



# **Keeping the Stars in Our Eyes: A GLOBE at Night Campaign Update**

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# OVERVIEW



- Light pollution threatens observatory sites and our right to starlight, but also energy consumption, wildlife and health.
- Emphasis of GLOBE at Night (GaN): to bring awareness to the public on issues of light pollution
- Citizen-scientists measure night sky brightness and submit observations to a website from a computer or smart phone.
- GLOBE at Night run the last 6 years by the National Optical Astronomy Observatory in Tucson, Arizona, USA.
- 66,000 measurements to date





# 2011 CAMPAIGN RESULTS



- 14,249 measurements for GLOBE at Night 2011
- > 6 out of 10 measurements have limiting magnitude 3 or 4.
- The largest # of countries (115) participated.
- 48 contributed ~ 99% of measurements.



## Legend

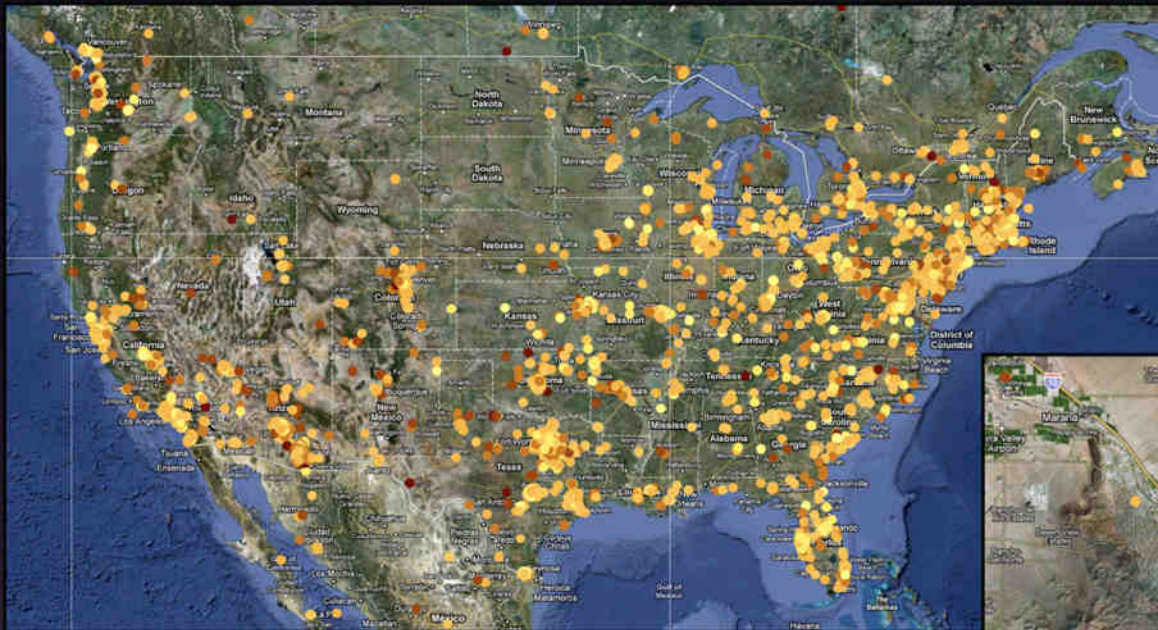
### 2011 GLOBE at Night Magnitude

- Bright Skies > Dark Skies
- Limiting Magnitude 1
  - Limiting Magnitude 2
  - Limiting Magnitude 3
  - Limiting Magnitude 4
  - Limiting Magnitude 5
  - Limiting Magnitude 6
  - Limiting Magnitude 7

