

# PCSD #1 Curriculum Map

**Content Area: Science**

**Course Name: Botany**

**Course Description:** Botany is the scientific study of plants and their relationship to the environment. Students will investigate the growth, reproduction, anatomy, morphology, physiology, biochemistry, taxonomy, genetics, and ecology of plants. Students will engage in daily homework, as well as projects, quizzes, tests, experiments, and lab write-ups. The traditional classroom and high tunnel greenhouse will be used for activities. Students will exercise a high level of understanding of the scientific method and problem solving. The intent is that students will be better prepared for college level courses and develop an interest in life-long learning of the world around them.

**Resources:** Many lessons, labs, and sample curriculum were adapted from the Minnesota Nursery and Landscape Association, link: <https://www.mnla.biz/page/hscurriculum>.

**Course Syllabus:** [Botany/Zoology Course Syllabus](#)

## Grading Guidelines:

80% Summative -Demonstrative Skill/Understanding	10% Formative-Checking for Understanding	10% Final Exam
EXAMPLES: Quizzes, Unit Tests, Large Projects-Summative; Final Essays; Lab Reports, Summative Presentations; etc. (Utilize Proficiency Scales for Common Assessments)	EXAMPLES: Informal Quizzes; Practice Tests; Small Projects; Homework; Practice; Class Activities; etc. (Utilize Proficiency Scales)	Final Exam

Unit and Timeframe	Essential Questions/Content	Objectives and Learning Targets	Resources/Text	Projects/Activities	Assessment/Proficiency Scales	Priority Performance Standards
Science as Inquiry: Engineering Design  Scientific Method  Measuring with Metrics	Review of scientific discovery process, calculations/measurements, and presenting data.  EQ: Generate a hypothesis to test an inference that you have observed. Summarize and	Students will learn how to gather data.  Students will learn how to report their findings in graph form, and what type of graph to use.  Students will learn how to analyze data and	CK 12: <a href="#">Lab Practices &amp; Safety</a>  CK12: <a href="#">Scientific Method</a>  CK 12: <a href="#">Units of Measurement</a>	Ladder Method for Metric Conversion s.  Metric Review Worksheet "Kids (kilo) Have (hecto) Dropped (Deca) Over (Base Unit) Dead (deci)	<a href="#">Lab Rubric</a>  <a href="#">Advanced Lab Rubric</a>  Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guided reading answers/HW  Formal Assessments: Metrics/	ETS1-1: ETS1-2: ETS1-3: ETS1-4: ETS1-5:

