

# Social.Water—Powering Citizen Contributed Hydrologic Data through the CrowdHydrology Project



USGS Citizen Science Workshop  
September 12, 2012

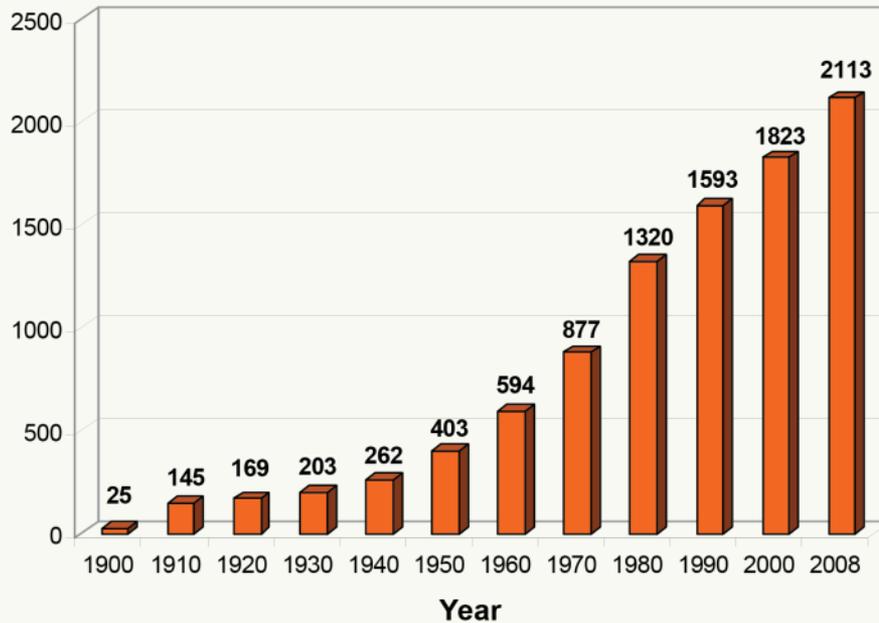
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mnfienen@usgs.gov  
Research Hydrologist  
*USGS Wisconsin  
Water Science Center*

