



GLOBE AT NIGHT

Teacher Activity Packet: Observation Guide

www.globeatnight.org

2012 Campaign Dates that use Crux: Jan. 14-23, Feb. 12-21, March 13-22 & April 11-20

Encourage your students to participate in a worldwide citizen science campaign to observe and record the magnitude of visible stars as a means of measuring light pollution in a given location. Because the data collection occurs in the evening, this is an excellent opportunity to get parents involved in a learning activity with their child. Participants will learn how to locate the constellation Crux. They will learn stars have different magnitudes of brightness in the night sky and that this information is of interest to scientists studying light pollution. Using the information provided your students will collect data and report their findings to the GLOBE at Night online database. The data will then be analyzed and mapped for participants to see the results of this global campaign.

You may choose to have GLOBE at Night be a part of your planned curricula or a completely independent extracurricular activity. Note that an activity packet has been designed for parents and families to help them successfully participate with their child.

Learning Objectives - Students will be able to:

- Use latitude and longitude coordinates to report the location of their observation
- Locate the constellation Crux using stellar maps
- Determine the magnitude of the faintest visible stars in their location
- Analyze the spatial data collected
- Draw conclusions from studying the mapped observations

Materials Needed:

- GLOBE at Night Teacher or Family Activity Packet
- Something to write on (clipboard or cardboard)
- Something to write with (pencil or pen)
- Red light to preserve night vision (A red light can be made by covering a flashlight with a brown paper bag or a red balloon with the neck cut off.)
- Optional: smart mobile device, GPS unit, or a topographic map to determine your latitude and longitude

Five Easy Star-Hunting Steps:

(www.globeatnight.org/observe.html)

- 1) Find your latitude and longitude** using any of the following:
 - a. Use the interactive tool in the web application at www.globeatnight.org/webapp/. With a smart cell phone or tablet, the latitude and longitude are automatically determined as you report the observation. If you are reporting it later on your computer, input the address of the observation. Or input your city; zoom in/out and pan around until you find it. The latitude and longitude will be displayed.
 - b. Visit eo.ucar.edu/geocode online for a similar tool.
 - c. Use a GPS unit where you take a measurement. Report as many decimal places as the unit provides.
 - d. Use a topographic map of your area.
- 2) Find Crux by going outside at least an hour after sunset** approximately between 8-10 pm local time. (Note for higher latitudes (>45 degrees North or South), you will need to do your observation closer to 9:00 pm rather than 8:00 pm.)
 - a. Determine the darkest area by moving to where the most stars are visible in the sky toward Crux. If you have outside lights, be sure they are all off.
 - b. Wait outside for at least 10 minutes for your eyes to adapt to the darkness. This is called becoming “dark-adapted.”
 - c. Locate Crux in the sky. For help use the appropriate Crux Finder Chart for your latitude. See (www.globeatnight.org/observe_finder.html)
- 3) Match your nighttime sky to one of our magnitude charts** (pp. 3-4 or www.globeatnight.org/observe_magnitude.html).
 - a. Select the chart that most closely resembles what you are seeing.
 - b. Estimate the cloud cover in the sky.
 - c. Fill out the Observation Sheet (page 5).
- 4) Report your observation online** (if not done already by smart mobile device) at: www.globeatnight.org/report.html.
 - a. There are 3 sets of campaign dates in 2012 that use Crux: Jan. 14-23, Feb. 12-21, March 13-22 and April 11-20. During those dates, take observations from different locations!
 - b. Your observations can be reported online any time up to the last day of the campaign month (e.g., January 31, February 29, March 31, and April 30, respectively).
- 5) Compare your observation** to thousands around the world at: www.globeatnight.org/analyze.html



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U.S. Education Standards:

This activity meets the following U.S. educational standards:

National Science Education Standards

Earth and Space Science Standards-

- K-4: Objects in the sky
- Science in Personal and Social Perspectives-
- K-4: Changes in environments
- 5-8: Populations, resources, and environments, Science and technology in society
- 9-12: Environmental quality, Science and technology in local, national, and global challenges

Mathematics Standards

Numbers and Operations: Understand numbers, ways of representing numbers, relationships among numbers, and number systems

- Pre-K-2: Count with understanding and recognize “how many” in sets of objects; Understand and represent commonly used fractions, such as $1/4$, $1/3$ and $1/2$
- 3-5: Develop understanding of fractions as parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers
- 6-8: Work flexibly with fractions, decimals, and percents to solve problems

Geometry: Use visualization, spatial reasoning, and geometric modeling to solve problems

- Pre-K-2: Recognize geometric shapes and structures in the environment and specify their location
- 3-5: Recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life
- 6-8: Recognize and apply geometric ideas and relationships in areas outside of the mathematics classroom, such as art, science, and everyday life

Geography for Life: The National Geography Standards Essential Element 1: The World in Spatial Terms

- How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.