	<p>analyze your findings.</p> <p><b>Topics</b> Scientific Method</p> <p>Metric Units</p> <p>Scale</p> <p>Graduated Cylinder</p> <p>Qualitative Data</p> <p>Quantitative Data</p>	<p>communicate results.</p>		<p>Converting (centi) Metrics (milli)"</p> <p>Botany Lab: Students design a lab to determine how a variable affects a plant. <a href="#">Plant: Controlled Experiment</a></p> <p>Read/Watch : Botany of Desire, by Michael Pollan <a href="http://www.youtube.com/watch?v=p54VVLSS6Qk">www.youtube.com/watch?v=p54VVLSS6Qk</a></p> <p>PBS Preview: <a href="http://www.youtube.com/watch?v=GdXQeWMxX-4">www.youtube.com/watch?v=GdXQeWMxX-4</a></p>	<p>Measurement Quiz</p> <p>80% of students will average a score of 80% on unit assessments.</p>	
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Unit 2: Cells and Tissues			Background Info Slide Show: <a href="#">Cells</a>  Parenchyma  Sclerenchyma  Collenchyma	Intro Lab: <a href="#">Microscope: Cells</a>  Intro Lab: <a href="#">Mitosis</a>  Intro Lab: <a href="#">Osmosis</a>		
Unit 3: Roots, Stems, and Leaves	<p>How does water travel to the top of a tree?</p> <p>How does the chemical structure of water relate to its unique properties and its function in plants?</p> <p>How are structure and function related in plants?</p> <p><b>Topics:</b> Transpiration</p> <p>Osmotic Pressure</p> <p>Cohesion</p> <p>Adhesion</p> <p>Plant Disease</p>	<p>Identify the parts of a leaf, stem, root, flower, and seed as well as describe the function of each.</p> <p>Name the three main parts of a plant and their functions.</p> <p>Name the three main parts of the cross-section of a trunk.</p> <p>Describe four types of below-ground stem modifications.</p> <p>Identify basic leaf parts and their functions.</p>	<p>Lesson: <a href="#">Stems</a></p> <p>Slide Show: <a href="#">Stems</a></p> <p>Mini-Lab/Lesson: <a href="#">Leaves Lesson</a></p> <p>Slide Show: <a href="#">Leaves</a></p> <p>Lesson: <a href="#">Roots</a></p> <p>Slide Show: <a href="#">Roots</a></p>	<p>Mini-Lab: <a href="#">Stems Lab</a></p> <p>Tree Lab: <a href="#">Tree Rings/Vascular Tissue</a></p> <p>Leaves/Coloring: <a href="#">Leaves ID Lab</a></p> <p><a href="#">Tree ID/Leaf Arrangement</a></p> <p>Roots/Coloring: <a href="#">Roots ID Lab</a></p>	<p>Word Search/Quiz: <a href="#">Botany Wordsearch Quiz</a></p> <p><a href="#">Lab Rubric</a></p> <p><a href="#">Advanced Lab Rubric</a></p> <p>Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guided reading answers/HW</p> <p>Formal Assessments: Metrics/ Measurement Quiz</p> <p>80% of students will average a score of 80% on unit assessments.</p>	<p>NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.</p> <p>PS.01.02.04.a. Discuss leaf morphology and the functions of leaves.</p> <p>PS.01.02.04.b. Explain how leaves capture light energy and allow for the exchange of gases.</p> <p>PS.01.01.02.a. Describe the morphological characteristics used to identify agricultural plants. The structure of leaves directly relates to their function as organs of photosynthesis.</p> <p>NRS.01.02.01.a. Describe morphological characteristics used to</p>

	Artificial Selection	Name three types of leaf characteristics that help in plant identification.				<p>identify trees and other woody plants.</p> <p>PS.01.02.03.a. Identify the components and the functions of plant stems. As an intricate scaffold, stems and branches increase surface area for photosynthesis.</p> <p>NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.</p> <p>PS.01.02.02.a. Identify the components, the types and the functions of plant Roots.</p> <p>NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.</p> <p>PS.01.02.02.a. Identify the components, the types and the functions of plant roots.</p>
<u>Subunit for Unit 3:</u> <u>Plant Nutrition</u>  Soils  Fertilizers	When it comes to food, what is the chief difference between plants and animals?	(1) name the 17 elements that form critical links in the chain of plant nutrition	Periodic Table Review  Lesson: <a href="#">Plant Nutrition</a>  Reading: <a href="#">Plant Nutrition</a>  Lesson: <a href="#">Soils</a>	Lab: (Start Plants 2 weeks prior to the lab) <a href="#">Plant Nutrition Labs (2)</a>  Lab:	<a href="#">Lab Rubric</a>  <a href="#">Advanced Lab Rubric</a>  Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guid	<p>PS.02.03.01.a. Identify the essential nutrients for plant growth and development and their major functions.</p> <p>PS.02.03.01. b. Describe nutrient deficiency symptoms and recognize environmental causes of nutrient</p>