# Audubon Christmas Bird Counts

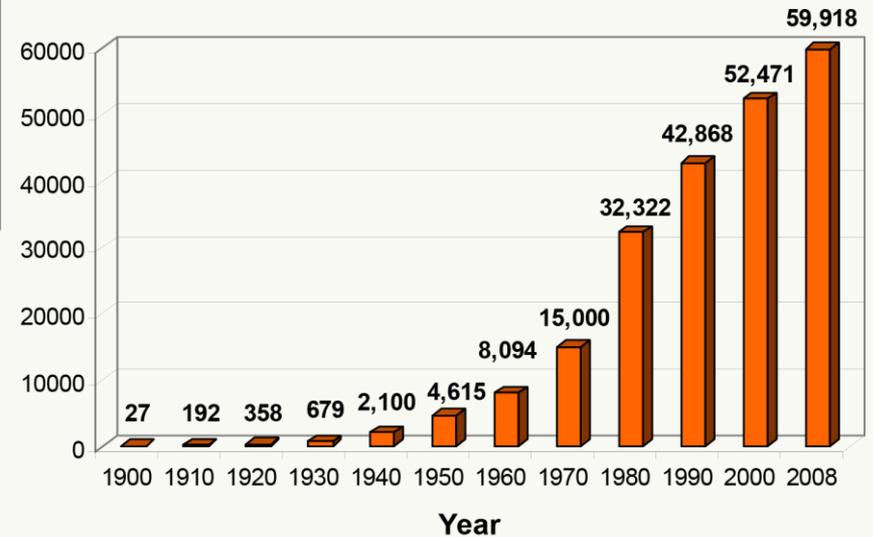


# Audubon Christmas Bird Counts: Growth of Participation

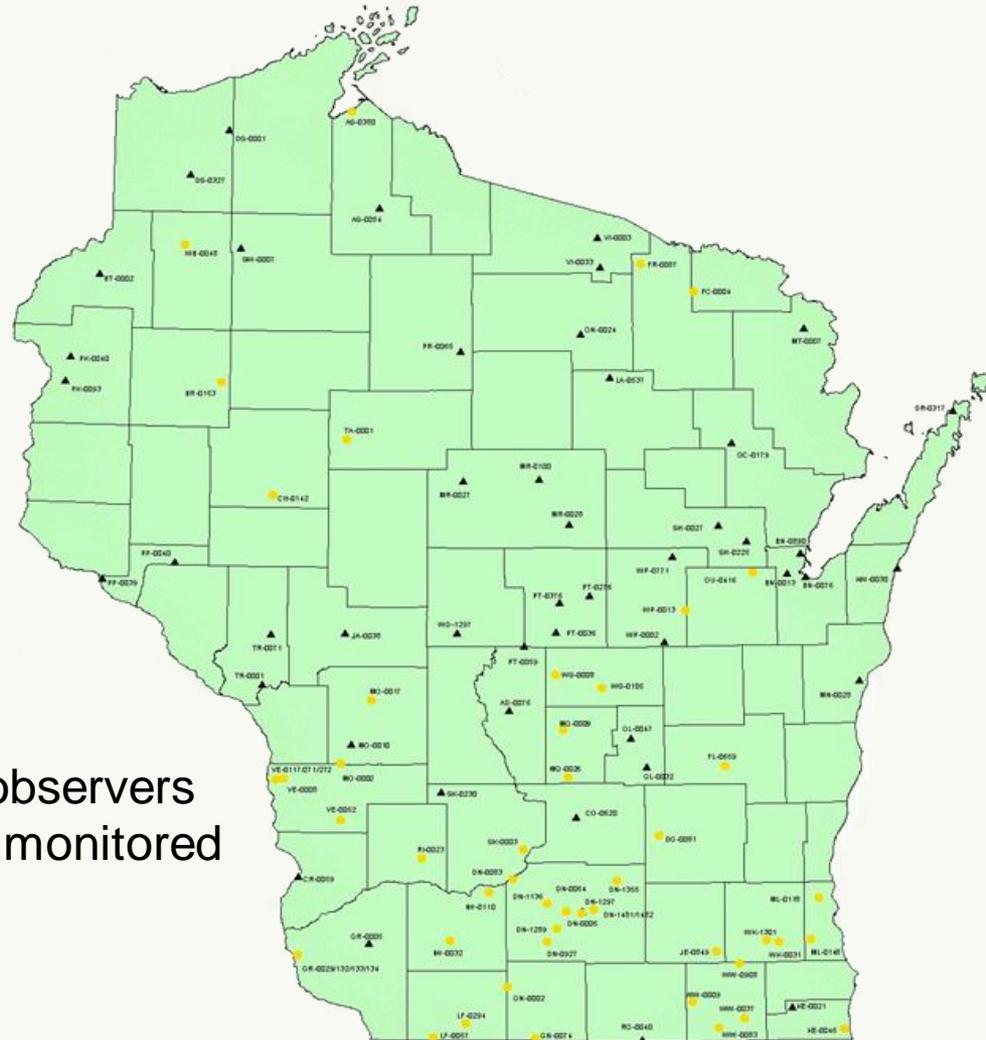
Number of Christmas Bird Counts



Number of CBC Participants



# Citizen Observers Contribute to the Wisconsin Groundwater Monitoring Network



black wells: citizen observers  
yellow wells: USGS monitored



# Harnessing the Crowd for Scientific Data and Analysis

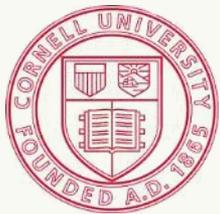
**ZOONIVERSE**  
REAL SCIENCE ONLINE

Galaxy Zoo and Moon Zoo  
[www.zooniverse.org/](http://www.zooniverse.org/)



