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| **Standards Key** |
| PS = Physical Science, LS = Life Science, ESS = Earth and Space Science, ETS = Engineering, Technology, and Applications of Science |

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| **Lesson (Grade Level Suggested)** | **Key Topics** | **State of Alaska Standards** | **NGSS Standards** |
| **Growing in Soil** | | | |
| 1. **Reading a Seed Packet**   **(K-12)** | * Reading and Comprehending Scientific Technical Information * Venn Diagrams * Plant Life Cycles * Plant Light and Soil Nutrient Needs * Horticulture * Germination * Propagation * Recording Scientific Data * Drawing Conclusions from Experimentation | K-LS1-1  1-LS1-1  2-LS2-1  3-LS4-4  4-LS1-1  5-LS1-1  MS-LS1-5  HS-LS1-2 | K-LS1-1  K-ESS2-2  K-ESS3-1  1-LS1-1  2-LS2-1  3-LS3-1  4-LS1-1  5-LS1-1  MS-LS2-1  HS-LS2-2 |
| 1. **Starting Plants in the Classroom**   **(K-12)** | * Reading and Comprehending Scientific Technical Information * Horticulture * Transplanting * Hydroponics * Plant Life Cycles * Array Mathematics and Grids * Germination * Plant light and soil nutrient needs * Standardized Science Measurements * Science Journaling * Recording Scientific Data in Tables * Drawing Conclusions from Experimentation | K-LS1-1  K-2-ETS1-2  1-LS1-1  2-LS2-1  3-LS4-4  4-LS1-1  5-LS1-1  5-LS2-1  MS-LS1-5  MS-ETS1-1  HS-LS1-2 | K-LS1-1  K-ESS2-2  K-ESS3-1  1-LS1-1  2-LS2-1  3-LS1-1  3-LS3-2  4-LS1-1  5-PS3-1  5-LS1-1  MS-LS1-5  MS-ETS1-1  HS-LS2-2  HS-ESS2-6 |
| 1. **Salad Container Greenhouse**   **(2-8)** | * Plant light and soil nutrient needs * Standardized Science * Standardized Science Measurements * Horticulture * Germination * Engineering – Greenhouse Construction and Function * Recycling * Plant Life Cycles * Careers in Agricultural Science * Standardized Science Measurements * Recording Scientific Data in Tables * Light Wave Physics – Types of Light * Recording Scientific Data in Tables * Drawing Conclusions from Experimentation | 2-LS2-1  3-LS4-4  4-LS1-1  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS1-5  MS-ESS3-5  MS-ETS1-2 | 2-LS2-1  2-PS1-4  K-2-ETS1-1  3-LS1-1  3-LS3-2  4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS1-6  MS-LS2-1  MS-LS3-3  MS-ETS1-1 |
| **Soil & Nutrition** | | | |
| 1. **Garden Soil Exploration**   **(K-12)** | * Introduction to Soil Composition and Types * Plant soil nutrient needs * Hydrology – water cycles * Geological Creation of Soil * Agriculture * Composting * Field Testing of Soil – Ribbon Test * Engineering – Constructing Soil Drainage Systems * Standardized Science Measurements * Recording Scientific Data in Tables * Small Scale construction of a Compost System * Drawing Conclusions from Experimentation | K-LS1-1  K-2-ETS1-2  1-LS1-1  2-LS2-1  2-PS1-4  3-LS4-4  4-ESS2-1  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS1-5  MS-LS2-1  MS-LS2-3  HS-LS1-5  HS-LS2-3  HS-ESS2-2  HS-ESS2-7 | K-LS1-1  K-ESS2-2  K-ESS3-1  1-LS1-1  2-LS2-1  2-PS1-2  K-2-ETS1-3  3-LS3-2  4-ESS2-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-1  MS-LS3-3  MS-ETS1-1  HS-LS2-6  HS-ESS2-6  HS-ESS2-7  HS-ESS3-4  HS-ETS1-1 |
| 1. **The Right Diet for Your Plants**   **(6-8)** | * Soil Composition and Types * Plant soil nutrient needs * Fertilizers * Human nutrient needs * Plant nutrient needs * Plant Life Cycles * Soil Improvement * Reading labels for fertilizers * Reading advertisements * Agricultural Economics – Products Promotion, Designing Advertisements for Soil Supplements * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation | MS-LS1-5  MS-LS2-1  MS-LS1-7 | MS-LS1-5  MS-LS2-1 |