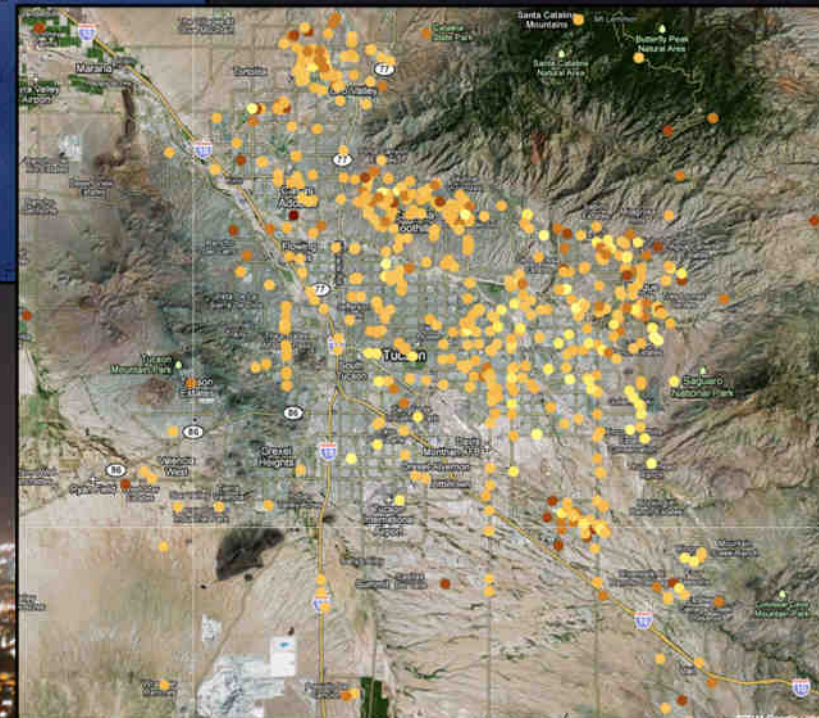




# 2011 CAMPAIGN RESULTS



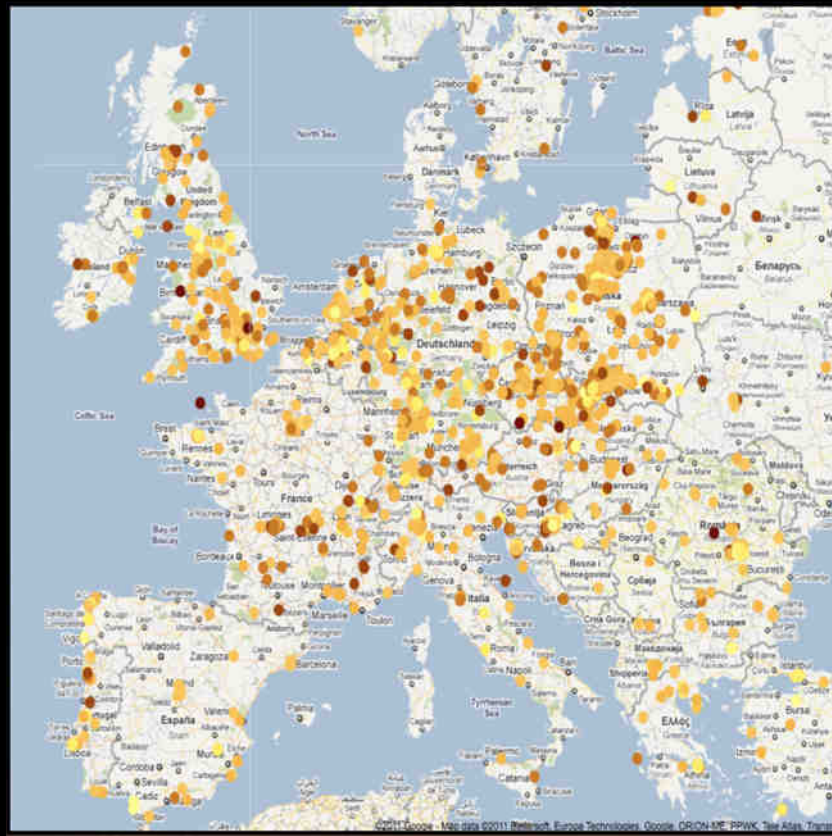
- Half measurements from the USA;  
10% from Arizona.







# 2011 CAMPAIGN RESULTS



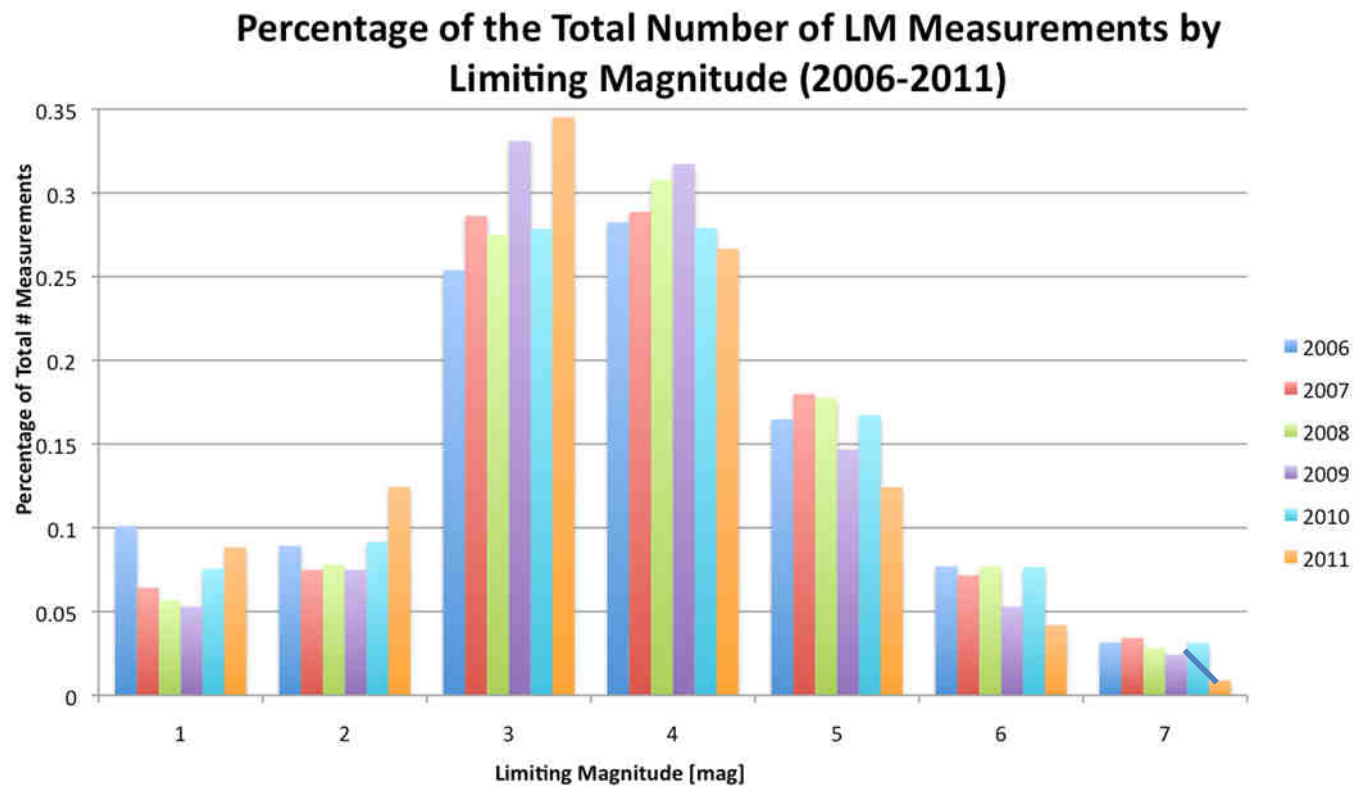
- Poland (with over 1200) = next largest contributor.
- India with 700 measurements
- Other top countries (300 to 450 measurements each): South Korea, Croatia, Puerto Rico, the Czech Republic, Chile, Germany, Colombia, Canada and Japan