CreekWatch

[creekwatch.researchlabs.ibm.com/](http://creekwatch.researchlabs.ibm.com/)



eBird

[ebird.org](http://ebird.org)



OpenDinosaur

[opendino.wordpress.com](http://opendino.wordpress.com)



wildlifecrossing.net

[www.wildlifecrossing.net/](http://www.wildlifecrossing.net/)



**SKYWARN**  
WEATHER.GOV®

Skywarn Weather Spotters

[www.nws.noaa.gov/skywarn/](http://www.nws.noaa.gov/skywarn/)



CoCoRaHS

Community Collaborative  
Rain, Hail, and Snow Network

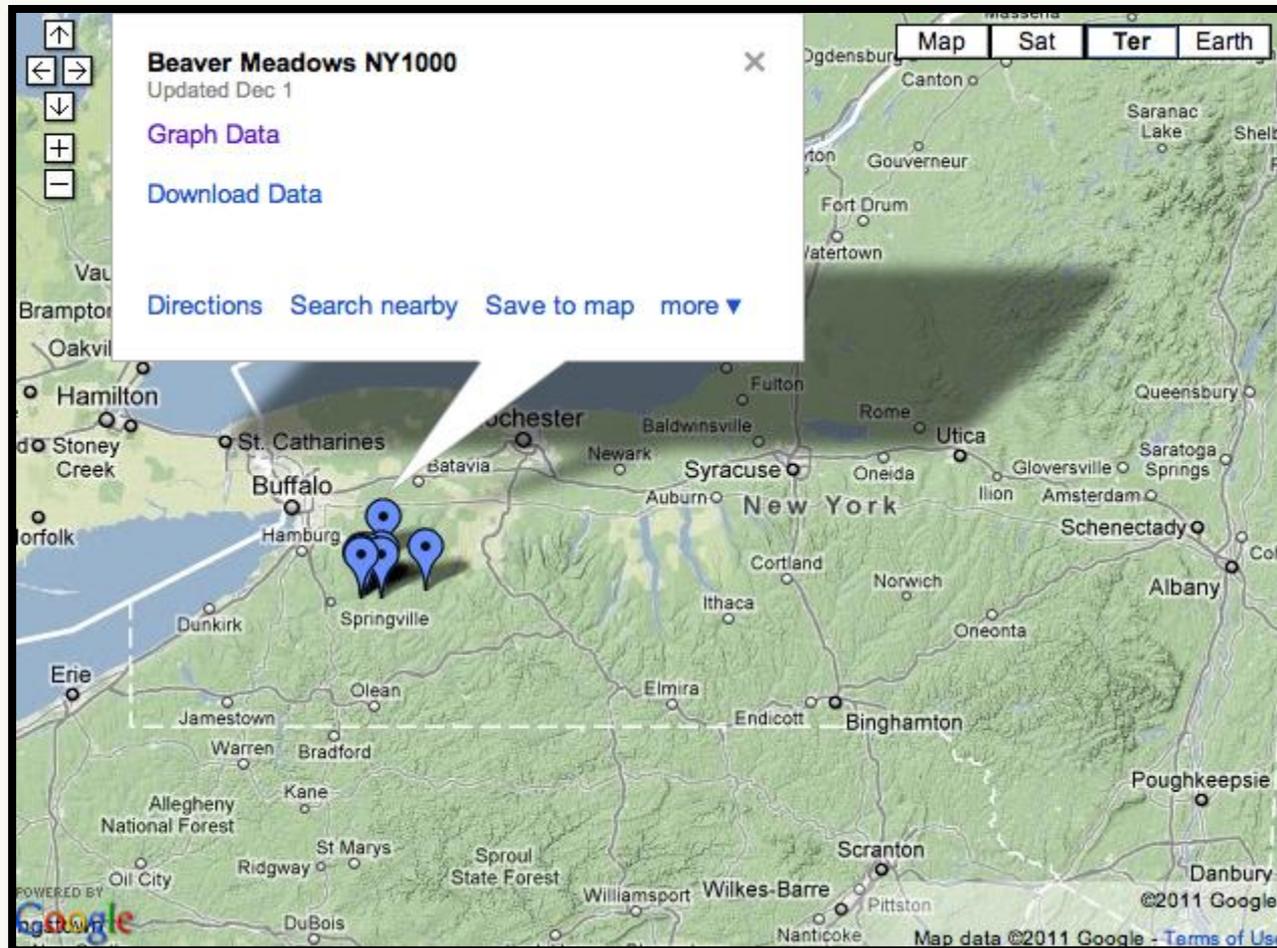
[www.cocorahs.org/](http://www.cocorahs.org/)