| 1. **Plant Nutrient Deficiencies**   **(6-8)** | * Plant Nutrient Needs * Nutrient Balance in Agricultural Soils * Fertilizers * Nutrient Deficiencies in Plants * Nutrient Deficiencies in Humans * Plant Nutrient Toxicities * Macronutrients and Micronutrients * Nitrogen Fixation * Organic vs. Commercial Fertilizers * Humanity Against Hunger – Social Concerns * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation | MS-LS1-5  MS-LS2-4  MS-ESS3-2 | MS-LS1-5  MS-LS2-4  MS-LS4-5  MS-ETS1-1 |
| **Plant Growth** | | | |
| 1. **Do You Know the Parts of Plants?**   **(K-3)** | * Introduction to Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Photosynthesis * Singing to Remember * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | K-LS1-1  1-LS1-1  2-LS4-1  3-LS4-4 | K-LS1-1  K-ESS2-2  K-ESS3-1  1-LS1-1  2-LS2-1  3-LS1-1 |
| 1. **Plant Parts: Roots**   **(2-6)** | * Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | 2-LS4-1  3-LS4-4  4-LS1-1  5-LS1-1  5-LS2-1  MS-LS1-1  MS-LS1-2  MS-LS1-4 | 2-LS2-1  2-PS1-1  3-LS1-1  4-LS1-1  5-LS1-1  MS-LS1-1  MS-LS1-2 |
| 1. **Plant Parts: Stems**   **(2-6)** | * Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Evapotranspiration and Transpiration * Recording Scientific Data in Tables * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | 2-LS4-1  3-LS4-4  4-LS1-1  5-LS1-1  5-LS2-1  MS-LS1-1  MS-LS1-2  MS-LS1-4 | 2-LS2-1  2-PS1-1  3-LS1-1  4-LS1-1  5-LS1-1  MS-LS1-1  MS-LS1-2 |
| 1. **Plant Parts: Seeds**   **(3-6)** | * Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Germination * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | 3-LS4-4  4-LS1-1  5-LS1-1  5-LS2-1  MS-LS1-1  MS-LS1-2  MS-LS1-4 | 3-LS1-1  4-LS1-1  5-LS1-1  MS-LS1-1  MS-LS1-2 |
| 1. **Leaf Factory**   **(3-6)** | * Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Photosynthesis * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | 3-LS4-4  4-LS1-1  5-LS1-1  5-LS2-1  MS-LS1-1  MS-LS1-2  MS-LS1-4  MS-LS1-6 | 3-LS1-1  4-LS1-1  5-LS1-1  MS-LS1-1  MS-LS1-2  MS-LS1-6 |
| 1. **Hydroponic Plant Growth Lesson**   **(3-12)** | * Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Hydroponics * pH Testing * Photosynthesis * Pollination * Nutrient Uptake * Lighting Systems * Recording Scientific Data in Tables * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | 3-LS4-4  4-LS1-1  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS1-5  MS-LS1-6  MS-ETS1-1  HS-LS1-2  HS-LS1-5  HS-LS2-3  HS-LS2-5  HS-ESS3-4 | 3-LS1-1  3-LS4-3  4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS1-6  MS-LS2-1  MS-LS3-3  MS-ESS3-3  HS-LS1-5  HS-LS2-7  HS-ESS2-6  HS-ESS2-7  HS-ESS3-4  HS-ETS1-1 |
| 1. **Harvesting Plants: Leaves**   **(2-8)** | * Plant Anatomy * Plant Life Cycles * Plant Dynamics (circulation and nutrient uptake) * Agriculture – Harvesting * Photosynthesis – Chemistry * Recording Scientific Data * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, drawing, and note-taking) | 2-LS4-1  3-LS4-4  4-LS1-1  5-LS1-1  5-LS2-1  MS-LS1-1  MS-LS1-2 | 2-LS2-1  2-PS1-1  3-LS1-1  4-LS3-1  5-LS1-1  MS-LS1-1  MS-LS1-2  MS-LS1-6 |
| **Hydroponics** | | | |
