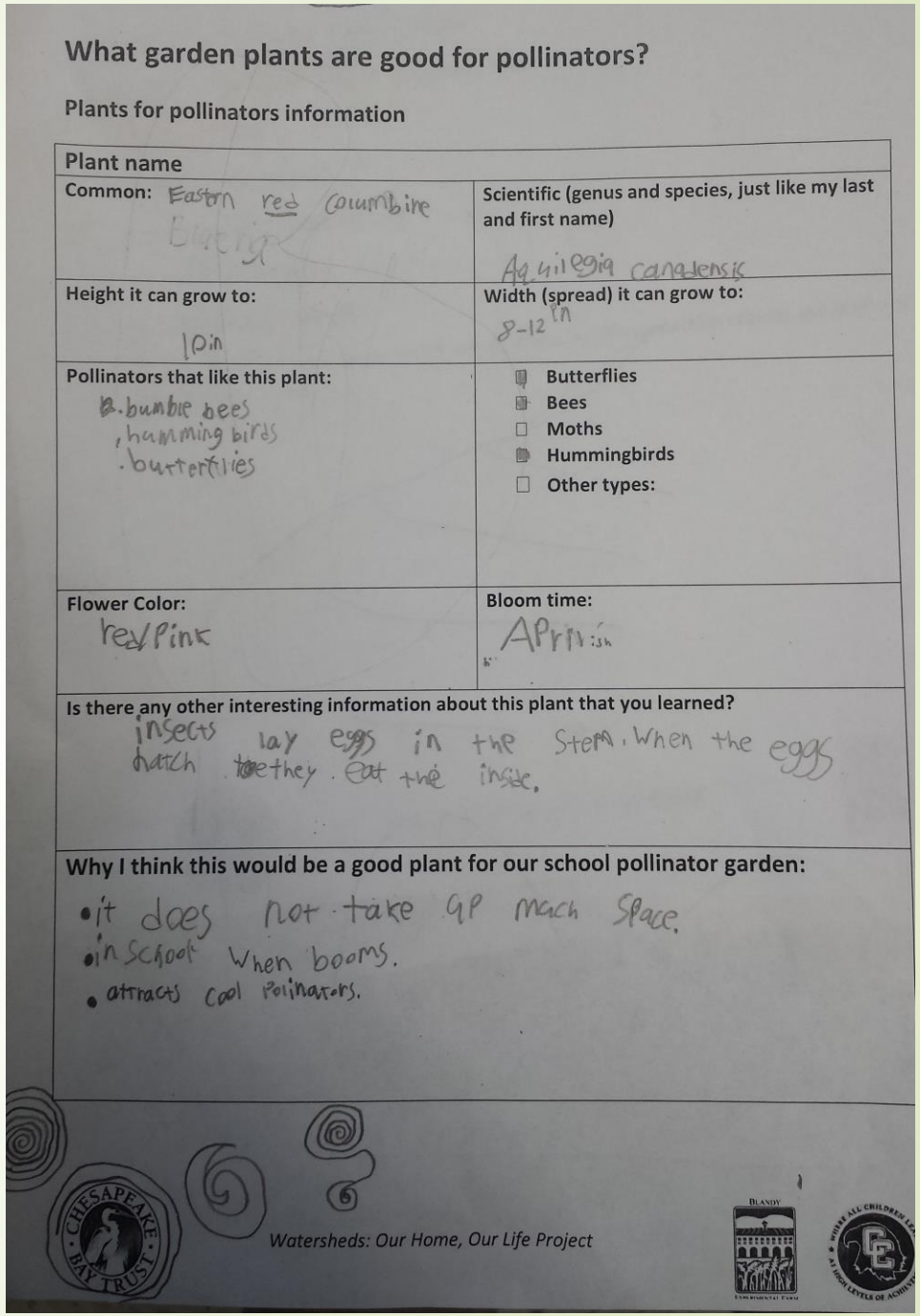
Let's design a garden!

Supporting Activities

https://blandy.virginia.edu/content/ed-programs-activities-and-lessons

What Plants are Good for Pollinators?

Goal: Students use online & printed materials to help select the native plants for their schoolyard pollination gardens.



What garden plants are good for pollinators?