	If we give a plant some fertilizers, or minerals, or nutrients can we say we're feeding a plant?	(2) explain how plants absorb nutrients (3) summarize the functions of 6 of the 9 macronutrients.	Reading: <a href="#">Soils</a>  Lesson: <a href="#">Fertilizers</a>  Reading: <a href="#">Fertilizers</a>	<a href="#">Soils Jar Lab</a>  Lab: <a href="#">Fertilizers</a>	ed reading answers/HW  Formal Assessments: Metrics/ Measurement Quiz  80% of students will average a score of 80% on unit assessments.	deficiencies. Seventeen essential minerals are required for normal physiological processes of plants.  NRS.01.02.05. a. Demonstrate techniques used to identify rock, mineral and soil types.  PS.02.02.01. a. Identify the major components of growing media and describe how growing media support plant growth. The root-soil interface and the physical makeup of the soil relate heavily to the normal physiological processes of plants.
Unit 4: Flowers, Fruits, and Seeds			Lesson: <a href="#">Flowers &amp; Fruits</a>  Slide Show: <a href="#">Flowers and Fruits</a>  Lab: What am I eating? <a href="#">Flowers/Fruits Lab</a>  Tutorial: Why do plants give us fruit? <a href="#">Fruit Talk</a>	Mini-Labs: <a href="#">Germination Mini-Labs</a> Part 1-After Cells Part 2-Seed Slide of Flowers/Fruits Part 3-After Flowers/Fruits Slides  Germination Lab 1: <a href="#">Germ Lab</a>  Germination Lab 2:		PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.  PS.01.02.05.b. Identify the different types of flowers and flower forms.  PS.01.02.06.a. Explain the functions and components of seeds and fruit.

				<a href="#">Seed Germination Inhibitors</a>  Lab: <a href="#">Flower Dissection</a>		
Unit 5: Plant Metabolism and Growth  Photosynthesis and Cellular Respiration	What variables can be manipulated to change the rate of photosynthesis?  What variables affect the rate of cellular respiration?  <b>Topics:</b> Heterotrophs  Autotrophs  Pigments		Lesson: <a href="#">Photosynthesis &amp; Cell Respiration</a>  Reading: <a href="#">Physiology of Plants-Photosynthesis and Cell Respiration</a>  Lesson: <a href="#">Environmental Factors</a>  Reading: <a href="#">Environmental Factors</a>	Photosynthesis Coloring: <a href="#">Photosynthesis Coloring</a>  Photosystems Coloring: <a href="#">Photosystems Coloring</a>  Plant Nutrition Lab: <a href="#">Nutrition Lab</a>  Plant Growth Lab: <a href="#">Plant Growth Hormones</a>  Online Lab: <a href="#">Photosynthesis Simulation</a>  Gas Exchange Lab: <a href="#">Elodea Photosynthesis Lab</a>	Quiz: <a href="#">Environmental Factors</a>  <a href="#">Lab Rubric</a>  <a href="#">Advanced Lab Rubric</a>  Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guided reading answers/HW  Formal Assessments: Metrics/ Measurement Quiz  80% of students will average a score of 80% on unit assessments.	NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.  PS.01.03.01.a. Explain the basic process of photosynthesis and its importance to life on Earth.  PS.01.03.01.b. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.  PS.01.03.02.a. Explain cellular respiration and its importance to plant life.  PS.01.03.02.b. Explain factors that affect cellular respiration and identify the products and byproducts of cellular respiration. Basic physiological processes give insight to the structure of plant parts.

				<p>Elodea Lab 2: <a href="#">Rate of Photosynthesis</a></p> <p>Elodea Lab 3: <a href="#">Photo/CR Lab</a></p> <p>Chlorophyll Lab: <a href="#">Flourescence of Chlorophyll</a></p> <p>Cellular Respiration Lab: <a href="#">Leaf Stomata Lab</a></p> <p>Transpiration Lab: <a href="#">Water Loss Lab</a></p>		<p>PS.02.01.01.a. Describe the qualities of light that affect plant growth.</p> <p>PS.02.01.02.a. Describe the effects air, temperature and water have on plant metabolism and growth.</p> <p>PS.02.01.02.b. Determine the optimal air, temperature and water conditions for plant growth. Light, temperature, and water affect the three basic physiological processes of plants.</p>
<p>Unit 6: Plant Breeding and Propagation</p> <p>Plant Reproduction and Life Cycles</p>	<p>How do plants depend upon biotic and abiotic factors in their environment for reproduction?</p> <p>What are the biological costs and benefits of sexual versus asexual reproduction in plants?</p>	<p>Be able to describe the events involving flowers: pollination, fertilization, relationship of ovule to seed formation, and relationship of pistil to fruit formation.</p>		<p>Plant Reproduction and Life Cycles</p>	<p><a href="#">Lab Rubric</a></p> <p><a href="#">Advanced Lab Rubric</a></p> <p>Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guided reading answers/HW</p> <p>Formal Assessments:</p>	<p>Be able to describe the events involving flowers: pollination, fertilization, relationship of ovule to seed formation, and relationship of pistil to fruit formation.</p>