# Analysis of GaN Data Over Last 6 Years



- On average, the people who participated in GLOBE at Night saw brighter skies & less stars over time.

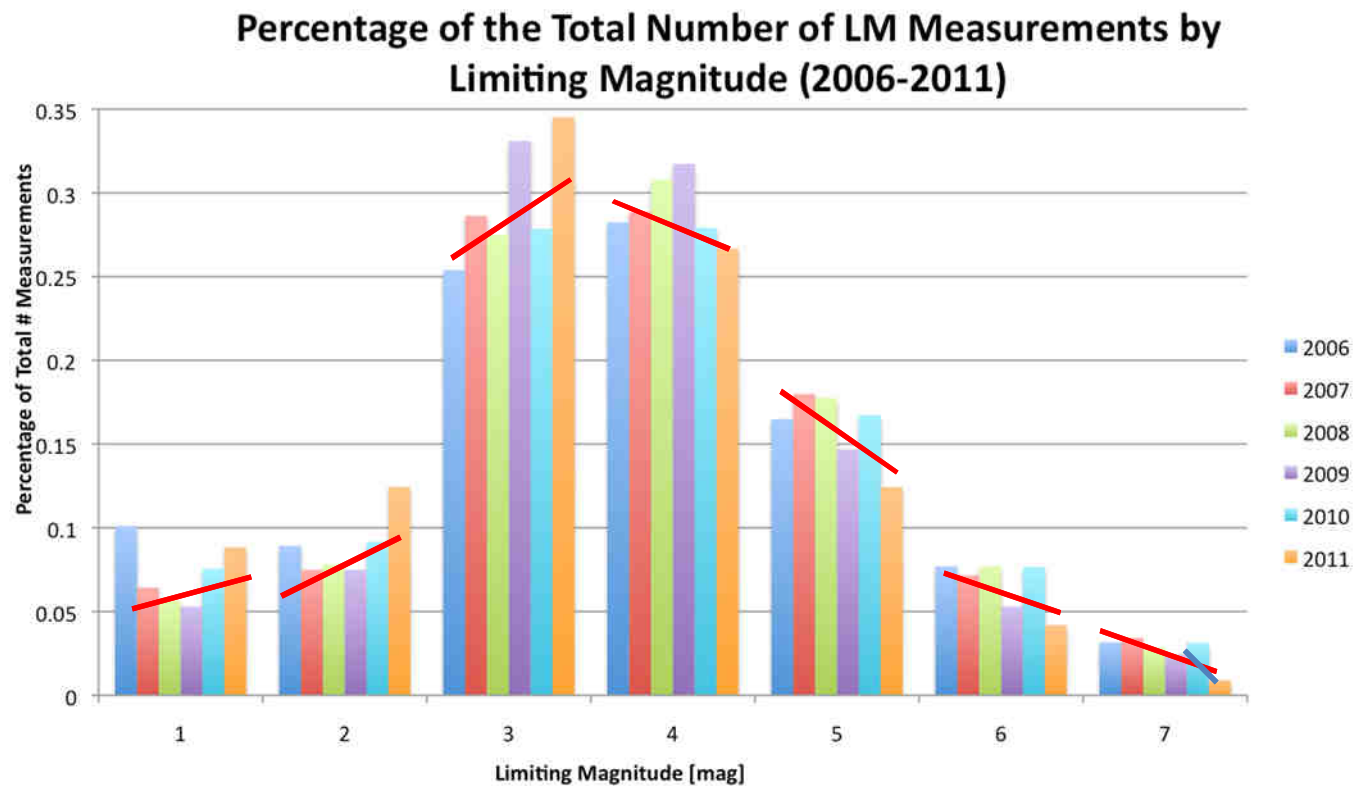




# Analysis of GaN Data Over Last 6 Years



- On average, the people who participated in GLOBE at Night saw brighter skies & less stars over time.







# Updates in the Last Year



- How do we improved our GLOBE at Night program to help increase global awareness on light pollution, its effects and how to light responsibly?
- This past year we worked on increasing:
  - The opportunities to participate
  - The promotion of the campaign
  - The opportunity to use the data
  - The opportunity for partnerships.