Plants for pollinators information

Plant name	
Common: Eastern red columbine Butrfly	Scientific (genus and species, just like my last and first name): Aquilegia canadensis
Height it can grow to: 10in	Width (spread) it can grow to: 8-12 in
Pollinators that like this plant: B. bumble bees, humming birds, butterflies	☐ Butterflies ☐ Bees ☐ Moths ☐ Hummingbirds ☐ Other types:
Flower Color: red/Pink	Bloom time: April-ish

Is there any other interesting information about this plant that you learned?

insects lay eggs in the stem. When the eggs hatch they eat the inside.

Why I think this would be a good plant for our school pollinator garden:

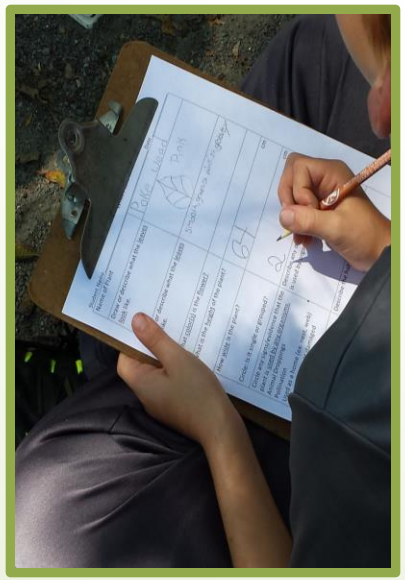
- it does not take up much space.
- in school when blooms.
- attracts cool pollinators.

Watersheds: Our Home, Our Life Project

Supporting Activities

What Plant Where?

Goal: Students explore & observe native plants for attributes (height, width, flower color, leaf shape, and habitat) that should be considered when choosing plants for a native plant garden. Students understand that a diversity of plant types is important for a native plant garden.



What Plant Where?

Student Name _____ Date _____

Name of Plant	Sea OATS
Draw or describe what the leaves look like.	Long pointy green. (grassy) point tip small.
Draw or describe what the leaves feel like.	smooth sticky
What color(s) is the flower?	NO
What is the height of the plant?	59 cm
How wide is the plant?	65 cm
Circle: Is it single or grouped?	
Circle any signs/evidence that the plant is used by any organisms. Animal Droppings Pollination Used as a home (ex. nest, web) Parts are eaten or damaged	Describe any other evidence that the plant is used by organisms. Chew
What is the habitat like? (circle all those that apply) Sunny Shady Wet Dry Rocky Leaf litter HUMID	Describe the habitat. grass + forest

Supporting Activities

Pollination Station

Goal: As Pollination Scientists, students investigate plant & pollinator interactions. What plants do pollinators & other organisms visit the most? Data was used to choose plants for the school pollination garden based on pollinator diversity.