	<b>Topics:</b> Sexual  Asexual  Vegetative Propagation  Tissue Culture  Cloning				Metrics/ Measurement Quiz  80% of students will average a score of 80% on unit assessments.	
Genetics	Why is it possible for a cell from one plant species to express genes from another species as in genetically modified organisms?  What is the relationship between genetic variability and biodiversity?  <b>Topics:</b> Selective Breeding  Genetic Modification	Explain the role of DNA, genes and chromosomes in heredity.  Describe genetic variability and its role in nature especially in terms of biodiversity.  Define hybrid.  Explain the relationship between heirloom plants and hybrids.  Explain the role of modern DNA techniques in developing new plant varieties		Genetics	<a href="#">Lab Rubric</a>  <a href="#">Advanced Lab Rubric</a>  Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guid ed reading answers/HW  Formal Assessments: Metrics/ Measurement Quiz  80% of students will average a score of 80% on unit assessments.	Explain the role of DNA, genes and chromosomes in heredity.  Describe genetic variability and its role in nature especially in terms of biodiversity.  Define hybrid.  Explain the relationship between heirloom plants and hybrids.  Explain the role of modern DNA techniques in developing new plant varieties
Unit 7: Plant Classification  Evolution	How do subtle differences among closely related species	Understand the role of genetics in the process of evolution.		Lab-Plant Collection: Typical of	<a href="#">Lab Rubric</a>  <a href="#">Advanced Lab Rubric</a>	Understand the role of genetics in the process of evolution. Describe Darwin's



Plant taxonomy	<p>provide evidence of environmental change and speciation?</p> <p>How can patterns of characteristics shared among organisms be used to categorize plant diversity according to relatedness?</p> <p><b>Topics:</b> Selective Pressures</p> <p>Speciation</p>	<p>Describe Darwin's theory of evolution as it relates to plants and their pollinators (coevolution)</p> <p>Practice correct usage of the scientific names; and the role of type specimen</p> <p>Define the terms: family, genus, species, subspecies, and variety.</p> <p>Demonstrate the use of a dichotomous key to identify an unknown vascular plant</p>		<p>any introductory Botany class, you will be required to collect, identify, and preserve a minimum of 20 different plants and trees found in our local area, and throughout the state. Use a taxonomic key, and learn how to properly preserve specimens.</p> <p>Pollinator Activity: Co-evolution of specific pollinators to specific plants.</p>	<p>Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guided reading answers/HW</p> <p>Formal Assessments: Metrics/ Measurement Quiz</p> <p>80% of students will average a score of 80% on unit assessments.</p>	<p>theory of evolution as it relates to plants and their pollinators (coevolution)</p> <p>Practice correct usage of the scientific names; and the role of type specimen</p> <p>Define the terms: family, genus, species, subspecies, and variety.</p> <p>Demonstrate the use of a dichotomous key to identify an unknown vascular plant</p>
Unit 8: Kingdom Protista						
Unit 9: Kingdom Fungi						
Unit 10: Bryophytes and Seedless Plants						
Matter and Energy in Ecosystems	How does a change in abiotic factors	Describe and define two aspects of the	Slide Show: <a href="#">Intro to Botany/Horticulture</a>	Lesson: <a href="#">Intro to Horticulture</a>	<a href="#">Lab Rubric</a>	