- How to analyze the spatial organization of people, places, and environments on Earth’s surface.

Essential Element 5: Environment and Society

- How human actions modify the physical environment.

Remember Safety First!

Please remind students of the following safety guidelines:

- Be sure you ask for permission from your parent(s) or guardian to go outside after dark to do this activity. This is designed to be a family activity, invite all your family members to do the activity with you.
- Depending on your location, be sure to wear suitable clothing for the weather and for being outside at night (light colored and/or with reflective colors).
- Remember safety first! When choosing the darkest area in your location, be sure the location is not close to traffic, the edge of a balcony, or near any other type of danger.

Multiple Observations:

You can enter more than one observation by moving to a new location at least 1 km away from your original location. Don’t forget to get new latitude and longitude coordinates. This can be done on the same night or on another night any time during the dates of the campaign.

Note: Crux is a constellation in the southern hemisphere. It can be seen during the mid-March and mid-April campaigns, but during the January and February campaign times, it is not visible at locations with latitudes north of 20 degrees S and north of 10 degrees S, respectively.

Note for higher latitudes (>45 N or S): astronomical twilight will occur later and Crux will be low on the horizon; so you may need to do your observation closer to 9:00 pm rather than 8:00 pm.

Charts in this document were prepared by Jan Hollan, CzechGlobe (<http://amper.ped.muni.cz/jenik/astro/maps/GaNight>).



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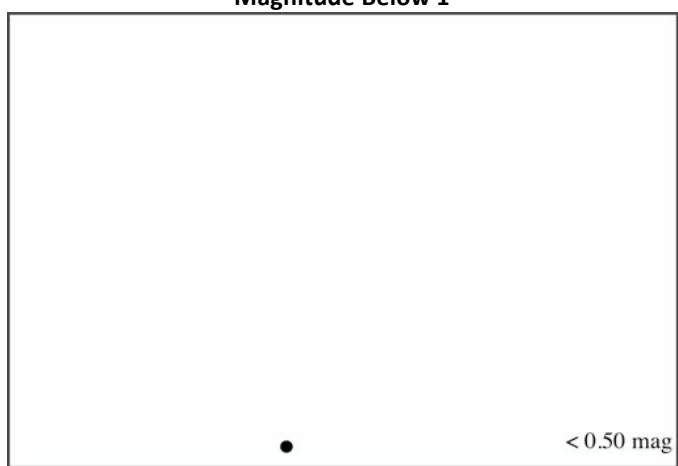
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Please orient this page with the arrows up according to your location (e.g., in the Northern Hemisphere, near the equator or in the Southern Hemisphere).

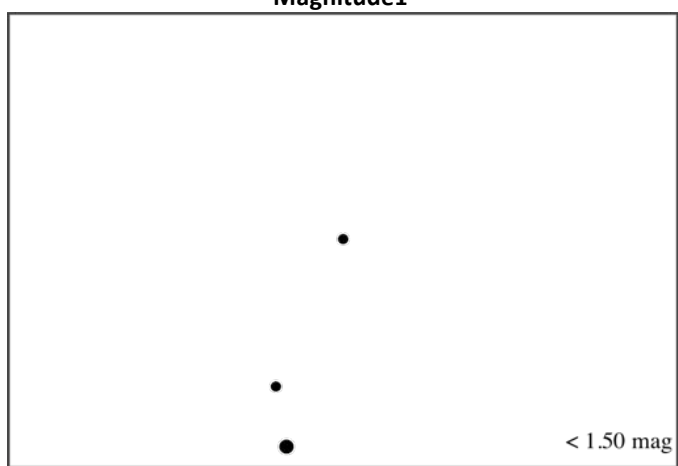
↑ Southern Hemisphere View ↑

Magnitude Below 1



Hint: You can't see Crux because the sky is too bright. The single bright star is called alpha Centauri or Toliman.

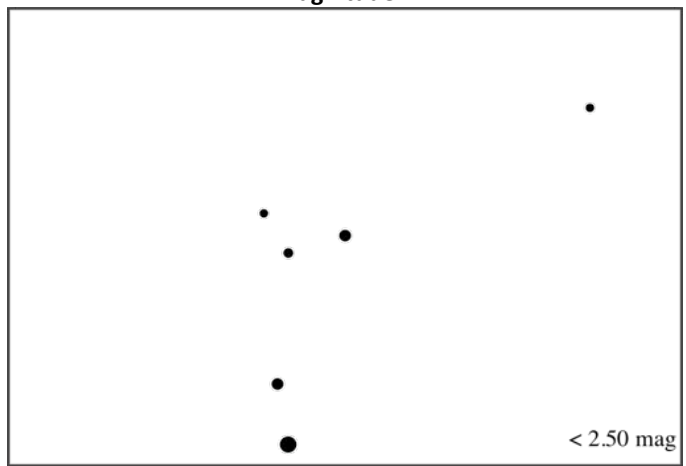
Magnitude 1



Three stars can be seen toward the constellation Crux: alpha Crux or Acrux, alpha Centauri and the star between them, beta Centauri or Hadar.