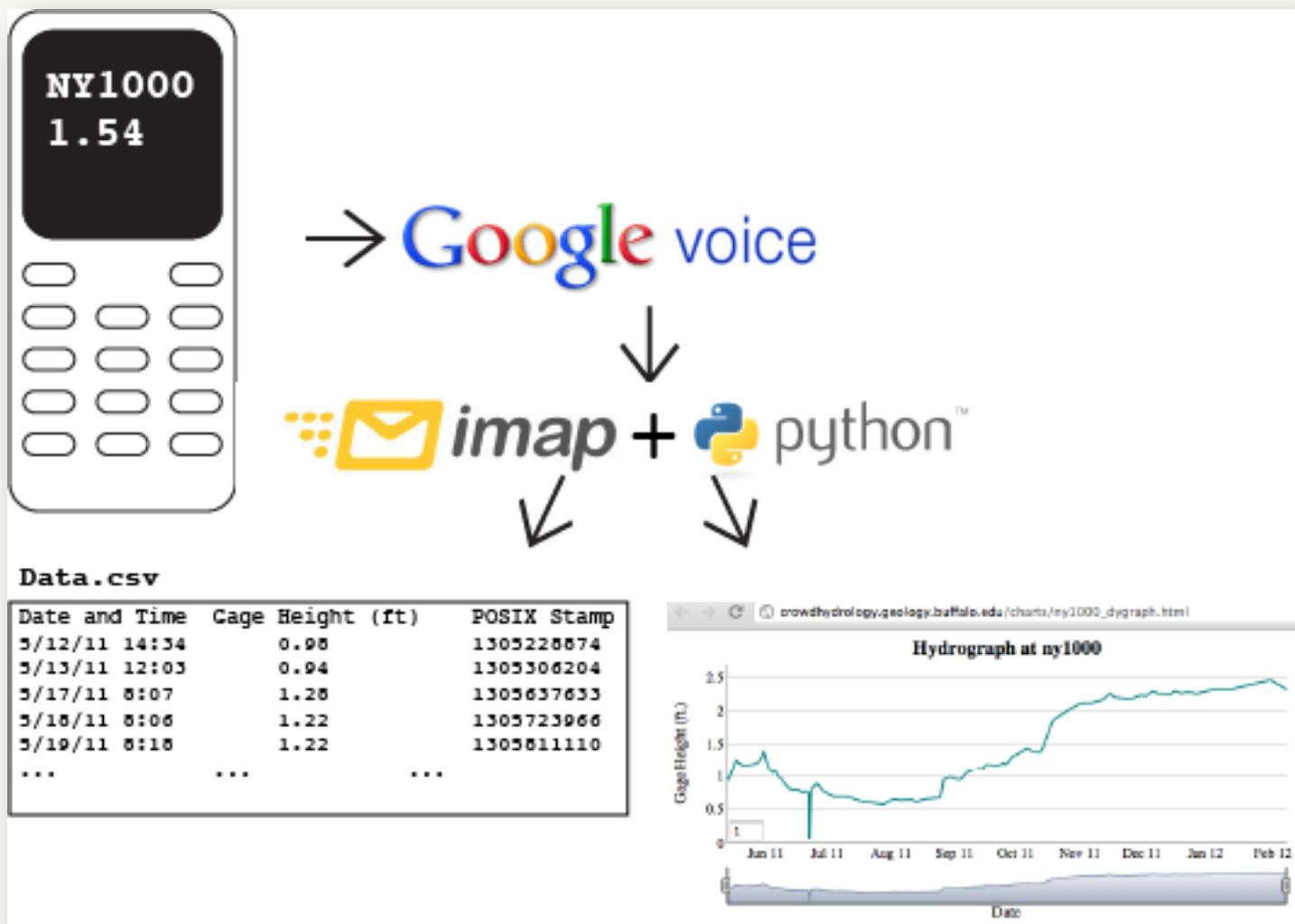
# CrowdHydrology

crowdhydrology.org



# social water

## Schematic Overview



# Signs and Gages

Text Water Level to:

**(716)218-0282**

Station #:

**NY1009**

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

**3.30**

3.32

3.28

3.26

3.24

3.22

**3.20**

3.18

3.16





# Upgraded Signs and Gages

## Gage Sign

### What's the water height?

Text "WI1009" and the  
current height to:

**608-514-1889**



CrowdHydrology

## Design Considerations

- Avoid terms of art
- Use graphics to illustrate concepts
- Concise summary of the project



## Shore Sign

### What's the water height today? Text us.

**1**

Find the ruler!



**2**

What's the height  
measurement at  
water surface?



**3**

Send to:  
608-514-1889

Text "WI1009"  
and the height  
from step 2



### What to do:

1. Look around for a ruler mounted in the water.
2. Read the measurement at the water's surface.
3. Text that number and "WI1009" to **608-514-1889**.

Visit [www.crowdhydrology.org](http://www.crowdhydrology.org) to see your measurement.  
(It will take a few minutes to load your point.)

**CrowdHydrology** collects water data using social media and citizen science. When you text us today's water height, we use your measurement to create a historical record of this lake or stream. If enough people send data, we can help predict floods and droughts.

State and local agencies can't put scientific monitoring equipment on every water body, but **CrowdHydrology** provides a way for local communities to track any lake or stream that's important to them. Help support **CrowdHydrology** by sending a measurement every time you visit this area.

