# NASA Citizen Science Resources for Educators

NASA Citizen Science projects invite the public to join collaborative research projects addressing a wide variety of scientific goals in astrophysics, biological and physical sciences, Earth science, heliophysics, and planetary science. These projects, which meet the same rigorous standards as any other NASA science project, offer you and your students welcoming opportunities to make observations, work with the latest spacecraft data, and interact with professional scientists. Through NASA citizen science projects, volunteers have made many impressive discoveries, including:

- Hundreds of extrasolar planets - planets outside of our solar system
- Thousands of brown dwarfs - astronomical objects larger than planets but smaller than stars
- 100,000s of emperor penguin nests on Antarctica leading to new understanding of penguin population dynamics
- Most of the known comets, many asteroids, and seven meteorites
- A new kind of auroral phenomenon affectionately called “Steve” by astrophotographers and now formally known as STEVE - Strong Thermal Emission Velocity Enhancement

The NASA Citizen Science projects listed here offer learning resources to help you connect citizen science experiences with the learning objectives or standards of your curriculum. The matrix below shows the gradebands served by each project. Clicking on the project name (first column) will take you to a short description of the project’s science goals, the project activity, links to the project website, and links to their educational materials.

All projects require internet-connected computers to participate. **GLOBE Observer projects** (numbers 3 - 6, below) additionally require use of a mobile app, but do not require a signal in the field.

Click here to see all NASA citizen science projects. Click here for news related to NASA citizen science.

| *NASA Citizen Science Project* | *K - 5* | *6-8* | *9-12* | *13-16* |
|---|---|---|---|---|
| 1. Fireballs in the Sky | X | | | |
| 2. Snapshot Wisconsin | X | X | X | |
| 3. GLOBE Observer - Clouds | X | X | X | |
| 4. GLOBE Observer - Trees | X | X | X | |
| 5. GLOBE Observer - Land Cover | X | X | X | |
| 6. GLOBE Observer - Mosquito Habitat Mapper | X | X | X | |
| 7. Goldstone Apple Valley Radio Telescope (GAVRT) | X | X | X | |
| 8. Growing Beyond Earth | | X | X | |
| 9. Planet Hunters TESS | | X | | X |
| 10. The International Astronomical Search Collaboration (IASC) | | | X | X |
| 11. Radio JOVE | | | X | X |
| 12. Floating Forests | | | | X |

| ***1. Fireballs in the Sky*** | **Ease of Implementation:** Easy - Moderate |
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| **Science goal:** Understand the early workings of the solar system by studying meteorites, fireballs, and their pre-Earth orbits by capturing the paths of fireballs in the sky from multiple viewpoints. | |
| **Project Activity:** Fireballs in the Sky is an Australian citizen science program that invites people around the world to learn about fireball and meteorite science and contribute fireball sightings via a user-friendly smartphone app. | |
| **Curricular Resources:** Two sets of activities are available: Space Rocks (lower elementary) and Origins (upper elementary). **BACK TO TOP↑** | |

| ***2. Snapshot Wisconsin*** | **Ease of Implementation:** Easy |
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| **Science goal:** Monitor Wisconsin wildlife year-round using a statewide network of trail cameras. Data gathered will help inform wildlife management decisions. | |
| **Project Activity:** There are two levels of participation available for this project. First, citizen scientists located anywhere can help identify wildlife captured by the statewide network of cameras. With multiple volunteers viewing each image, a highly accurate consensus is reached for each photo. Snapshot Wisconsin researchers are also available to help with tricky identifications on the website's talk board. Second, citizen scientists located in Wisconsin can apply to host their own Snapshot Wisconsin trail camera on private or public land in one of the statewide survey blocks, or to monitor a camera in an elk reintroduction area. Learn more about the requirements and complete an application here. | |
| **Curricular Resources:** Snapshot in the Classroom (grades K-12) **BACK TO TOP↑** | |

