

# Deep Lake Explorer

*Bringing citizen scientists to the underwater world of the Great Lakes*

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Office of Research and Development • Office of Water • Region 5 • Great Lakes National Program Office • Oak Ridge Institute for Science • GDIT



# *Talk outline*

- Underwater Video in the Great Lakes
- Crowdsourcing Science with Zooniverse
- Pilot study goals
- Deep Lake Explorer Tour
- Lessons Learned



<https://www.zooniverse.org/projects/mollwick/deep-lake-explorer>

# *Underwater video*

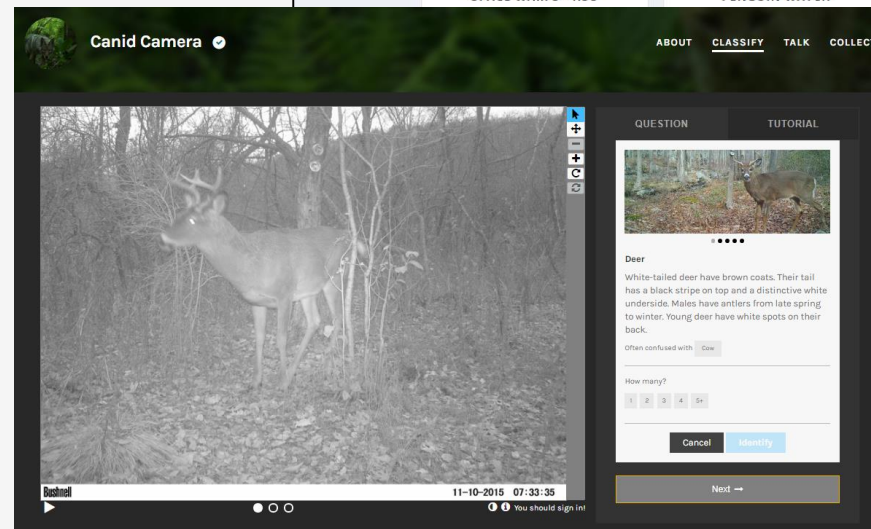
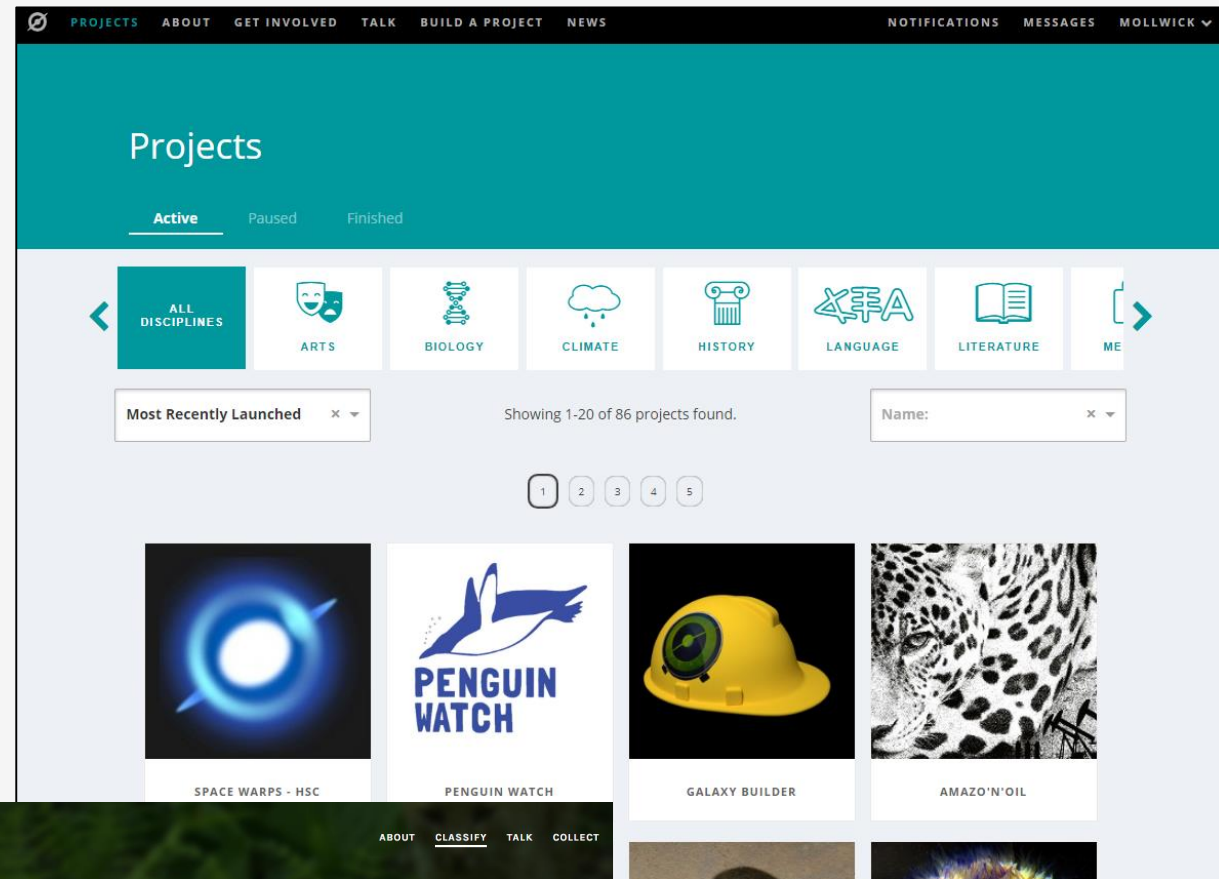
- Opportunity to characterize benthic conditions at sites where grab sampling isn't effective.
- EPA's National Coastal Condition Assessment - every 5 years
  - Water quality, sediment quality, macroinvertebrates, fish tissue, underwater video
  - Over 1000 videos in Great Lakes nearshore & connecting channels
- Rapidly improving video technology → Need timely, effective analysis tools
- Video quality challenges:
  - Water clarity, turbidity, lighting, depth of field issues, image stability
  - Can be addressed through improved video collection – we're working on this!
  - Analysis is subjective
- Consensus-based interpretation by multiple analysts: Crowdsourcing