CrowdHydrology

POWERED BY:  
social water

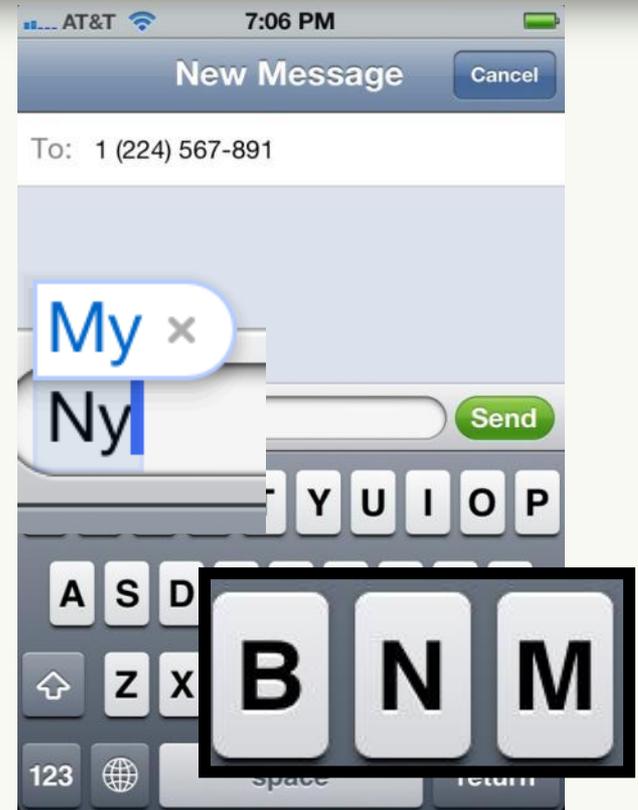
PARTNERS:



# FuzzyWuzzy and the cost of generality...

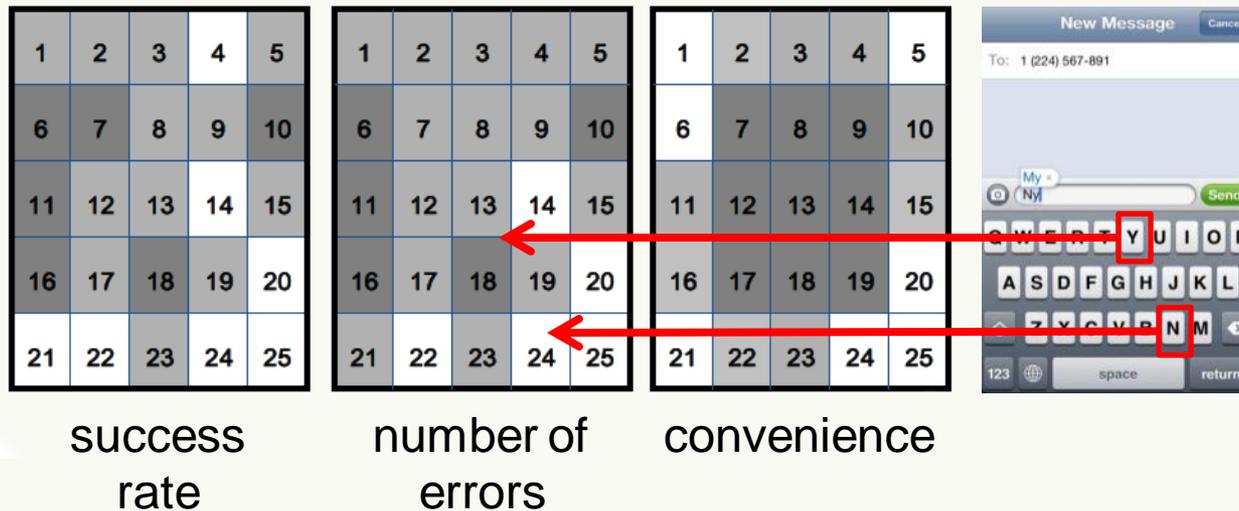
- ☆ [redacted] 17162180: [show details](#) Oct 9  
Station NY1000 water level 1.40
- ☆ [redacted] 1716218: [show details](#) Oct 11  
Station#NY1000 1.38
- ☆ [redacted] 1716218: [show details](#) Oct 23  
1.80 Station NY1007
- ☆ [redacted] 1716218 [show details](#) Nov 25  
By 1007 2.15  
[Reply](#) [Forward](#)
- ☆ [redacted] 1716218 [show details](#) Nov 25  
My 1002 ny 2.64  
[Reply](#) [Forward](#)

to me ▾  
Station #NY1002 Cattaraugus Creek @ Rt. 16 Water level = 1.35 feet. Water turbidity very low (clear water), temp much cooler than the air. Fish biting.



# FuzzyWuzzy

what about typos on “y”?



Park et al. (2008)

Touch Key Design for Target Selection on a Mobile Phone

*Mobile HCI 2008 proceedings*

# FuzzyWuzzy

use regular expressions to trim out irrelevant information

~~Ny Station #1008 water level 2.45ft.~~

~~Sent using SMS-to-email. Reply to this email to text the sender back and save on SMS fees. <https://www.google.com/voice>~~

NY1000 NY1001 NY1002 NY1003 NY1004 ... NY1007 NY1008

# FuzzyWuzzy

use regular expressions to ~~pull out floating point values~~  
~~Ny Station #1008 water level~~ 2.45ft.