| 1. **Introduction to Hydroponic Systems**   **(4-12)** | * Introduction to Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Drawing Conclusions from Lecture and Examples | 4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-4  MS-LS2-5  MS-ESS3-3  HS-LS1-2  HS-LS2-5 | 4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-1  MS-LS3-3  MS-ESS3-3  HS-LS2-7  HS-ESS2-6  HS-ESS3-4  HS-ETS1-1 |
| 1. **Passive Hydroponic System**   **(3-8)** | * Introduction to Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Recording Scientific Data in Tables * Standardized Science Measurements * Small Scale construction of a Hydroponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 3-LS4-3  4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-4  MS-LS2-5  MS-ESS3-3  MS-ETS1-1 | 3-LS1-1  3-LS4-3  4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-1  MS-LS3-3  MS-ESS3-3  MS-ETS1-1 |
| 1. **Hydroponic Growing Media**   **(3-12)** | * Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * Growing Media (soil, water, other) * Recording Scientific Data in Tables * Standardized Science Measurements * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 3-5-ETS1-2  4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-4  MS-LS2-5  MS-ESS3-3  MS-ETS1-2  HS-ESS3-4 | 3-LS1-1  3-LS4-4  4-LS1-1  5-LS1-1  3-5-ETS1-2  MS-LS1-5  MS-LS3-3  MS-ESS3-3  MS-ETS1-1  HS-LS1-3  HS-LS2-6  HS-ESS2-6  HS-ESS3-4  HS-ETS1-3 |
| 1. **Setting Up the Floating Platform Hydroponic System**   **(4-12)** | * Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * Plant Life Cycle * pH, Acidity, and Alkalinity Testing * Recording Scientific Data in Tables * Standardized Science Measurements * Medium Scale construction of a Hydroponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-4  MS-LS2-5  MS-ESS3-3  MS-ETS1-4  HS-LS1-2  HS-LS2-5  HS-ESS3-4 | 4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-1  MS-ESS3-3  MS-ETS1-4  HS-LS1-3  HS-LS2-7  HS-ESS2-6  HS-ESS2-7  HS-ESS3-4  HS-ETS1-3 |
| 1. **Setting Up the Nutrient Film Technique (NFT) System**   **(4-12)** | * Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Recording Scientific Data in Tables * Standardized Science Measurements * Large Scale construction of a Hydroponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-4  MS-LS2-5  MS-ESS3-3  MS-ETS1-4  HS-LS1-2  HS-LS2-5  HS-ESS3-4 | 4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-1  MS-ESS3-3  MS-ETS1-4  HS-LS1-3  HS-LS2-7  HS-ESS2-6  HS-ESS2-7  HS-ESS3-4  HS-ETS1-3 |
| 1. **What? No Soil?**   **(6-8)** | * Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * Recording Scientific Data in Tables * Standardized Science Measurements * Small Scale construction of a Hydroponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | MS-LS2-1  MS-LS2-3  MS-LS2-4  MS-LS2-5  MS-ESS3-3  MS-ETS1-1 | 4-LS1-1  5-PS3-1  5-LS1-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-1  MS-ESS3-3  MS-ETS1-1 |
| 1. **Chena Hot Springs Growing Tower System**   **(4-12)** | * Hydroponic Systems * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Standardized Science Measurements * Large Scale construction of a Hydroponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-3  MS-LS2-5  MS-ESS3-3  MS-ETS1-4  HS-ESS3-4 | 4-LS1-1  5-LS1-1  5-ESS3-1  3-5-ETS1-1  MS-LS2-1  MS-LS3-3  MS-ETS1-4  HS-LS1-3  HS-LS2-7  HS-ESS2-6  HS-ESS3-4  HS-ETS1-3 |
| **Aquaponics** | | | |