Plant Population and Community Ecology	<p>influence plant communities within an ecosystem?</p> <p>What role do plants play in the energy transformations that occur in ecosystems?</p> <p>How does soil affect the community of plants that live in an area?</p> <p>What factors determine which plant species will grow in a specific area?</p> <p><b>Topics:</b> Biotic</p> <p>Abiotic</p> <p>Terrestrial</p> <p>Aquatic</p> <p>Soil Profile</p>	<p>environment that impact plant life: abiotic (non-living) and biotic (living)</p> <p>Explain the role that green plants play in energy flow through an ecosystem</p> <p>Diagram how water, carbon, oxygen, and nitrogen are recycled through the environment</p>			<p><a href="#">Advanced Lab Rubric</a></p> <p>Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guid ed reading answers/HW</p> <p>Formal Assessments: Metrics/ Measurement Quiz</p> <p>80% of students will average a score of 80% on unit assessments.</p>	
<p><u>Unit 11:</u> <u>Gymnosperms</u> <u>Plant Materials</u> Trees Shrubs Vines Herbaceous Plants</p>	<p>What roles do trees play in the larger scheme of nature?</p> <p>Why are both scientific and</p>	Students will be able to recognize and name 10 common trees the next time they see them in	<p>Lesson: <a href="#">Trees</a></p> <p>Slide Show: <a href="#">Deciduous Trees</a></p> <p>Slide Show: <a href="#">Coniferous/Evergreen Trees</a></p>	<p>Chart: <a href="#">Deciduous Trees Chart</a></p> <p>Chart: <a href="#">Coniferous/Evergreen Chart</a></p>	<p><a href="#">Lab Rubric</a></p> <p><a href="#">Advanced Lab Rubric</a></p> <p>Informal Assessments: Bell work/exit slips/class lectures/discussions</p>	NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.

	<p>common names used to identify plants?</p> <p>Trees and shrubs share certain characteristics, such as woody stems. But in what ways do trees and shrubs differ?</p> <p>How would you define the terms “tree” and “shrub”?</p>	the landscape in Wyoming.	<p>Lesson: <a href="#">Shrubs/Vines</a></p> <p>Slideshows: <a href="#">Deciduous Shrubs</a> <a href="#">Evergreen Shrubs 1</a> <a href="#">Evergreen Shrubs 2</a> <a href="#">Woody Vines</a></p> <p>Lesson: <a href="#">Herbaceous Plants</a></p> <p>Slideshow: <a href="#">Herbaceous Plants</a></p>	<p>Charts: <a href="#">Deciduous Shrubs</a> <a href="#">Evergreen Shrubs</a> <a href="#">Woody Vines</a></p> <p>Chart: <a href="#">Herbaceous Plants</a></p>	<p>/check for understanding/guid ed reading answers/HW</p> <p>Formal Assessments: Metrics/ Measurement Quiz</p> <p>80% of students will average a score of 80% on unit assessments.</p>	<p>NRS.01.02.01.b. Identify trees and other woody plants.</p> <p>PS.01.01.01.a. Explain systems used to classify plants.</p> <p>PS.01.01.02.a. Describe the morphological characteristics used to identify agricultural plants.</p> <p>PS.01.01.02.b. Identify agriculturally important plants by common names.</p> <p>PS.01.01.02.c. Identify agriculturally important plants by scientific names. Wyoming offers a wide variety of trees, large and small, broadleaf and needle-leaved, deciduous and coniferous.</p>
<u>Unit 12:</u> Angiosperms, Flowering Plants						
<u>Extra Unit:</u> <u>Landscape &amp; Turf Management</u>	What happens to plants that haven't been pruned for 50 years?	A large part of caring for plants involves selective pruning	<p>Lesson: <a href="#">Pruning</a></p> <p>Lesson: <a href="#">Weeding, Watering, and Mulching</a></p> <p>Reading: <a href="#">Weeding, Watering, and Mulching</a></p> <p>Lesson: <a href="#">Turfgrass</a></p>	<p>Quiz/Mini-lab: <a href="#">Turfgrass</a></p>	<p><a href="#">Lab Rubric</a></p> <p><a href="#">Advanced Lab Rubric</a></p> <p>Informal Assessments: Bell work/exit slips/class lectures/discussions /check for understanding/guid ed reading answers/HW</p>	<p>PS.03.02.05.a. Explain the reasons for controlling plant growth.</p> <p>PS.03.02.05.b. Demonstrate proper techniques to control and manage plant growth through mechanical, cultural or chemical means.</p>

			Reading: <a href="#">Turfgrass</a>		Formal Assessments: Metrics/ Measurement Quiz  80% of students will average a score of 80% on unit assessments.	PS.03.02.05.c. Create and implement a plan to control and manage plant growth. Because of the balance between roots and leaves, pruning generally stimulates growth.
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