~~Sent using SMS-to-email. Reply to this email to text the sender  
back and save on SMS fees. <https://www.google.com/voice>~~

# Simple Database (.csv file)

```
Date and Time,Gage Height (ft),POSIX Stamp  
05/12/2011 14:34:34,0.98,1305228874.0  
05/13/2011 12:03:24,0.94,1305306204.0  
05/17/2011 08:07:13,1.28,1305637633.0  
05/19/2011 08:18:30,1.22,1305811110.0  
05/19/2011 18:19:35,1.21,1305847175.0  
05/20/2011 08:12:58,1.18,1305897178.0
```

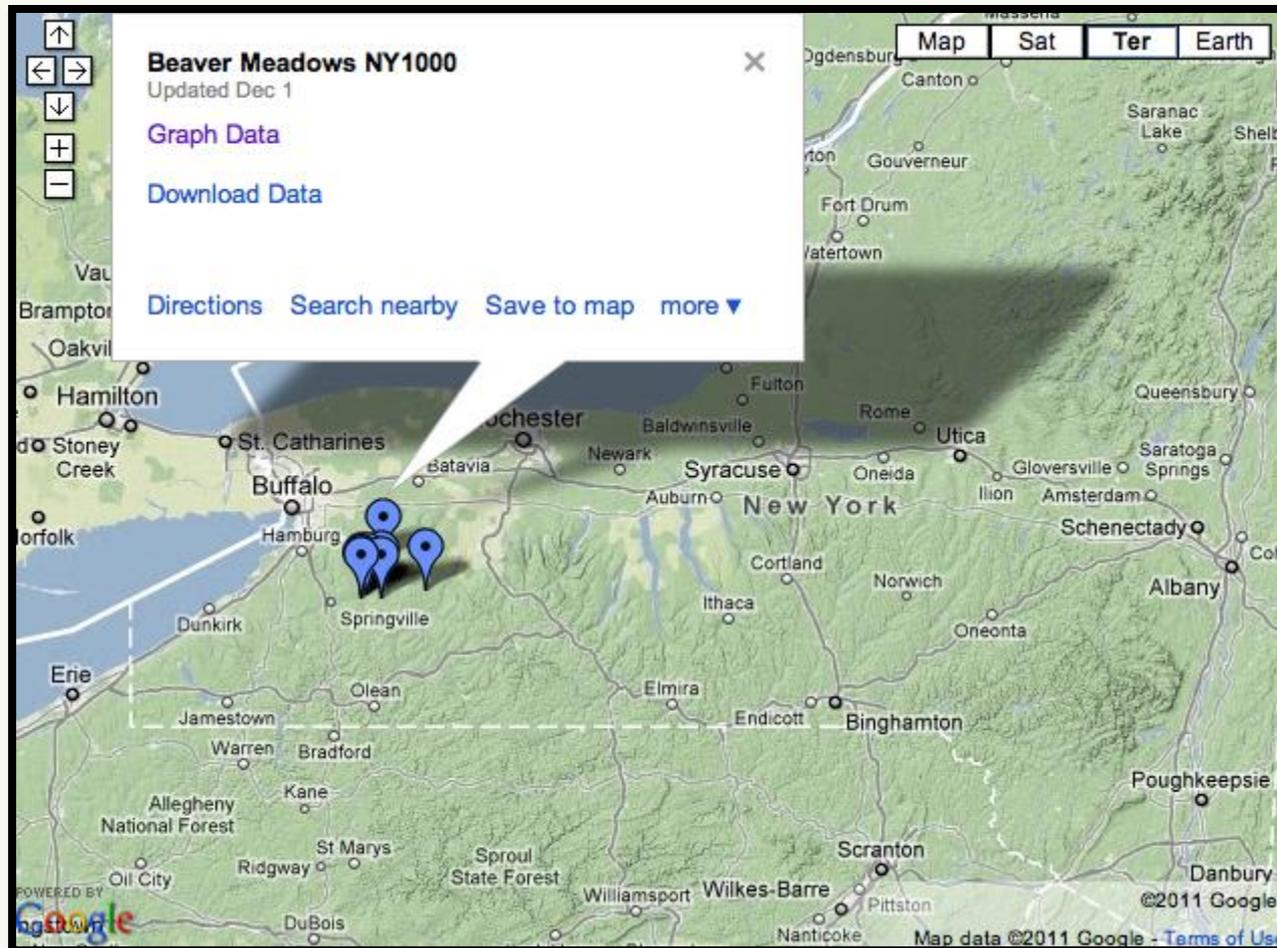


Date and time read from email time stamp and converted to appropriate timezone

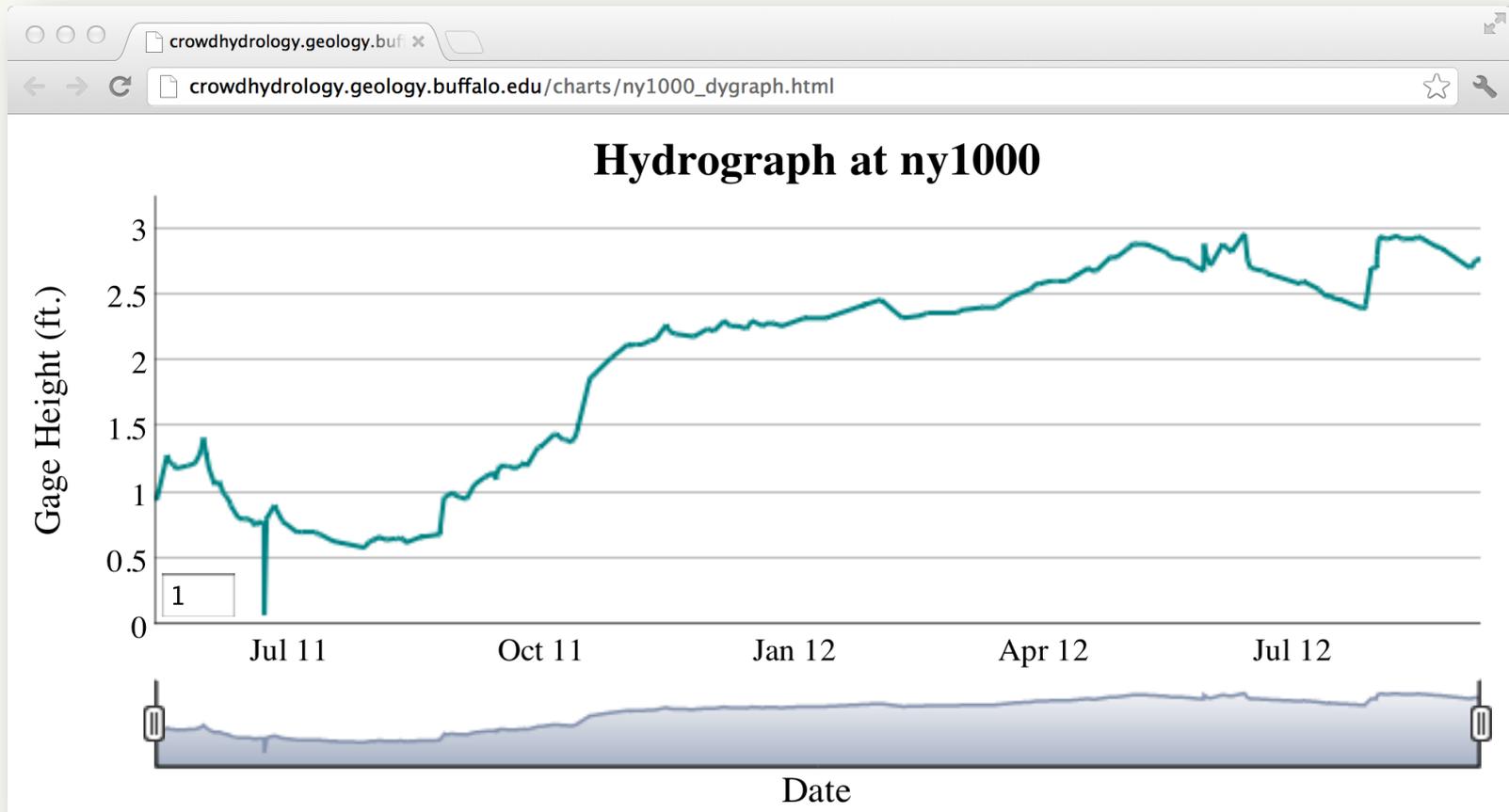
HTML page generated using Dygraphs JavaScript

