VIRTUALLY WILD! COMMUNITIES

ACTIVITY GUIDE FOR FOREST MEASUREMENTS

So you watched a *Virtually Wild! Communities* video with your class. Now what? There's a lot to unpack but worry not. We have a few activities to get you started.

Themes from Forestry and Forest measurement with Virtually Wild! Communities:

- STEM applied to natural resource measurement
- arithmetic
- geometry
- cartography
- changing technology over time

Resources:

- Texas Forest Service Website
    - Check their conservation education resources
- HERE in Houston Website
    - Check out our page on Forests
- iTree -- canopy measurement and other tools
- Check out the City Nature Challenge

Books on drones (used for digital monitoring) courtesy of Houston Public Library:

Drones by Katie Marsico

Eye of the storm : NASA, drones, and the race to crack the hurricane code by Amy E. Cherrix

Robots and Drones: Past, Present and Future by Mairghread Scott

Activity Guide for Virtually Wild! Communities

Math in the Forest

Activity # 1 Tree Hugger	**Time Required: 30 mins**
Lesson Developers: Emma Wilson & Alicia Mein-Johnson of Citizens Environmental Coalition	**Materials:** -Tape Measure -Trees of Texas from A&M Forest Service -Texas Big Tree Registry
Objectives: ❖ Measure the circumference and diameter of a tree ❖ Find your 'Champion' tree ❖ Determine area of tree canopy	**Grade Level - Science & Math TEKS** **7th** - 1-4, **&** 7.9

Procedures

Time	Activities
5 min	I. Motivation/Warm Up -City trees are part of the urban forest; go outside and look at some of the trees on your campus as part of a short nature walk. Question: are they healthy? What are the benefits to people and wildlife provided by trees?
10	II. Information -One way to measure forest health is to measure the diameter of trees in a sample plot and use that measurement to determine the total area of land covered by vegetation (basal area). -Many cities hold contests to measure trees and find the 'champion' or largest diameter tree in the area. Show the Texas Big Tree registry website and tell students they can hold a competition to find the champion tree in your community.
10	III. Practice -Students find a tree and measure diameter with a tape measure (alternatively, they can wrap yarn around the tree and measure the yarn with a ruler). -Find the diameter of the tree mathematically dividing the circumference by 3.142 ($C=\pi d$). -Compare and determine who had the largest diameter tree by making a bar graph or other pictorial representation. -Determine which tree would be best for students to "hug" based on the length of their arms
10	IV. Application -Students measure at least two more trees and look for the biggest tree in their community.
	V. Modifications -Older students can calculate the cumulative area ($A = \pi r^2$) of their school yard covered by trees. Students can calculate the stem area (combined area of all the trees based on their diameter) to find the ratio of vegetation to empty space in the sample area. -If you were to plant new trees in the community, determine the proper spacing of trees, based on expected canopy area of a full-grown tree. Differentiate canopies of native trees, (Trees of Texas from A&M Forest Service) and make recommendations.

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Math in the Forest

Activity # 2 Trees are Nature's Skyscrapers	**Time Required: 60 mins**
Lesson Developers: Emma Wilson & Alicia Mein-Johnson, Citizens' Environmental Coalition	**Materials:** -tape measure or yard stick to measure ~50ft distance -homemade hypsometer (DIY here) -Trigonometric formulas for calculating the height of a tree -Basic Tree Measuring Standards Trees of Texas from A&M Forest Service
Objectives: ❖ estimate the height of a tree using geometry ❖ find the tallest tree.	**Grade Level - Science & Math TEKS** **4th - 8th, varies**

Procedures

Time	Activities
5 min	I. Motivation/Warm Up -Ahead of time, measure the height of 3 trees. Have an estimation competition in which students guess the height of the three chosen trees.
10	II. Information -Make a homemade hypsometer in class, or use a ruler, and review how to measure the height of a tree using provided formulas (Trig or Basic).
20	III. Practice -Walk the class out to the three chosen trees, and measure together. Go back to the class and work out the math… Who was closest to their original estimate? Who got the most accurate measurement of the trees?
30	IV. Application -Have kids go out and measure a tree near their house, or near the school, and complete the math to determine the height of the trees. See who can find the shortest and tallest trees. -Compare the average height of Texas Trees to the height of the trees you found. Discuss growing conditions, and reasons for height variety.

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Math in the Forest

Activity # 3 If a tree falls and no one hears it, how many are left?	**Time Required: varies**
Lesson Developers: Emma Wilson, Alicia Mein-Johnson, Citizens' Environmental Coalition	**Materials:** Hula-hoops, Masking tape, Tape measure or yard stick,dice, Map (printed from google maps or drawn) of the area, thermometer. Seek App by iNaturalist to identify species Forest Research for Species Diversity iTree
Objectives: ❖ Learn how to conduct a biological survey of trees or plants ❖ Learn applications of such natural resource surveys	**Grade Level - Science & Math TEKS** **5th** – 1-4, & varies **6th** - 1-4, & varies **7th** - 1-4, & varies **8th** - 1-4, & varies

Procedures

Time	Activities
5 min	I. Motivation/Warm Up -Find your pace! Foresters and surveyors learned to measure their pace so that they can estimate long distances just by walking. We can do this without specialized equipment like a GPS instrument or 100 ft tape measures. -Place a piece of tape on the ground, then with a tape measure or yardstick, mark out a 10-foot distance and place another piece of tape. -Have students walk from one tape to the other. Every two steps is one 'pace'. Have students record their pace per 10-feet.
15	II. Information -A biological survey helps us learn more about the forest and its needs. Surveys can include species count or measurement of plants or animals. The design of the survey can be random or geometrical, and should be statistically significant, or cover enough of the area to represent changes in the local ecosystem. -**What to measure**. Students can estimate canopy cover, ground cover, species diversity. Older students might pick a list of plant and animal species. Younger students might measure how many trees, or how many different kinds of plants (without necessarily identifying species for each one) Students should ask questions about what they see: Are the trees older or younger? Are they native species? Are there cavities, nests, or other signs of animals living in them? Are there any insects in areas without trees? What is the temperature in the sun vs shade? etc. -**How to measure**. Use a printed or drawn map of the survey area, and draw a grid over the map. Choose sample areas on the map using dice for random sampling. Mark the first space on the grid, then roll the dice and skip the same number of grid spaces as the result. For geometrical sampling, choose an interval of grid squares to sample and mark a sample area in each spot. -Older students design their own survey individually or in groups, younger students participate in the teacher's survey design.

10	III. Practice -Have students go out to an area near the school to conduct their survey, using a map and pacing to their sample points. -Hula hoops make great markers for a sample point, and students can sample from within the hula hoop or use a tape measure to sample a 10-foot area around the sample point. -Have them collect data on notebook paper, and write down unique observations about the area. When the students come back to the classroom, compile the data sheets from each student or group and analyze as appropriate. Find the mean, median, range, etc for each species and for the total number of plants, then do the same for the animals. Or find species diversity indexes, as seen on Forest Research.
	IV. Application -Use iTree tools to get information about your area, and compare the class findings to other areas nearby. -Use the class data to learn about the sample area. Are there more or less animals in areas covered by trees and grass? Is there a difference in temperature between shady areas and sunny areas? What else can you tell from the survey? -The results of the class survey can be used to make a school committee to plant more trees, or submitted to citizen science initiatives like the City Nature Challenge, or a champion tree registry.