| ***3. GLOBE Observer - Clouds*** | **Ease of Implementation:** Easy |
|---|---|
| **Science goal:** Determine the impact of clouds on local weather and Earth's climate system. Images taken by citizen scientists on the ground are used in conjunction with satellite images from above to gain a more complete picture of clouds in the atmosphere. | |
| **Project Activity:** Once you have downloaded the app and created an account, the Clouds tool will guide you through the observation process. Required data includes providing your location, reporting on overall cloud cover and surface conditions that can impact satellite observations. Optional (but very useful) data include cloud types, cloud opacity, sky conditions and visibility, then taking photos of what you see in the sky. | |
| **Curricular Resources:** Resource Library (grades K-12) **BACK TO TOP↑** | |

| ***4. GLOBE Observer - Trees*** | **Ease of Implementation:** Easy |
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| **Science goal:** Monitor how much carbon is being stored in terrestrial ecosystems, and how this could change as patterns of drought, fire, and forest ecosystems shift in a changing climate. Tree height data from citizen scientists helps validate satellite data. |
| **Project Activity:** Once you have downloaded the app and created an account, the Trees tool will guide you through the observation process. Required steps include selecting a tree and using your device to measure the angle from the bottom to the top of the tree, walking to the tree and counting your steps (to determine the distance) and reporting on surface conditions. The app will use that information to calculate an estimate of the tree's height. Optional steps are taking a photograph of the tree and measuring the circumference of the tree. |
| **Curricular Resources:** Resource Library (grades K-12) **BACK TO TOP↑** |

| ***5. GLOBE Observer - Land Cover*** | **Ease of Implementation:** Easy |
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| **Science goal**: Map changes in the landscape to prevent future disasters, monitor natural resources, and collect information on the environment. Ground observations from citizen scientists can provide reference data to help scientists interpret satellite data, improving the accuracy of maps created from remote sensing data and other products. | |
| **Project Activity:** Once you have downloaded the app and created an account, the Land Cover tool will guide you through the observation process. You will report on current surface conditions, then take photographs in all four cardinal directions, up and down. Optionally, you can classify the land cover in your photographs, telling us if it is grassland, a forest or an urban area, as well as compare your classification to a satellite land cover observation and note any differences. | |
| **Curricular Resources:** Resource Library (grades K-12) **BACK TO TOP↑** | |

| ***6. GLOBE Observer - Mosquito Habitat Mapper*** | **Ease of Implementation:** Easy |
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| **Science goal:** Monitor where mosquitoes and larvae have been observed in order to determine when outbreaks of disease such as malaria or dengue most likely will occur, or when chemical or other controls will be most effective. | |
| **Project Activity:** Once you have downloaded the app and created an account, the Mosquito Habitat Mapper tool will guide you through the observation process. The main required element is to look for a possible mosquito breeding habitat (standing water or somewhere water could collect), and report if you see any mosquito larvae in the water. Optionally, you can sample and count the larvae and try to identify the mosquito type, both of which will require additional equipment. | |
| **Curricular Resources:** Resource Library (grades K-12) **BACK TO TOP↑** | |



| ***7. GAVRT*** | **Ease of Implementation:** Moderate |
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| **Science goal:** Inspire and enrich student learning through their active contribution to professional science. The GAVRT Project is a partnership between NASA/JPL and the Lewis Center for Educational Research. |
| **Project Activity:** The GAVRT program allows you and your students to operate a 34 meter (112 foot) radio telescope from your classroom. Partnered with scientists and other observatories from around the world, you will do real research and exploration. We cannot predict exactly what you will see! Available projects include studying black holes, planets, and helping to monitor the health of spacecraft. |
| **Curricular Resources:** Resources provided after short online orientation (sign up here) (grades 5-12). **BACK TO TOP↑** |