# CrowdHydrology

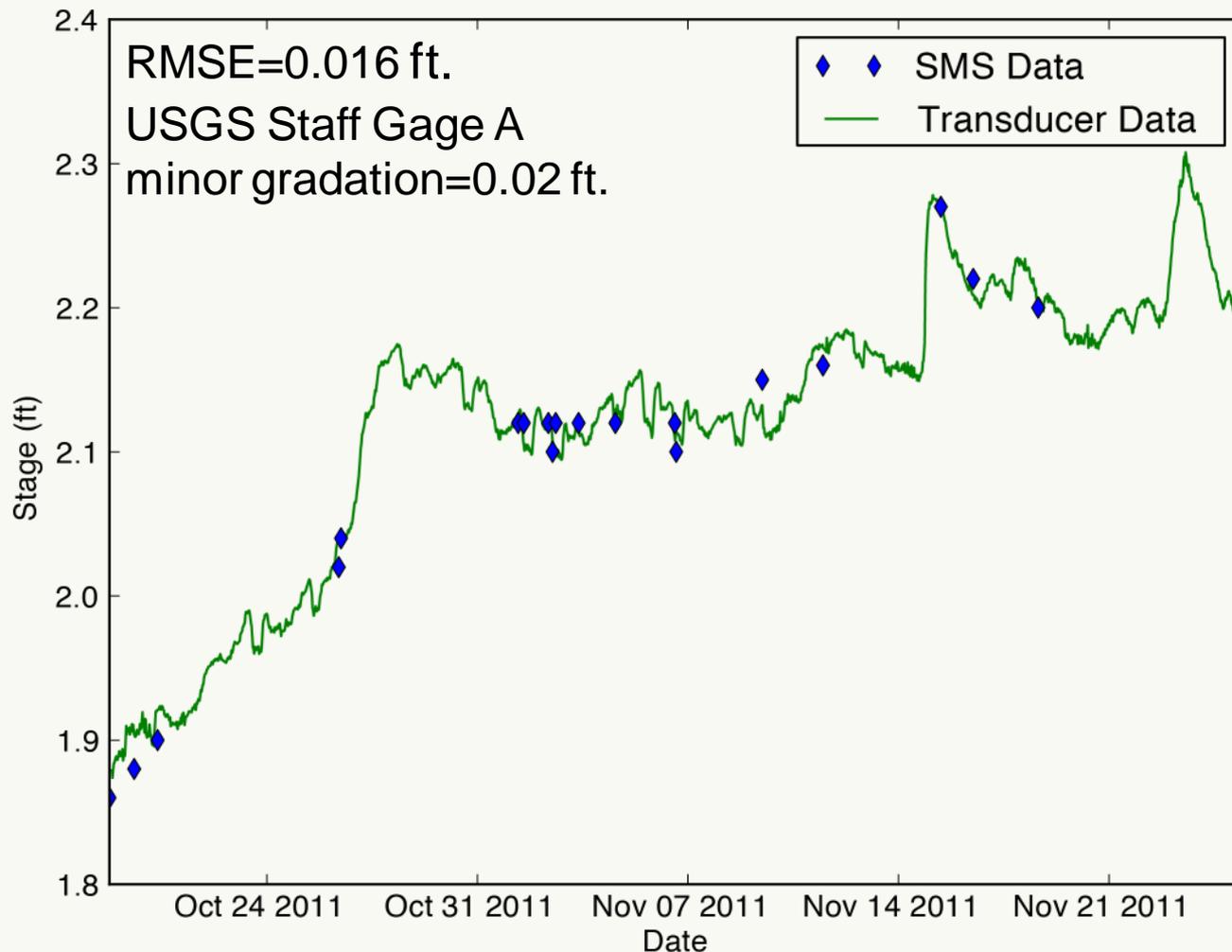
crowdhydrology.org



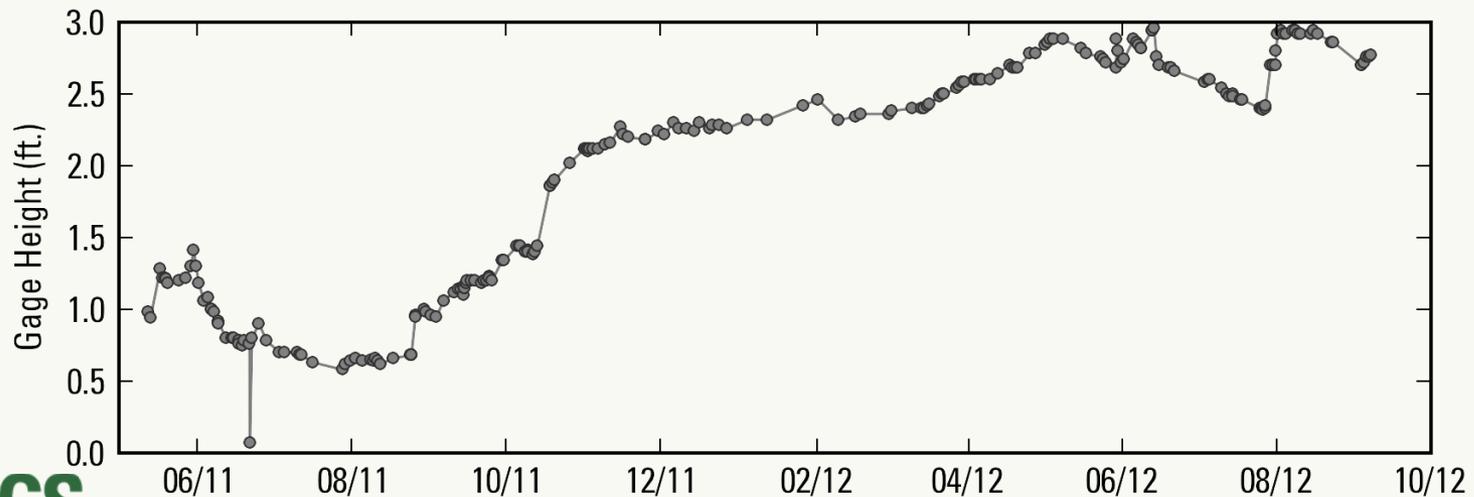
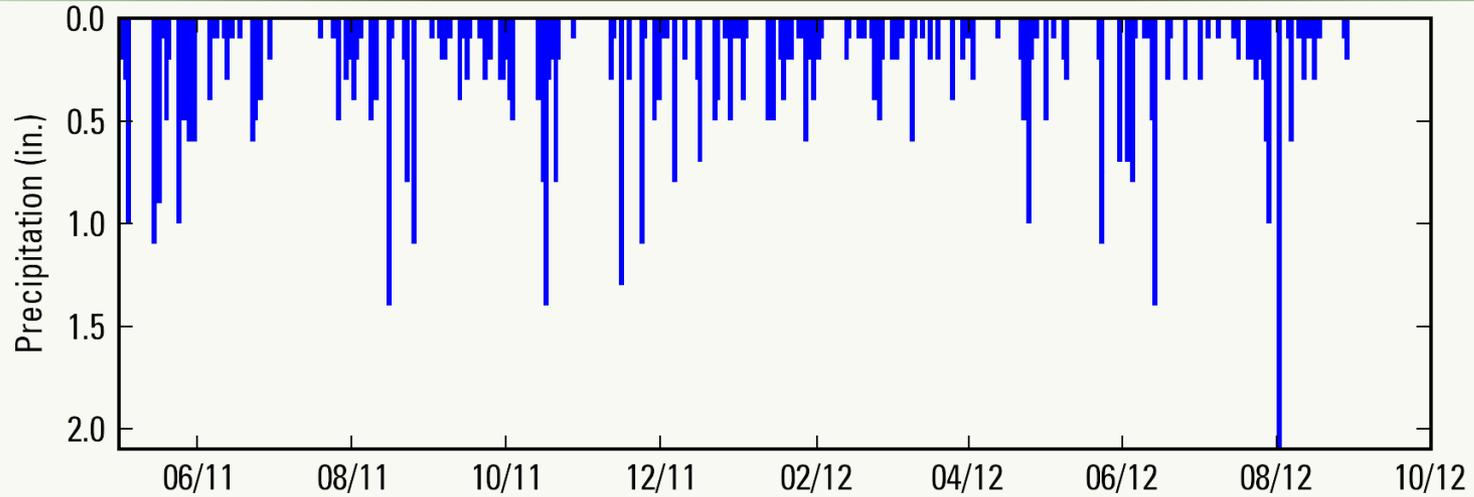
# 2011-2012 NY1000 History