# INCREASE THE OPPORTUNITIES FOR PARTICIPATION IN THE CAMPAIGN

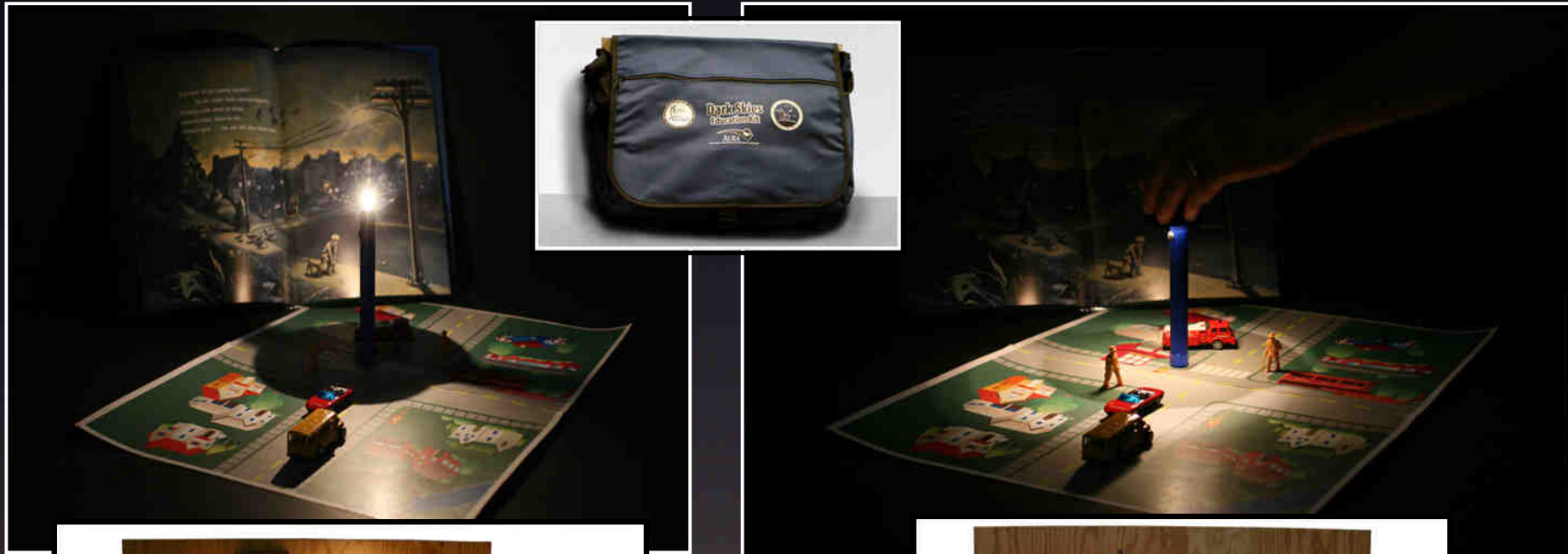


- On-line social communities on Facebook and Twitter
  - During the campaign there were close to 1000 visitors per week
  - [www.facebook.com/GLOBEatNight](http://www.facebook.com/GLOBEatNight) & [twitter.com/GLOBEatNight](http://twitter.com/GLOBEatNight).
- Evaluation to examine the effectiveness of the GLOBE at Night program and its accompanying “Dark Skies Rangers” activities
- 4 tutorial videos for the activities





# Light Shielding Demo and Examples of Good & Bad Lights







## Activities

- **Explorer**
  - Light Shielding Demo
  - Spectra of Lights
  - School Outdoor Lighting Audit
  - Student Symposium
- **Protector**
  - Turtle Hatching Activity
  - Wildlife Activity (Insects)
- **Advocate**
  - Magnitude Reader
  - Finding Orion, Cygnus, etc.
  - GLOBE at Night campaign

Videos Coming





# INCREASE THE PROMOTION OF THE CAMPAIGN



- New: measurements can be submitted as data is taken
  - Using smart phones, tablets or computers
  - and the web application at [www.globeatnight.org/webapp/](http://www.globeatnight.org/webapp/)
  - It automatically registers the location, date and time.
  - Without a smart mobile device? User-friendly tools determine latitude and longitude easily and accurately.
- In 2011, two annual campaigns instead of one.
  - new materials were developed and translated for on-line interactive tools, limiting magnitude star charts, and other resources for 2 new constellations (Leo and Crux). **MANY, MANY THANKS TO JENIK HOLLAN FOR THE MAGNITUDE CHARTS!!!**
  - Eventually NOAO is contemplating offering the program year-round for seasonal studies.







View summary of data submitted from this machine

## 1 When did you make your observations?

If needed, change the observation date and time using the current date and time format, below, as an example.

Observation Date   
(yyyy/mm/dd)

Observation Time   
(24 hour time)

Switch to [Daytime version](#).

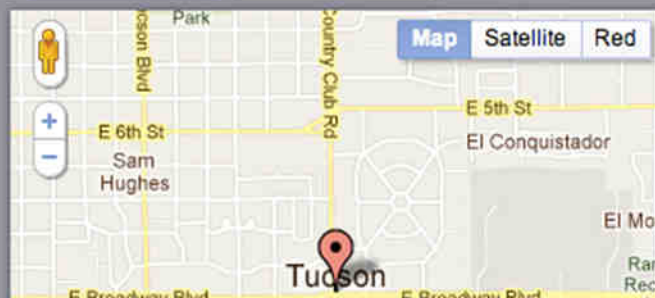
## 2 Where did you make your observations?

Use the map below to help you find the latitude and longitude of your location when you made your observations

Type the [street address](#), the [common name](#), or the latitude and longitude (in decimal degrees) of your location into the text box & click **Map It!**. Refine your location by zooming in, scrolling and tapping the map.

If you have the Latitude and Longitude in Degrees (°), Minutes (') and Seconds (") (DMS), [use our conversion tool](#) to convert them to decimal degrees and map the location.