Pollination Station: Flower Pollinators

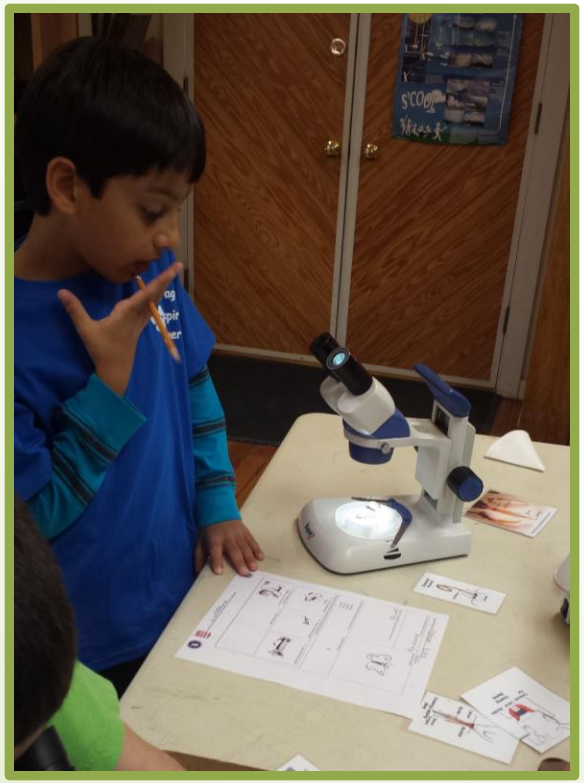
Student Names _____

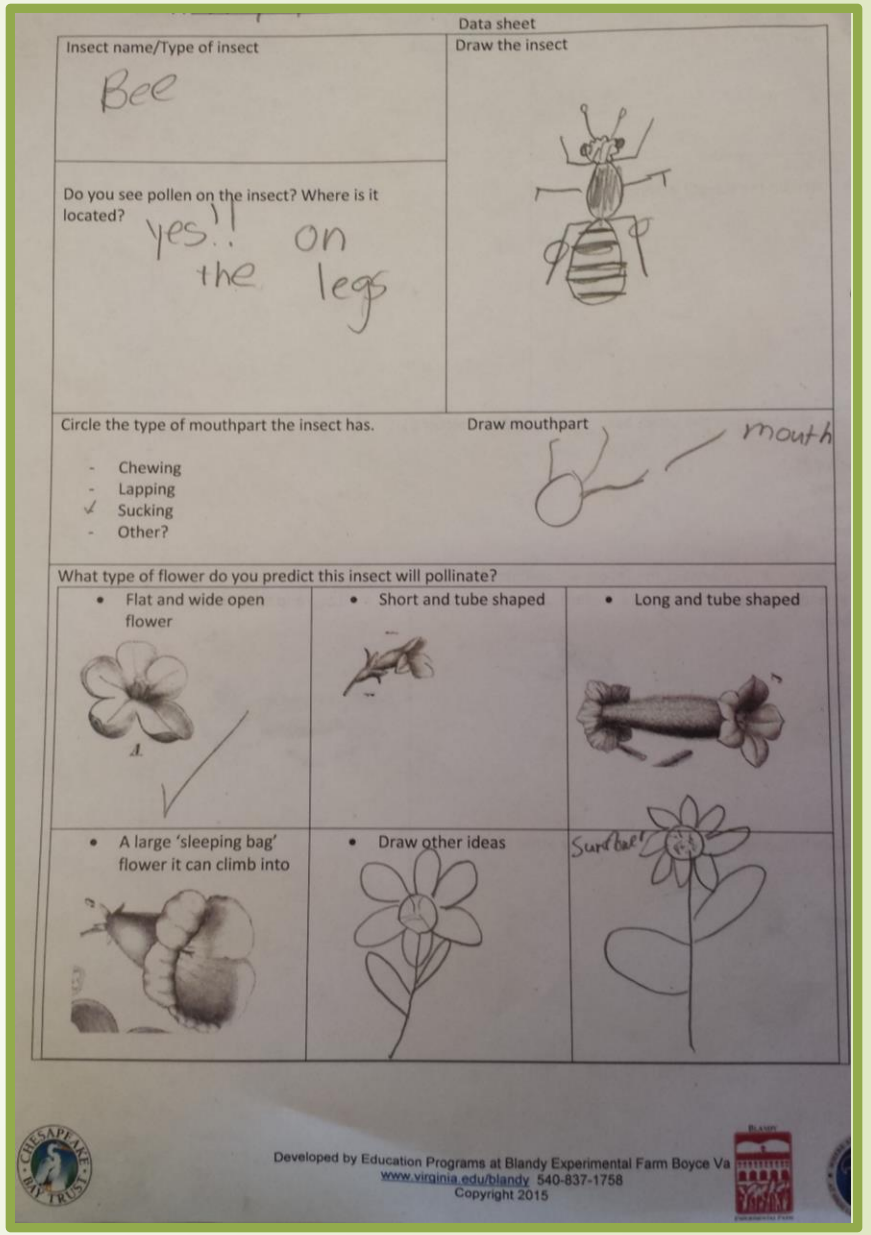
Record Plant Name from label	
Observe a cluster of flowers for 30 seconds. Count the **number of all animal visitors** you see on the flower.	
Observe the same cluster of flowers for one minute. **Count the different types** of visitors (ex. Big bumblebee, red butterfly, stink bug.) You are not counting each organism but type.	
Choose **one insect** visiting the flower you are observing and **observe** it for **one minute**.	
What is the organism **doing**?	
Is the animal getting nectar or pollen? Doing something else?	(circle one) Nectar Pollen
Do you see **pollen** on the animal?	Yes No
Where is the pollen located?	
Describe any evidence that pollen is being moved from the flower.	

Supporting Activities

Insect Adaptations

Goal: Students explore ways that insects collect pollen & compare mouthparts to determine if an insect collects pollen or nectar. What are some adaptations that insects have that help them to feed on different foods & from different parts of plants?