# 2011 NY1000 Validation

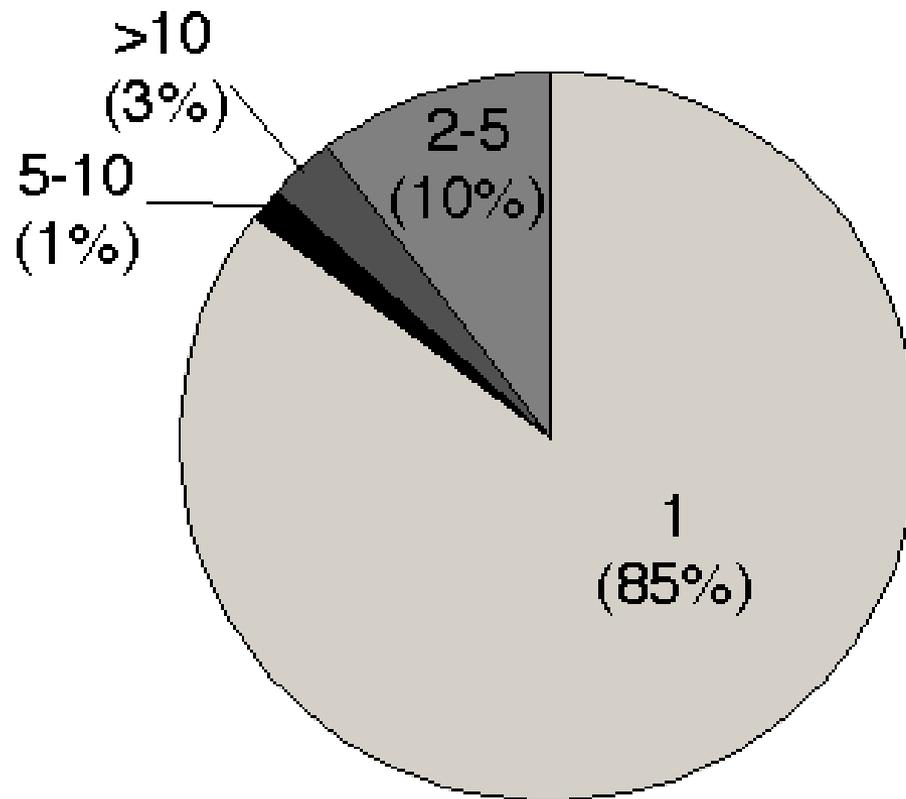


# 2011-2012 NY1000 Reality Check

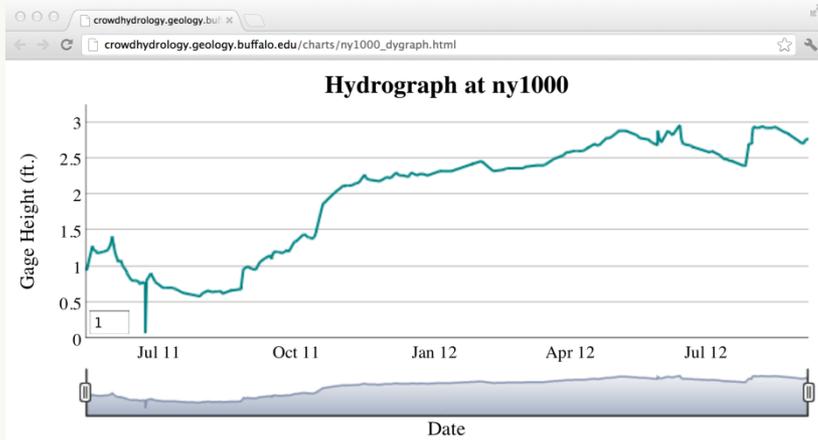


# Level of Participation and the Dr. Smith Effect

Number of Texts per Observer



# 2011 NY1000 History



# Future Plans: Getting a hold on social aspects.

## Trout Lake Long Term Ecological Research Station USGS WEBB site

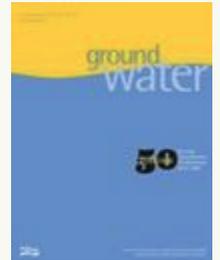


# Future Plans: Lakes and Streams in the Glacial Aquifer System



# Further Future Plans

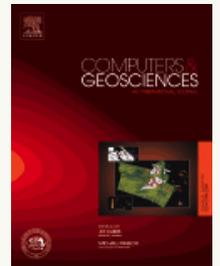
Paper on CrowdHydrology published in *Ground Water*



Open-source Social.Water Code published on github



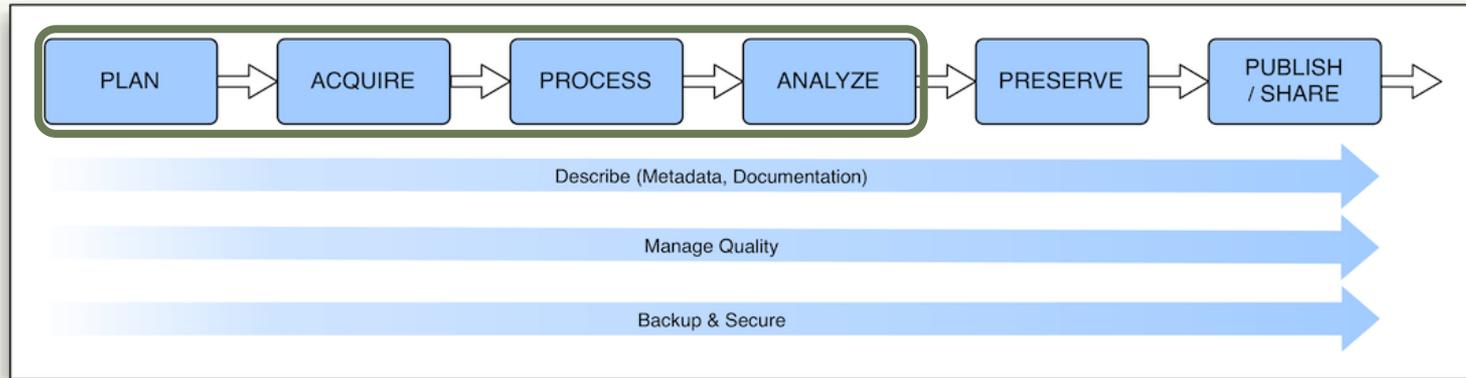
And documented in *Computers and Geosciences*



Madison Lake Clarity Project (Test and Text)

Smartphone App to also acquire photos?

# Handling Citizen Data



We have focused on the first four aspects

Challenges for further discussion:

- impractical to validate all data points

- we have focused on validating the *process* for now

- PII considerations for storing contact information

- value of recruiting trained observers?

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crowdsourcing hydrologic information may be a  
*secondary* source of data, but is a  
*primary* source of public engagement

# Questions?

Thanks to:

Chris Lowry, University at Buffalo

Laura De Cicco, USGS-CIDA Middleton,

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Dave Yearke, Loren Smith and Charlotte Hsu, SUNY Buffalo

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