| 1. **Setting Up the Aquaponic System**   **(4-12)** | * Introduction to Aquaponics (fish farming + hydroponics) * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Recording Scientific Data in Tables * Standardized Science Measurements * Medium Scale construction of an Aquaponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-2  MS-LS2-4  MS-ESS3-3  MS-ETS1-4  HS-LS1-2  HS-LS2-5  HS-LS2-6  HS-ESS3-4 | 4-LS1-1  5-PS3-1  5-LS1-1  5-LS2-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-2  MS-LS3-3  MS-ESS3-3  MS-ETS1-4  HS-LS1-3  HS-LS2-7  HS-LS4-5  HS-ESS2-6  HS-ESS2-7  HS-ESS3-4  HS-ETS1-3 |
| 1. **Aquaponic Fish Care**   **(4-12)** | * Introduction to Aquaponics * Introduction to Fisheries (biology and care) * Water Quality and Monitoring * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Recording Scientific Data in Tables * Standardized Science Measurements * Small Scale construction of an Aquaponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1  MS-LS2-1  MS-LS2-2  MS-LS2-4  MS-ESS3-3  MS-ETS1-4  HS-LS1-2  HS-LS2-3  HS-LS2-5  HS-LS2-6  HS-ESS3-4 | 4-LS1-1  5-PS3-1  5-LS1-1  5-LS2-1  3-5-ETS1-1  MS-LS1-5  MS-LS2-2  MS-LS3-3  MS-ESS3-3  MS-ETS1-4  HS-LS1-3  HS-LS2-6  HS-LS2-7  HS-LS4-5  HS-ESS2-6  HS-ESS2-7  HS-ESS3-4  HS-ETS1-3 |
| 1. **Exploring Aquaponics**   **(K-2)** | * Introduction to Aquaponics * Introduction to Fisheries (anatomy, biology, and care) * Water Quality and Monitoring * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Recording Scientific Data * Standardized Science Measurements * Small Scale construction of an Aquaponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | K-LS1-1  K-ESS3-1  K-2-ETS1-2  1-LS1-1  2-PS1-4 | K-LS1-1  K-ESS2-2  K-ESS3-1  1-LS1-1  1-LS1-2  1-ESS1-2  2-PS1-2  2-LS2-1  2-LS4-1  2-ESS2-2  K-2-ETS1-2 |
| 1. **Exploring Aquaponics**   **(3-5)** | * Introduction to Aquaponics * Introduction to Fisheries (anatomy, biology, and care) * Water Quality and Monitoring * Plant Dynamics (circulation and nutrient uptake) * pH, Acidity, and Alkalinity Testing * Recording Scientific Data * Standardized Science Measurements * Small Scale construction of an Aquaponic System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 3-LS3-2  3-5-ETS1-3  4-LS1-1  4-PS3-4  5-PS3-1  5-LS1-1  5-LS2-1 | 3-LS1-1  3-LS3-2  3-LS4-3  3-LS4-4  4-LS1-1  5-PS3-1  5-LS1-1  5-LS2-1  3-5-ETS1-1 |
| **Composting** | | | |
| 1. **Composting Worms**   **(K-8)** | * Introduction to Composting * Life Cycle and Anatomy of Worms * Decomposition of Vegetation * Composition of Compost (Macro and Micro Organisms, Oxygen and Aeration, Temperature) * Recording Scientific Data * Standardized Science Measurements * Medium Scale construction of a Compost System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | K-LS1-1  K-ESS3-1  K-2-ETS1-2  1-LS1-1  2-LS4-1  3-LS4-3  3-5-ETS1-1  4-LS1-2  5-PS3-1  5-LS2-1  MS-LS1-3  MS-LS1-8  MS-LS2-1  MS-LS2-2  MS-LS2-5  MS-ESS3-3  MS-ETS1-1 | K-LS1-1  K-ESS2-2  K-ESS3-1  1-LS1-1  1-LS1-2  2-LS4-1  K-2-ETS1-1  3-LS1-1  3-LS3-2  3-LS4-3  3-LS4-4  4-LS1-1  4-LS1-2  5-PS3-1  5-LS2-1  3-5-ETS1-1  MS-LS1-1  MS-LS1-5  MS-LS1-7  MS-LS2-4  MS-LS3-3  MS-ESS3-3  MS-ETS1-1 |
| 1. **The Rotten Truth**   **(3-5)** | * Introduction to Composting * Life Cycle and Anatomy of Worms * Decomposition of Vegetation * Biodegradation * Composition of Compost (Macro and Micro Organisms, Oxygen and Aeration, Temperature) * Recording Scientific Data * Standardized Science Measurements * Small Scale construction of a Compost System * Drawing Conclusions from Experimentation (hands-on, observation, and note-taking) | 3-LS4-3  3-5-ETS1-3  4-LS1-1  5-PS3-1  5-LS2-1 | 3-LS1-1  3-LS3-2  3-LS4-3  3-LS4-4  4-LS1-1  4-LS1-2  5-PS3-1  5-LS2-1  3-5-ETS1-1 |