| ***8. Growing Beyond Earth (GBE)*** | **Ease of Implementation:** Moderate |
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| **Science goal:** Develop technologies for growing food crops for long-duration missions into deep space. | |
| **Project Activity:** Growing Beyond Earth (GBE) engages classrooms in research to identify and develop plants suitable for growth and consumption during space travel. The project challenges classrooms to conduct a series of plant growth experiments using equipment similar to the Vegetable Production System (Veggie) on the International Space Station. | |
| **Curricular Resources:** Interested teachers (grades 6-12) will first need to complete the GBE Inquiry Form. Once accepted, teachers attend a mandatory training workshop, and Fairchild Tropical Botanic Garden will send all the materials necessary to construct the Vegetable Production System and start growing plants and running experiments. Curricular guide included. (grades 6-12) **BACK TO TOP↑** | |

| ***9. Planet Hunters TESS*** | **Ease of Implementation:** Moderate |
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| **Science goal:** Discover planetary systems and explore the formation and evolution of these worlds by helping analyze data from a survey of 200,000 nearby stars made by NASA's Transiting Exoplanet Survey Satellite (TESS) mission | |
| **Project Activity:** As a planet passes in front of (or transits) its parent star, it blocks out a small amount of the star's light. The satellite measures light from nearby stars over a period of time, generating graphical displays called light curves (light vs. time). The citizen scientist looks for points on the lightcurve that appear lower than the rest, potentially indicating a transiting planet. | |
| **Curricular Resources:** For middle school classrooms (grades 6-8), see the Educator Guide (nine distinct lessons). Undergraduate curriculum has been piloted and will be released in the fall of 2021. Contact Molly Simon for info at molly.n.simon@asu.edu. **BACK TO TOP↑** | |

| ***10. International Astronomical Search Collaboration (IASC)*** | **Ease of Implementation:** Moderate |
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| **Science goal:** Search recent images made by major observatories for previously unidentified asteroids. | |

**Project Activity:** Computers search data collected through the major sky survey telescopes for asteroids. Many are found this way, but many are missed. The IASC makes the data available for more careful manual observation. Thus far, student citizen scientists have discovered 1,500 main belt asteroids, including two earth threatening Near Earth Objects, seven trans-Neptunian objects, and one Jupiter family comet. Using special software, students will compare astronomical images for the purpose of discovering objects moving across the frames. This project trains participants to utilize the Astrometrica software to search for asteroids or trans-Neptunian objects (TNOs).

**Curricular Resources:** While no formal curricular resources are available, IASC provides software, ready-to-analyze data, and instructions on how to use in the high school classroom setting. Fill out the register form and submit as instructed to begin using IASC. (grades 9 and up) **BACK TO TOP↑**

| ***11. Radio JOVE*** | **Ease of Implementation:** Moderate-Challenging |
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**Science goal:** Detect and analyze radio frequency signals emanating from Jupiter and the Sun to better understand their magnetic fields and plasma environments.

**Project Activity:** Radio Jove invites citizen scientists to build a radio telescope from a kit (purchase required) to use for personal studies, or to engage with data collected by radio telescopes. For those unfamiliar with radio astronomy, the Radio Jove FAQ page and the Joining In page are useful places to start.

**Curricular Resources:** Lesson plans (grades 9 and up) **BACK TO TOP↑**

| ***12. Floating Forests*** | **Ease of Implementation:** Moderate |
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**Science goal:** Monitor changes in kelp forests around the globe to determine the health, resilience, and productivity of coastal ecosystems.

**Project Activity:** Human activities have long overlapped with kelp forests, and now more people than ever live in coastal cities. Scientists want to find out if the growth and development of these cities has affected the health of the nearby kelp forests. Kelp shows up in Landsat images as light green patches along coastlines. These patches can be large or small, and can be very faint. This variation is why help is needed from citizen scientists. Participants will indicate whether there are kelp present or not.

**Curricular Resources:** Undergraduate curriculum has been piloted and will be released in the fall of 2021. Contact Molly Simon for info at molly.n.simon@asu.edu. **BACK TO TOP↑**