Virginia Science Standards of Learning

Science and Engineering Practices:

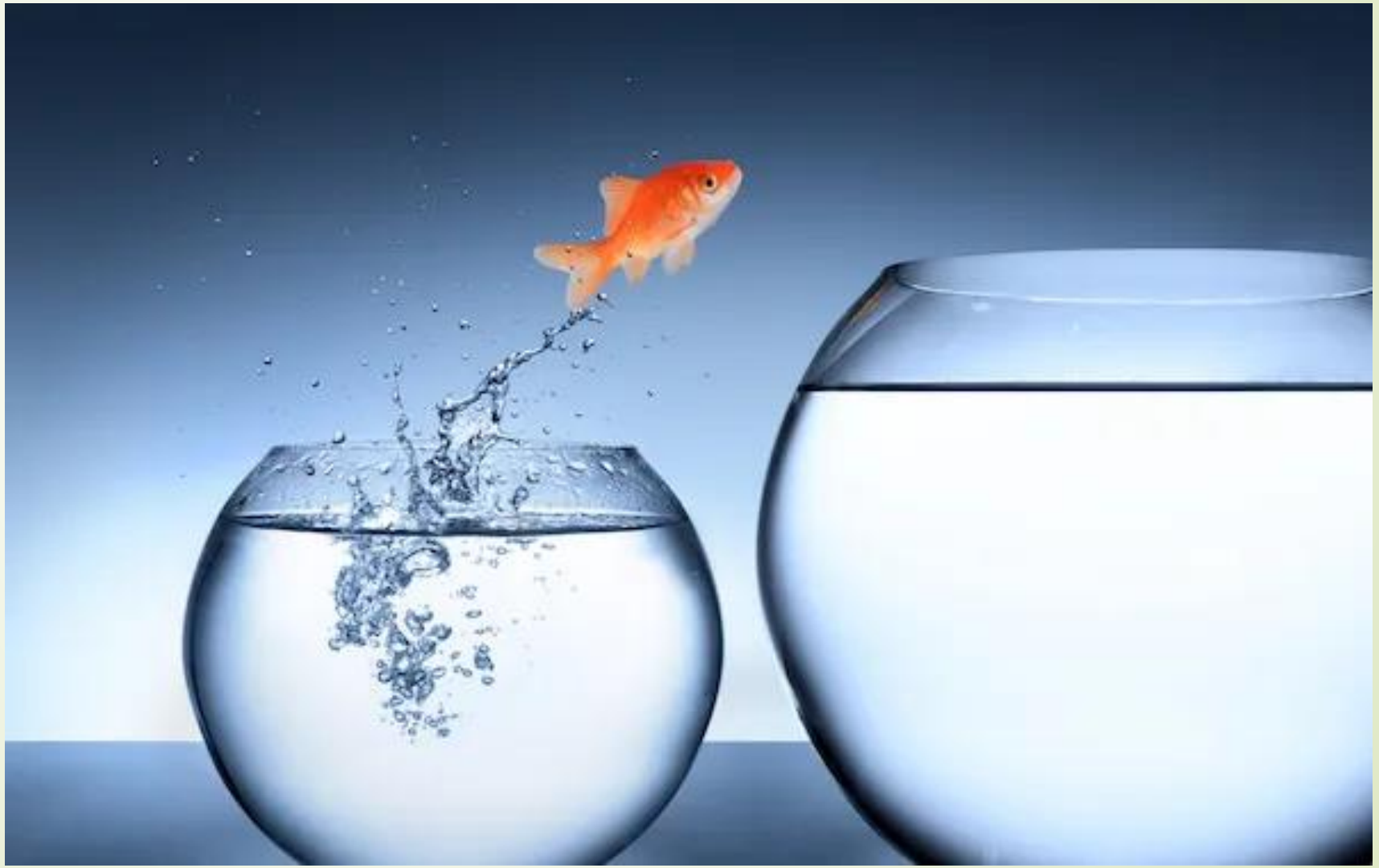
- Asking questions & Defining Problems
- Planning & Conducting investigations
- Interpreting, analyzing, & evaluating data
- Constructing and critiquing conclusions & explanations
- Developing & Using Models
- Obtaining, evaluating, & communicating information

Virginia Science Standards of Learning

Concepts that increase in complexity with grade level:

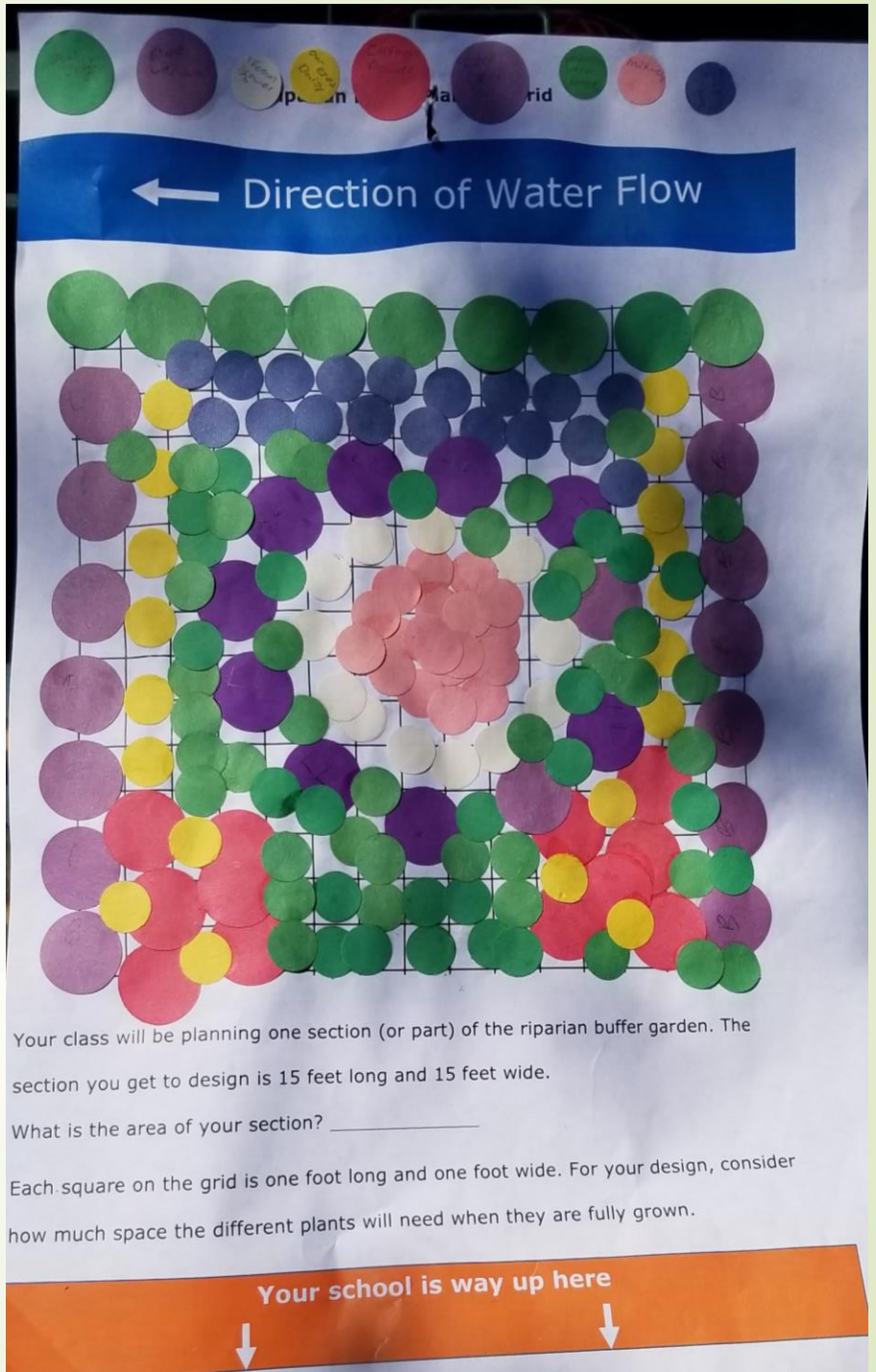
- **Plant life cycles / Growth & development of organisms**
- **Structure & function**
- **VA resources & human impacts**
- **Scale, proportion & quantity**
- **Interrelationships of science, agriculture, mathematics, technology, & engineering**

Scaling up



5th Grade Riparian Buffer

This project was funded through a grant from the NOAA Chesapeake Bay B-WET Program, award # NA18NMF45703152


Direction of Water Flow
Your class will be planning one section (or part) of the riparian buffer garden. The section you get to design is 15 feet long and 15 feet wide.
What is the area of your section? _____
Each square on the grid is one foot long and one foot wide. For your design, consider how much space the different plants will need when they are fully grown.
Your school is way up here

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7th grade pollination garden

This project was funded through a grant from the NOAA Chesapeake Bay B-WET Program, award # NA18NMF45703152

Creating a scale model your pollination garden

Cut out disc indicating the appropriate diameter of your mature plants. Use the color paper to match the color flower that it produces. Each ½ " box = 1 ft. Use this scale for determining the size of your discs. Label each disc with the species of plant and it's height. Arrange your discs on the map of our garden plot below. Consider the following as you play with the arrangement:

- Are colors distributed in a visually appealing way?
- Do you have taller plants in the back and shorter plants in the front?