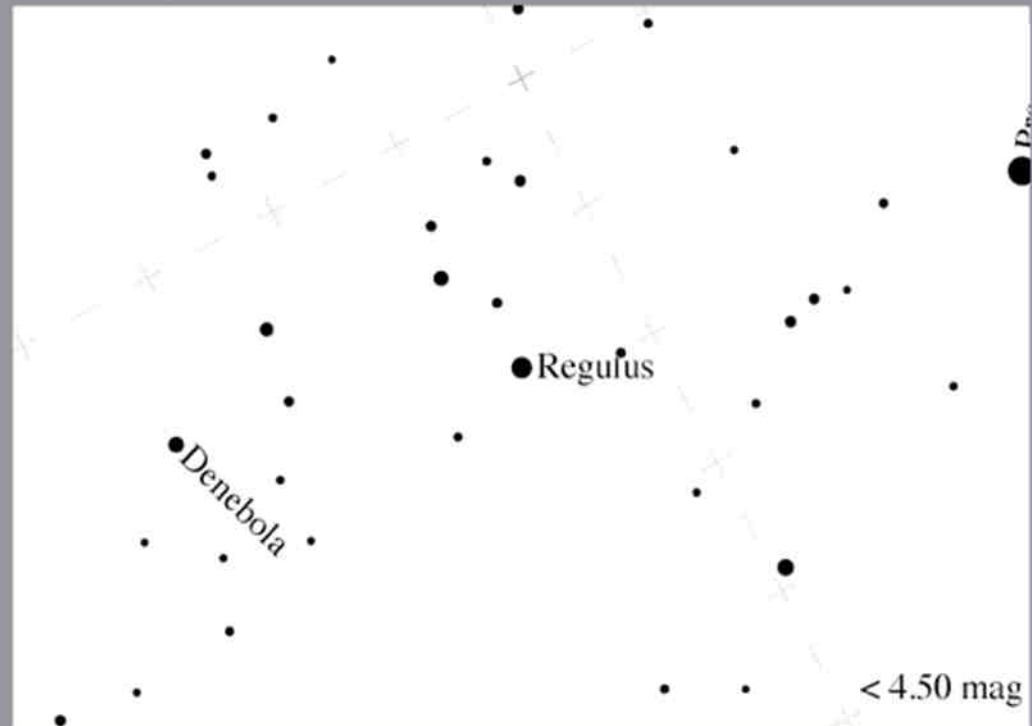
When your location is correct, click the checkbox.



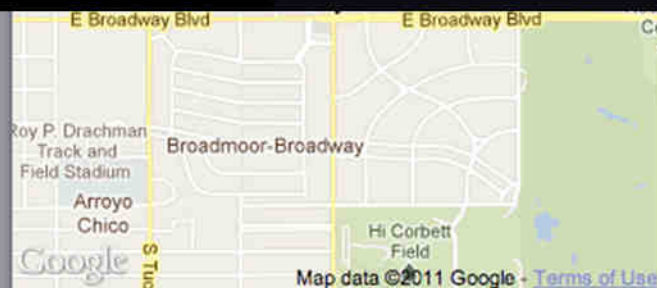
## 3 How dark was the sky that night?

To select the magnitude chart that most closely resembles what you see, click the thumbnail images below the larger magnitude chart. This will load sky views at various magnitudes. The currently displayed magnitude chart is highlighted on the corresponding thumbnail. When you have found the chart that most closely resembles your view of the night sky, leave that thumbnail highlighted.

Note: For the constellation Leo, the star charts for magnitudes 0-3 have a field of view of 100°. For magnitudes of 4-7 the field of view is 50°.



Constellation: Leo



Location correct: ☐

[Reset GPS](#)

Latitude: 32.2217429

Longitude: -110.92647899999997

Country:

#### Your comments on the location

(E.g., Rural, suburban, or urban location; Snow cover? Number of streetlights, porchlits or other light sources (vending machines, etc.) in vicinity; Trees or structures in vicinity)

*rural area: 100 feet from a street light; shielded porchlight*

#### 4 What were sky conditions like that night?

Were there any clouds? Estimate how much of the sky was covered (touch/click the image below):



Clear



1/4 of the sky



1/2 of the sky



More than 1/2 of the sky

#### Your comments on the sky

(E.g., Haze - direction?  
Clouds - type, direction?  
Sky glow/light dome - direction?)

*sky glow toward the SW from city 10 miles away*

#### 5 Did you use a Sky Quality Meter (SQM)?

If so, please tell us your reading and, optionally, the serial number of the SQM you used.

SQM reading

Serial Number

#### 6 Ready to send us your data?

If you have filled out all the information in the previous five steps, you are ready to send us your data. Take a moment to double-check that the data you have entered above is correct and then click the **Submit Data** button below. And thanks for being a GLOBE at Night citizen scientist!





# INCREASE THE OPPORTUNITIES FOR USING THE DATA



- More areal coverage → more possibilities: “adopt-a-street”
  - Measurements every 1-2 km for the length of a major or semi-major street.
  - Comparisons over hours, days, months or search for dark sky oases or light-polluted areas.
  - Expansion to other cities planned.
- A 2<sup>nd</sup> new Web application ([www.globeatnight.org/mapapp/](http://www.globeatnight.org/mapapp/)) to map GLOBE at Night data points around a city or an area of choice
  - The resulting maps are bookmarkable and shareable.
  - A CSV file can be downloaded.