# Zooniverse.org

- Crowdsource media interpretation
- Mostly imagery, a few camera or audio projects
- Many viewers build consensus on interpretation of media
- Easy to build projects
- Underwater video is new to Zooniverse
- Zooniverse new to EPA



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# *Pilot study goals: Prove the method*

- Can crowdsourcing analysis of underwater video...?
  - Produce timely, reliable, reproducible data
  - Be cost-effective
  - Meet the data needs of managers
  - Educate and foster stewardship for the Great Lakes
- Current Status: Beta-testing app with subset of data



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# *Successful Zooniverse projects*

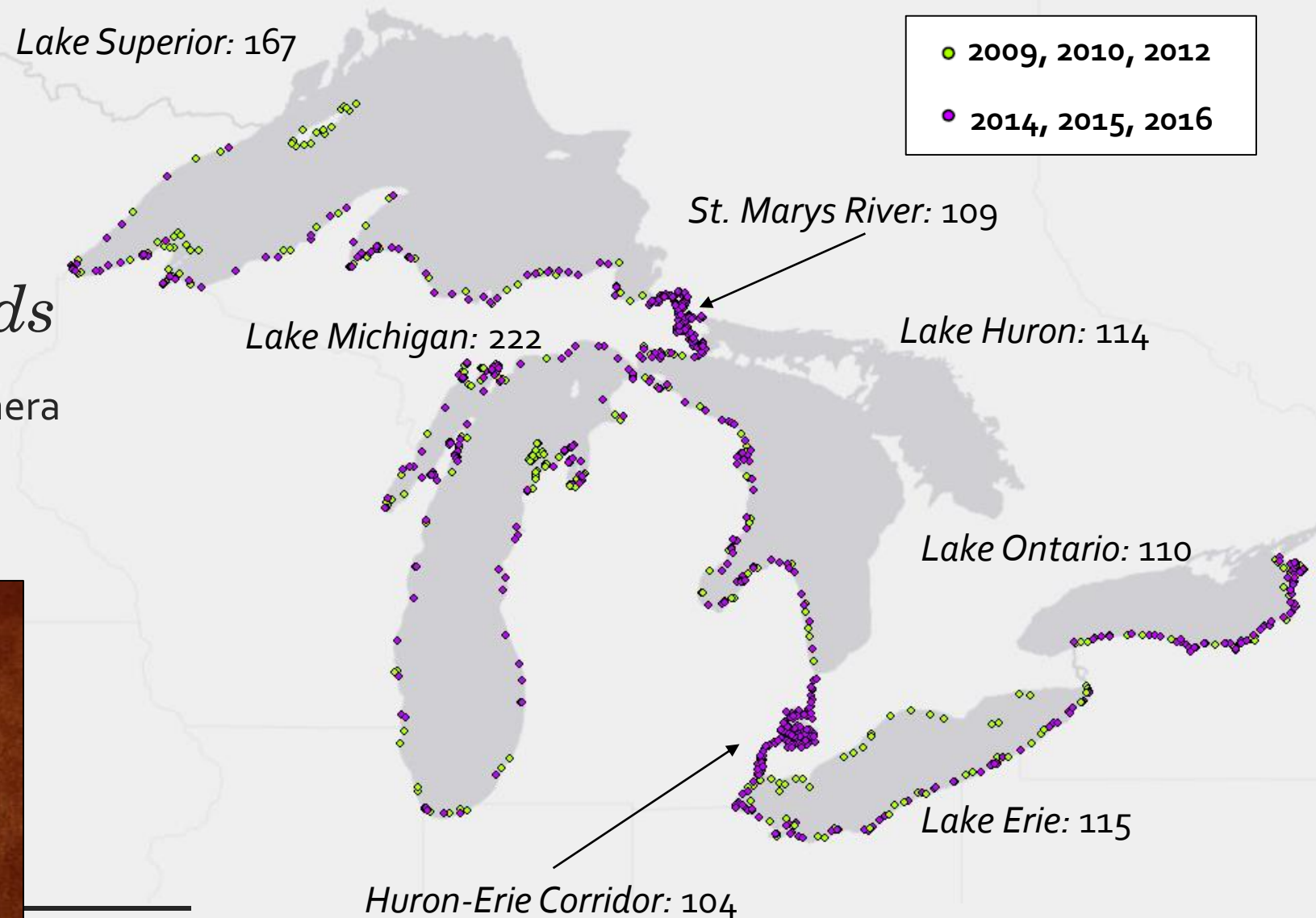