When you are satisfied with your arrangement, you may glue your discs down and submit your plan to your teacher. Put your name on THE BACK. We will be voting on our favorite garden plan! The finalist from each class will be submitted to your 7th grade teachers for final voting!

J-WMS Native Plant Garden "Wish List"
Garden size 18' x 18' (estimate)
Most plants will be in 1 quart pots (4.75")

Common Name	Scientific Name	Attracts	Bloom color	Bloom time	Mature Height	Mature Diameter
Butterfly weed	Asclepias tuberosa	Monarch butterfly	Orange	May-Sept	1.5-3 feet	1.5-3 feet
Wild Geranium	Geranium maculatum	Native bees	purple	April-June	2 feet	18 in
Whorled Coreopsis	Coreopsis verticillata "Creme brulee"	Birds and Butterflies	Yellow	May-Aug	2.5 ft	2ft
Woodland sunflower	Helianthus divaricatus	Native bees	Yellow	Aug-Oct	2-6ft	1-3ft
Scarlet beebalm	Monarda didyma	Hummingbirds, butterflies, bees	Red	July-Sept	4ft	3ft
Golden	Packera	Butterflies	Yellow	March-May	1-2ft	1-1.5 ft

Designing your pollination garden

- Your garden should include a minimum of 5 different species of NATIVE plants
- Should have a variety of colors/textures/heights for visual appeal
- Your garden should attract a minimum of 3 different species of pollinators. Fill in the following chart:

	Common name	Flower Color	Pollinator(s)	Mature Height	Mature Diameter	Environmental requirements (sun/water/soil)
1. ✓	Butterfly weed	orange	Wasp	4-5ft	3-4 ft	fast draing soil full sun
2. ✓	blue wild indigo	blue	bees butterfly hummingbirds	24-36 inches	12-24 inch	Sun exposed; full soil type: moist/well drain
3.	daffodiles	yellow white. ect	Bees	630 inch	6-12 inch	full sun/ parcall shade rich and moist
4. ✓	christmas fern	Green	chatapillers	1.5 3ft 1.5ft	1.5ft	loose moist turff soil part-full shade
5	golden rag wood	yellow	Butterflys Bees	1-2 ft	1-1.5ft	welled drained full sun minural soil
6						
7						
8						