## Web Application to Map GLOBE at Night Data

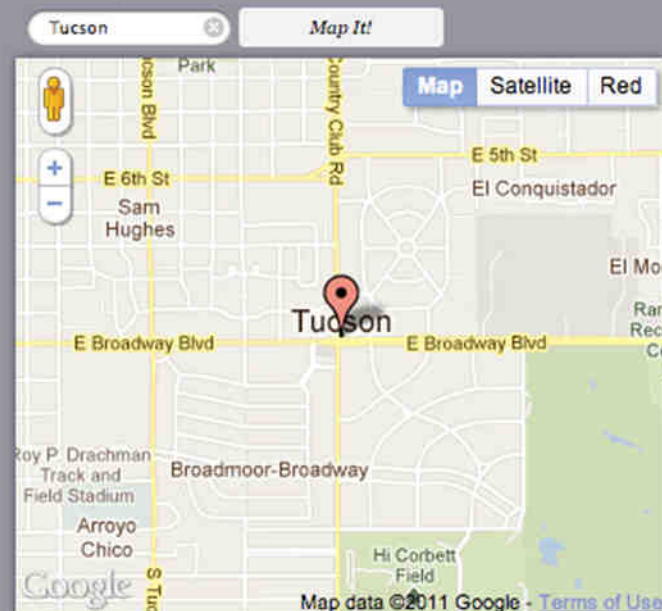
This map application allows you to map GLOBE at Night data points within a distance you specify around a city or an area of your choice. The resulting maps are bookmarkable and shareable.

You can also download a CSV file of those data points that can be opened in Excel, or other spreadsheet. Find the download link in the generated map's Legend.

### Input map center

The application asks first for the center of the map, which can be simply a city name or a common place name, or as specific as a mailing address or a latitude and longitude (in decimal degrees). Note: the map will plot up to 4000 data points.

Type the location of the map center into the text box and click **Map It!**



Latitude: 32.2217429  
Longitude: -110.92647899999997

### Provide a radius

Provide a radius (in km) to define the area around the center of the map within which you want to show data points.

Radius:

### Data Year

Choose the year in which the data set was taken from the pull down menu. There is a data set for every year since 2006.

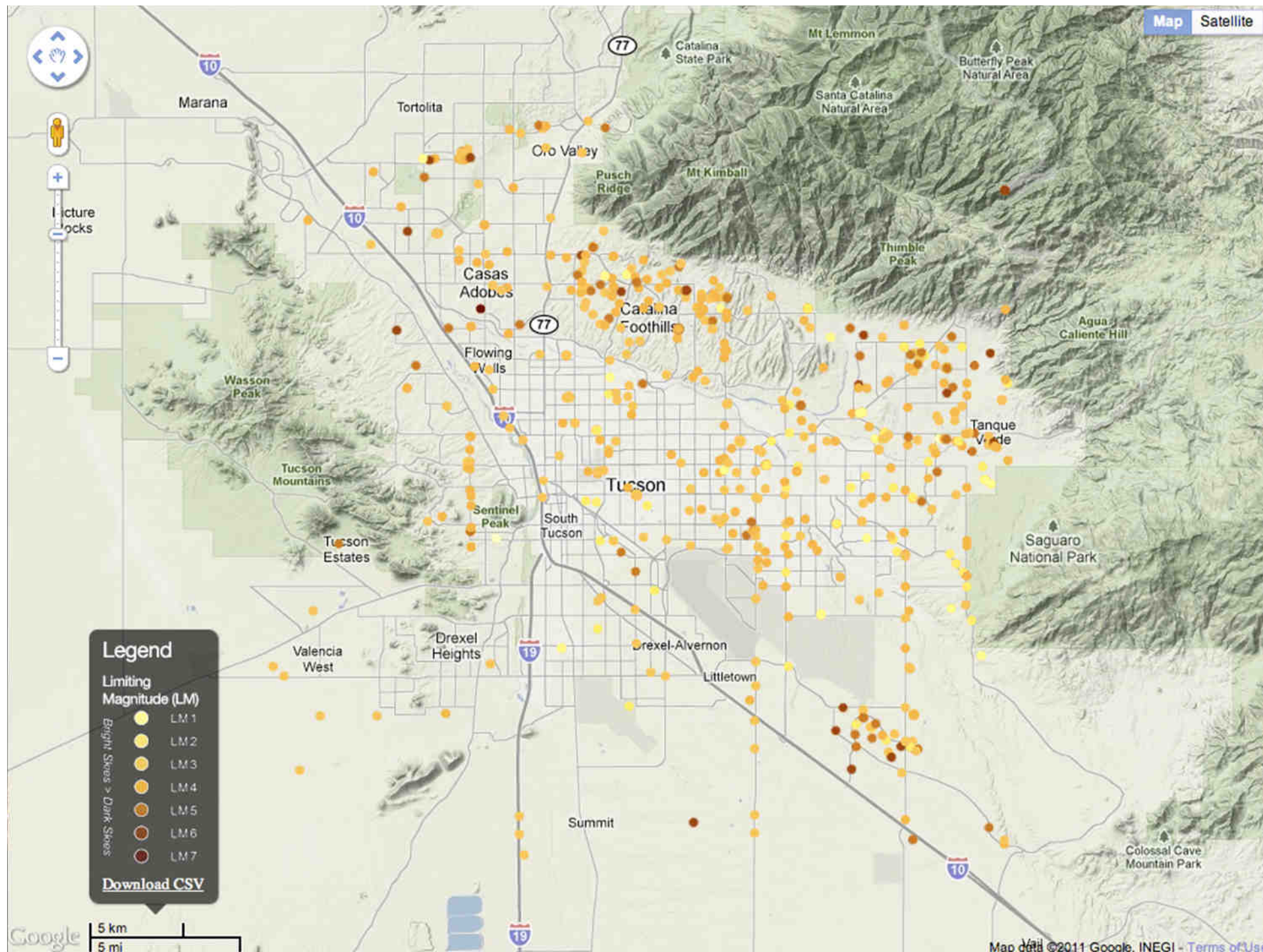
Year:

### Generate the map

The map is now ready to be made. Click "Generate Map".