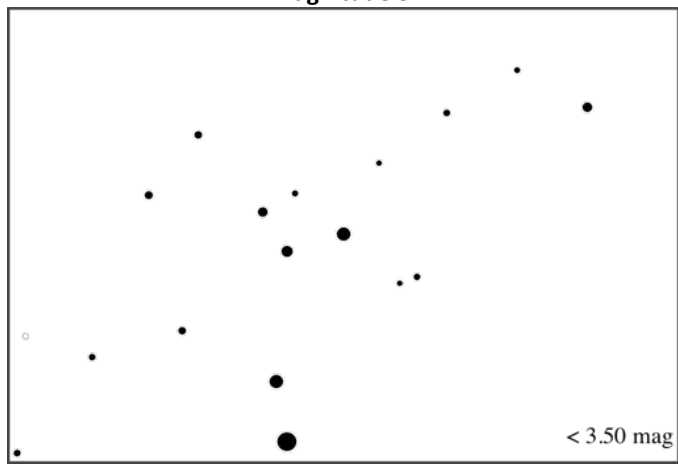
↑ Near Equator View ↑

Magnitude 2



Hint: Two more stars in Crux can be seen in addition to Acrux, alpha Centauri and beta Centauri.

Magnitude 3



Hint: The fourth main star in Crux can be seen. Together with the other three main stars in Crux, they are the ends of a cross. The next 3 brightest stars in Centaurus surround Crux.

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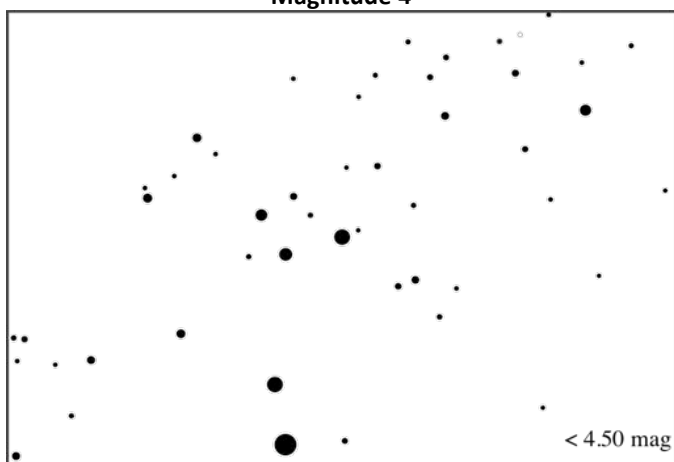
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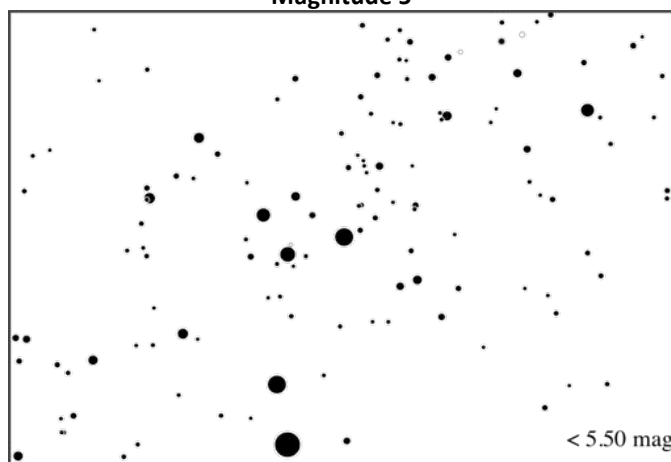
↑ Southern Hemisphere View ↑

Magnitude 4



Hint: The fifth brightest star in Crux can now be seen (epsilon Crucis) just inside the "kite". A couple of stars surround Crux and gamma and delta Centauri.