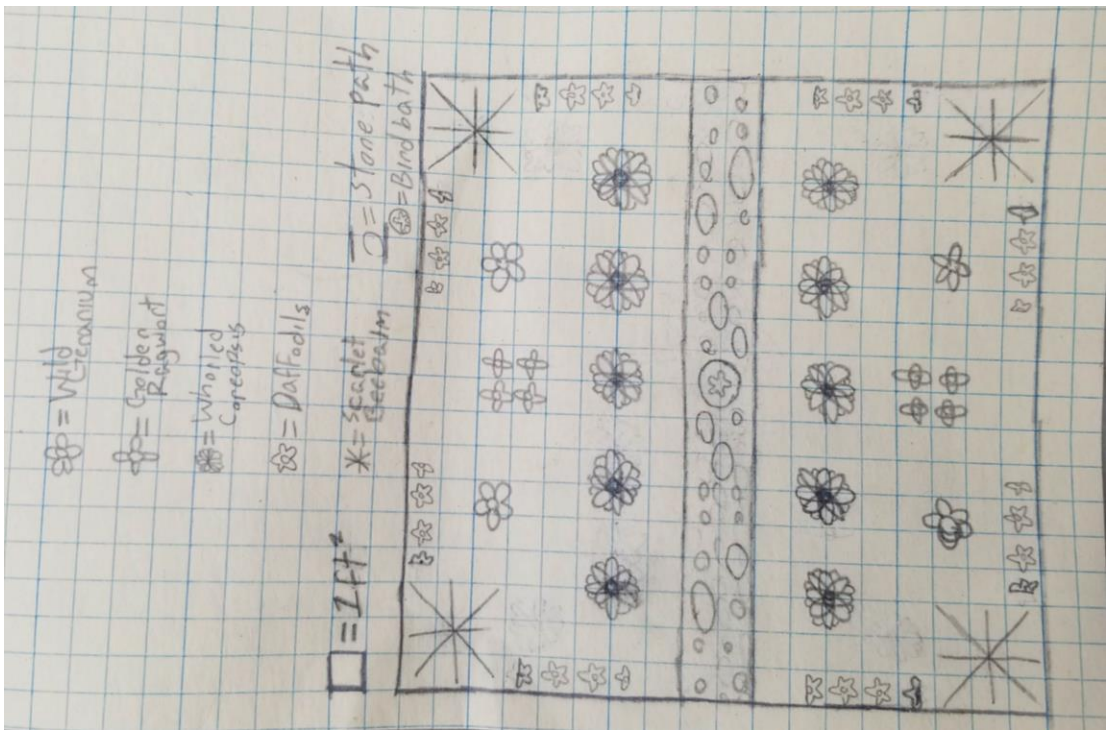
1 inch per week for water

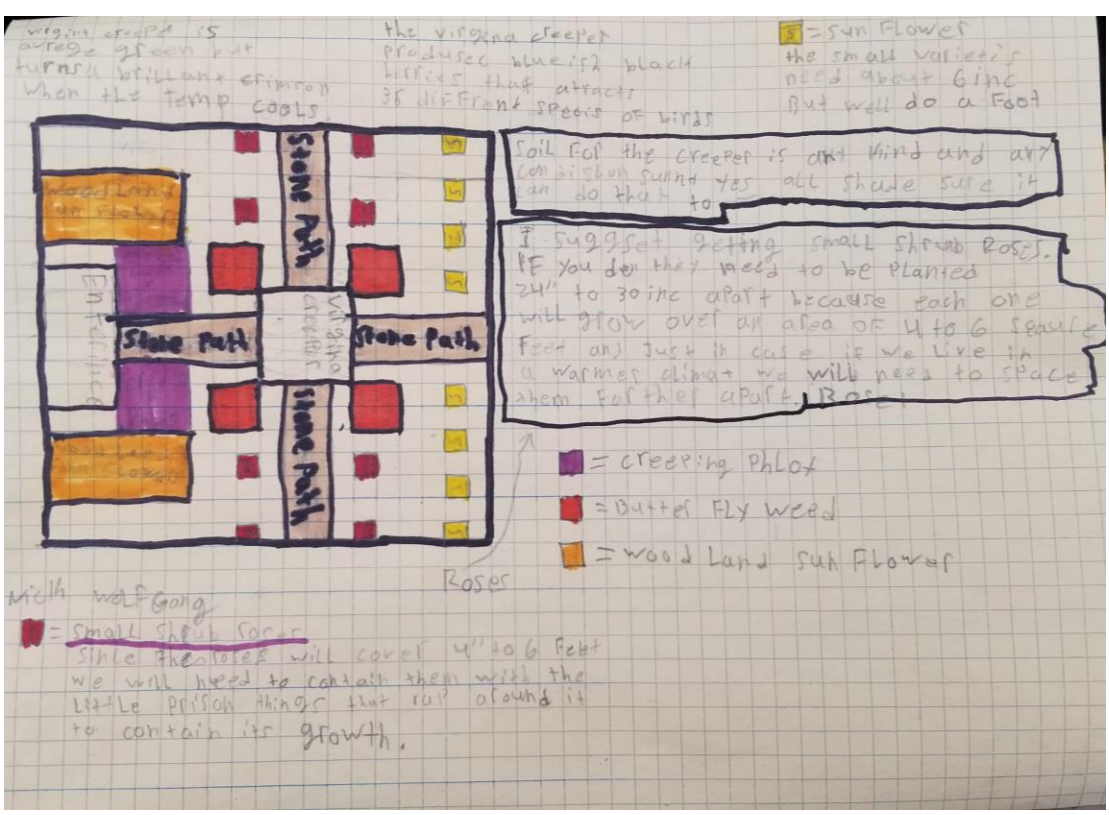
one inch of water every couple of weeks well drain soil

Water once planted until first rain soil

water once a week

don't need water drought to it takes long time without rain fall


= White Geranium
= Golden Ragwort
= Whorled Coreopsis
= Daffodils
= Scarlet Beebalm
= Stone path
= Bird bath
= 1ft


Stone Path
Stone Path
Stone Path
Stone Path
= creeping Phlox
= Butterfly weed
= wood Land sun Flower
Roses
= small shrub roses

Measuring, laying stone, & planting

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Student Centered Garden Design & Planting