**GENERATE MAP**







# INCREASE THE OPPORTUNITIES FOR USING THE DATA

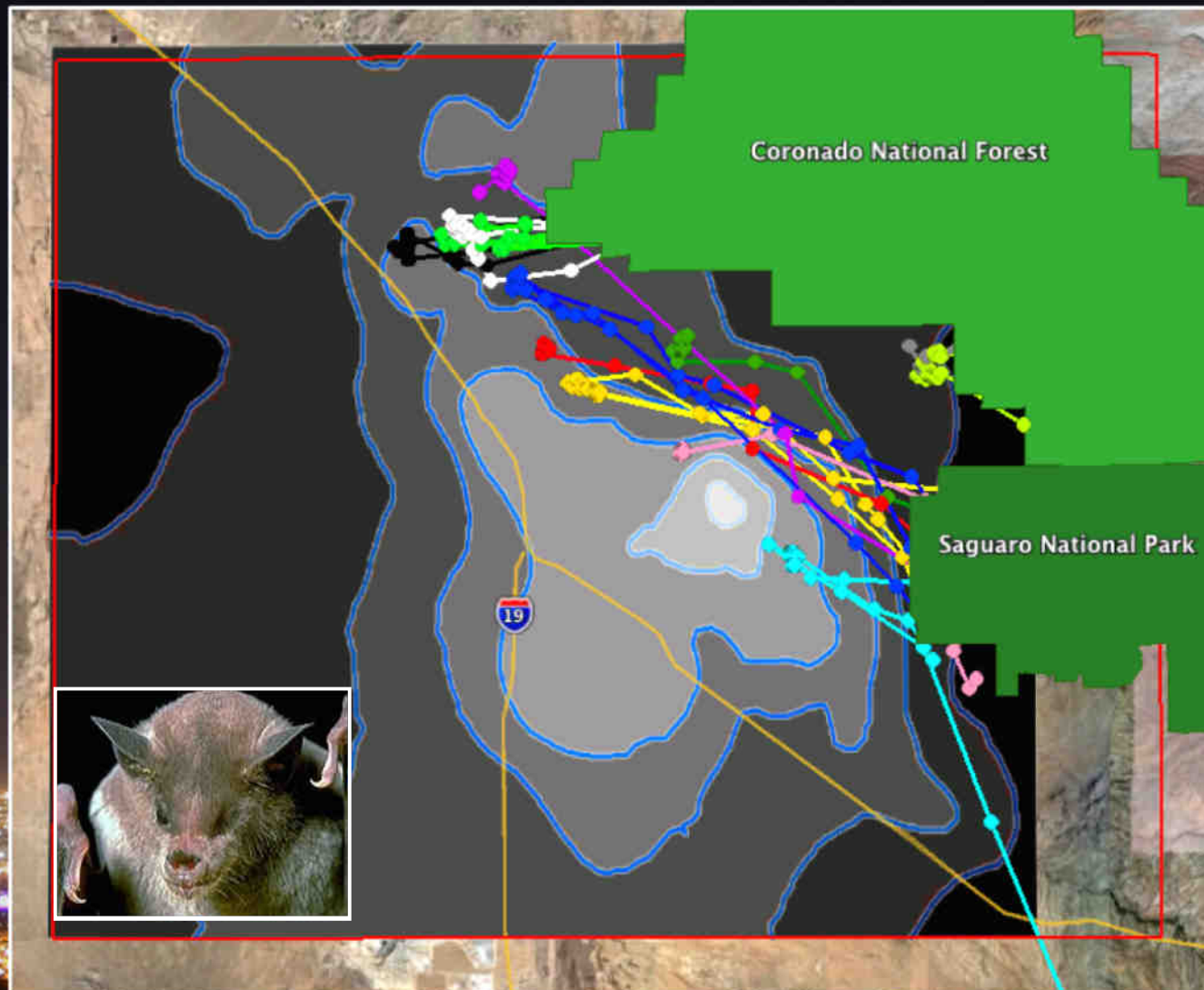


- NOAO and the Arizona Game and Fish Department → a project with GLOBE at Night data and bat telemetry to examine a dark skies corridor in Tucson where the endangered bats fly 25 km from roost to foraging area.
- The goal of this project is to beta-test comparing GLOBE at Night data with datasets on wildlife, health, and energy consumption.
- 1<sup>st</sup> summer, an undergraduate student worked with visual data.
- 2<sup>nd</sup> summer, an undergraduate student worked with SQM data.