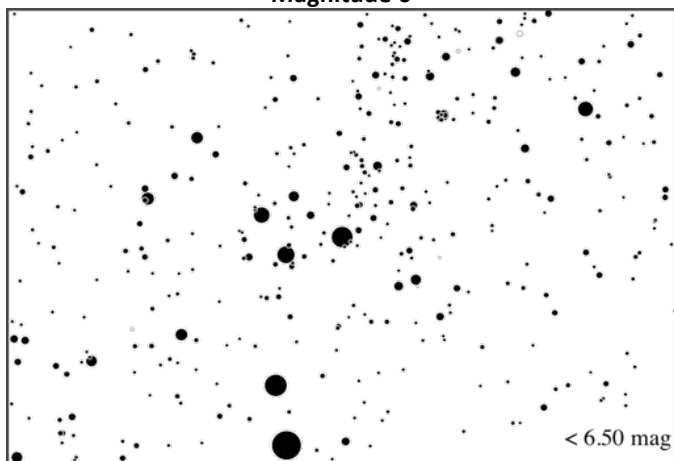
Magnitude 5



Hint: A few more stars surround Crux and gamma and delta Centauri.

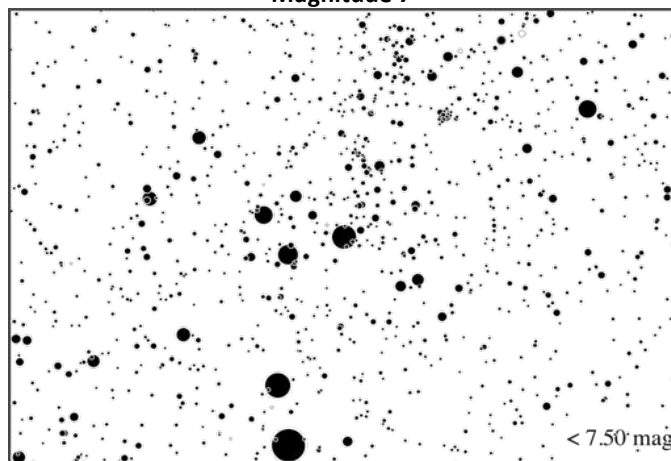
↑ Near Equator View ↑

Magnitude 6



Hint: Stars can now be seen within the "kite" or cross of Crux.

Magnitude 7



Hint: You can't count that many stars!

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Only fields marked by * are required.

*Date: March / April (circle month) _____, 2011

*Observation Time: ____:____ PM local time (HH:MM) *Country: _____

*Latitude (in deg/min/sec ____ deg ____ min ____ sec (North / South) circle direction
or decimal degrees): _____ decimal degrees

*Longitude (in deg/min/sec ____ deg ____ min ____ sec (East / West) circle direction
or decimal degrees): _____ decimal degrees

Comments on location: (e.g. There is one street light within 50 m that is shielded from my view.)

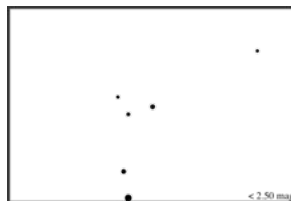
*Match your nighttime sky to one of our magnitude charts :



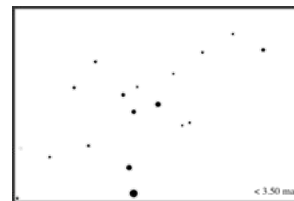
Stars in Crux not visible



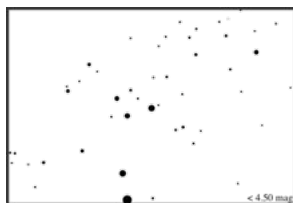
Magnitude 1 Chart



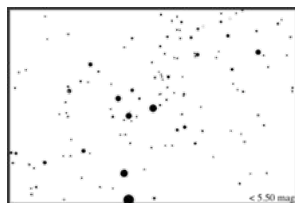
Magnitude 2 Chart



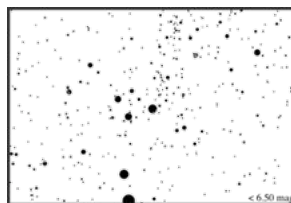
Magnitude 3 Chart



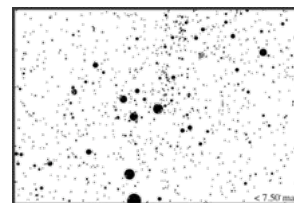
Magnitude 4 Chart



Magnitude 5 Chart



Magnitude 6 Chart



Magnitude 7 Chart

Reading from the Unihedron Sky Quality Meter (if applicable): _____

Serial number from the Unihedron Sky Quality Meter (if applicable): _____

*Estimate the cloud cover in the sky:

Clear Clouds cover $\frac{1}{4}$ of sky Clouds cover $\frac{1}{2}$ of sky Clouds cover $> \frac{1}{2}$ of sky

Comments on sky conditions: (e.g. a little haze to the north)

Report online at www.globeatnight.org/report.html