- Provide **learning opportunities** so that students understand:
  - Plant-insect/bird adaptations (structures & functions)
  - Importance of planting native plants
  - Size of various plants at maturity (height & width)
- Have students, along with teachers & administrators, **identify the area** to be planted (location & size). Get approval from the facilities manager, too.
- Provide resources for students to **research plants** to include in their garden (It's helpful to narrow the potential choices to plants that are adapted to the planting site & that you know you can purchase. Be sure to provide plenty of plants from which to choose.)
- **Make a scaled grid** for the garden site (for younger kids). Middle & high school students can use graph paper & determine their own scale.
- For elementary students, it is helpful to **create circles** scaled to the garden design grid that represent the color & width of the plants at maturity. These are used to design the garden. Older students can use colored pencils to design their gardens.
- **Test the design** outside using circles cut from newspaper to represent the full width of the plant at maturity & PVC pipe (or sticks) cut to the height of the plants at maturity. Students replicate their design in the garden using the circles & PVC & adjust, as needed, before planting.
- **Plant** the garden!!!

Resources for selecting native plants for pollination gardens

- Local native plant societies; Local public gardens & arboretums
  - Virginia Native Plant Society vnps.org specifically https://vnps.org/virginia-native-plant-guides/ for downloadable guides
- Xerces, Pollinator Conservation Resource Center: https://xerces.org/pollinator-resource-center
- Xerces Society: https://xerces.org/publications/plant-lists
- Pollinator Partnership Ecoregion Planting Guides: https://www.pollinator.org/guides
- Pollinator Partnership: https://www.pollinator.org/gardencards
- Audubon Society: https://www.audubon.org/native-plants/

We grow scientists at Blandy!

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Thank you!

Blandy Education Conference Materials:

https://blandy.virginia.edu/content/ed-conference-information-and-resources

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5th grade Riparian Buffer Plant Selection Student Sheet

What plants are good for our riparian buffer along Roseville Run?

Name(s) _____

Plant Type (circle one):				
Perennial flowering plant	**Grass or Sedge**	**Fern**	**Shrub**	**Small tree**

Plant name	
Common:	**Scientific (genus and species, just like my last and first name)**
Plant Size at maturity	
Height it can grow to:	**Width or diameter (spread) it can grow to:**
Plant Flowers (if the plant has flowers)	
Flower Color (if the plant has flowers):	**Bloom time:**
Is there any other interesting information about this plant that you learned?	
Why I think this would be a good plant for our school riparian buffer:	

Pollination Garden Research, Design & Planting Activities: *Alignment with NGSS 3-Dimensional Learning*

Scientific & Engineering Practices	Cross-cutting Concepts
1. Asking Questions & Defining Problems 2. Developing & Using Models 3. Planning & Carrying Out Investigations 4. Analyzing & Interpreting Data 5. Using Mathematics & Computational Thinking 6. Constructing Explanations & Designing Solutions 7. Engaging in Argument from Evidence 8. Obtaining, Evaluating, & Communicating Information	Patterns Scale, Proportion, & Quantity Structure & Function

Disciplinary Core Ideas	
Life Sciences	**Engineering, Technology, & the Applications of Science** From: *A Framework for K-12 Education*, National Research Council, The National Academies, 2011
LS1. A Structure & Function LS1. B Growth & Development of Organisms LS2.A Interdependent Relationships in Ecosystems LS4.D Biodiversity & Humans	ETS1.A Defining & Delimiting and Engineering Problem ETS1.B Developing Possible Solutions ETS1.C Optimizing the Design solution ETS2.A Interdependence of Science Engineering, & Technology

Pollination Garden Research, Design & Planting Activities: Alignment with NGSS 3- Dimensional Learning

*From: *A Framework for K-12 Science Education*, National Research Council, The National Academies Press, 2011

Scientific and Engineering Practices	Cross-cutting Concepts
Asking Questions & Defining Problems **Developing & Using Models** **Planning & Carrying Out Investigations** **Analyzing & Interpreting Data** **Using Mathematics & Computational Thinking** **Constructing Explanations & Designing Solutions** **Engaging in Argument from Evidence** **Obtaining, Evaluating, & Communicating Information**	Patterns Scale, Proportion, & Quantity Structure & Function
Disciplinary Core Ideas	
Life Sciences	**Engineering, Technology, & the Applications of Science***
LS1. A Structure & Function **LS1. B Growth & Development of Organisms** **LS2.A Interdependent Relationships in Ecosystems** **LS4.D Biodiversity & Humans**	ETS1.A Defining & Delimiting and Engineering Problem ETS1.B Developing Possible Solutions ETS1.C Optimizing the Design solution ETS2.A Interdependence of Science Engineering, & Technology