# GLOBE at Night Data with Bat Telemetry



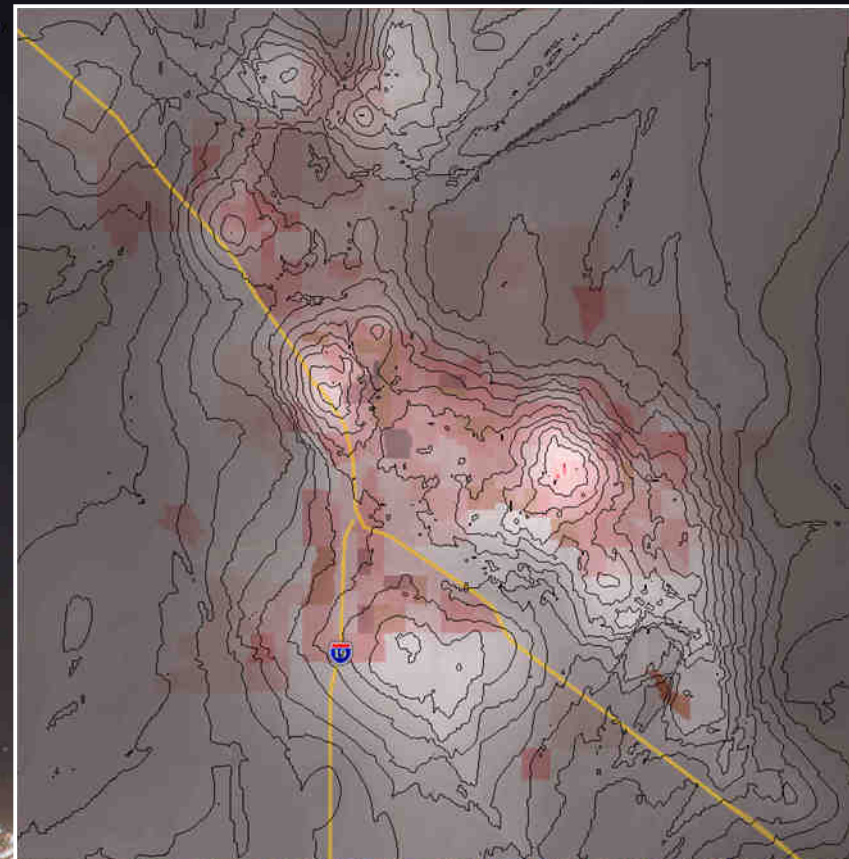


# LOOKING for PARTNERS or IDEAS to



Work with the GLOBE at Night data to

- Compare data over time
- Compare to population density
- Compare with photography or spectroscopy
- Use in a lighting survey
- Search for dark sky oases
- Monitor ordinance compliance
- Study effects of light pollution on
  - human health, animals or plants
  - safety, security, energy consumption, cost



Tucson, Arizona





# INCREASE THE OPPORTUNITIES FOR PARTNERSHIPS



- With a local educational environmental center → every spring 20-30 groups of 50 students up to 8<sup>th</sup> grade → Dark Skies Rangers
- With prominent national groups like Girl Scouts of America via the National Girls Collaborative Project. For instance, the Junior-level Girls Scouts learn about energy conservation and GLOBE at Night through activities in the book "Get Moving!" from the "It's Your Planet – Love It!" Leadership Journey series.
- With international groups like the Galileo Teacher Training Program (which has trained 5000 teachers in the last 2 years with representatives in 100 countries)



# SUMMARY



- This past year our updates focused on improving the GLOBE at Night program to help increase global awareness on light pollution, its effects and how to light responsibly.
- We worked on increasing:
  - The opportunities to participate
  - The promotion of the campaign
  - The opportunity to use the data
  - The opportunity for partnerships.
- Also gave last campaign results and analysis
- Inviting comments, questions, ideas and/or partnerships





# GLOBE at Night 2012



We hope you will join the GLOBE at Night campaign:

January 14-23

February 12-21

March 13-22

April 11-20

Websites of interest:

[www.darksky.org](http://www.darksky.org)

[www.globeatnight.org](http://www.globeatnight.org)

[www.darkskiesawareness.org/DarkSkiesRangers/](http://www.darkskiesawareness.org/DarkSkiesRangers/)

**GLOBE at NIGHT 2012**

Month	Start Date	End Date
January	14	23
February	12	21
March	13	22
April	11	20

[WWW.GLOBEATNIGHT.ORG](http://WWW.GLOBEATNIGHT.ORG)

**Get Out and Observe the Night Sky!**

- Engage students worldwide in observing the nighttime sky.
- Encourage citizen and family science with a hands-on learning activity outside of the classroom.
- Gather light pollution data from an international perspective.

**Can you see the stars?**





# Thank-you for your kind attention!



GLOBE at Night outreach event organized by Joan Chamberlin (a teacher from the USA) visiting students in Nepal (March 2011)



Students and Advisor from Clube Ciencias Alunos (Portugal) participate in GLOBE at Night 2011.







# Contact Information



## Connie Walker

- Dark Skies Rangers Program & GLOBE at Night Program Director
- 1-520-318-8535 or
- [cwalker@noao.edu](mailto:cwalker@noao.edu)





# Sponsoring Institutions



GLOBE at Night ([www.globeatnight.org](http://www.globeatnight.org)) has been a collaboration between

- the National Optical Astronomy Observatory (NOAO) in Tucson, AZ;
- the International Dark-Sky Association (IDA) in Tucson, AZ;
- The Global Learning and Observations to Benefit the Environment (GLOBE) Program, in Boulder, CO;
- the Environmental Systems Research Institute, Inc. (ESRI) in Redlands, CA; and
- the Centro de Apoyo a la Didactica de la Astronomia (CADIAS) in Altovalsol, Chile.

Other partners have included the Astronomical Society of the Pacific, the American Astronomical Society, the Astronomical League, Astronomers Without Borders, The World At Night, and Let ThereBeNight.org.