- User can learn about what interests them while providing valuable research contribution
- Simple and easy to participate - best guesses
- No complicated training
- Volunteers' contributions *make it work*
  - Public recognition, challenges, gamification, graduated tasks
- Feedback and interaction with scientists
  - Forum allows conversation and questions about analysis and videos
  - Ongoing communication - Newsletter/social media, post results
- Successful projects: Volunteers get invested in project → educates and fosters stewardship, moves research forward quickly & effectively, all at low cost.



# Video collection sites

## Collection Methods

- GoPro or SeaViewer camera
- Drop camera
- 2 mins of video





# Stakeholder-defined data needs

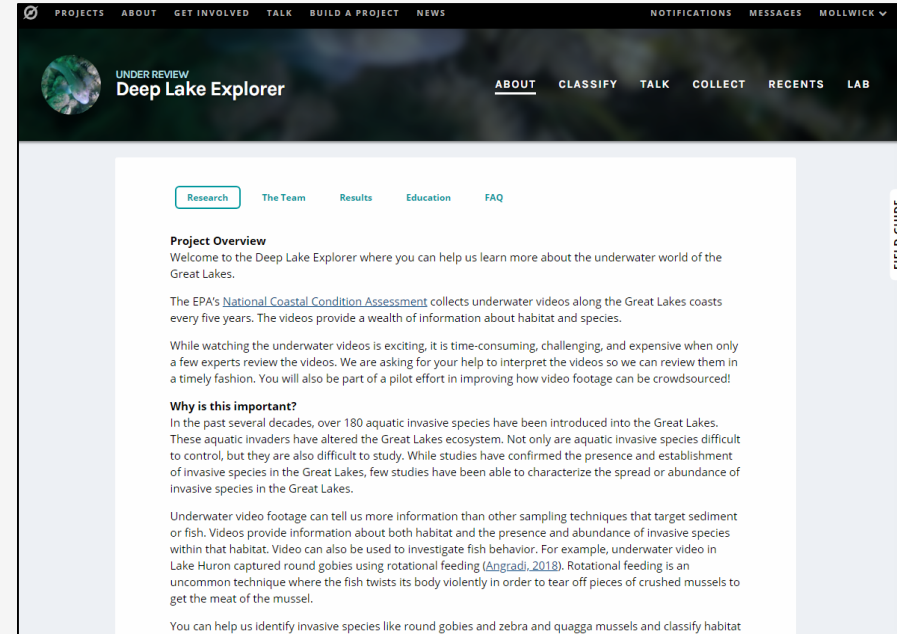
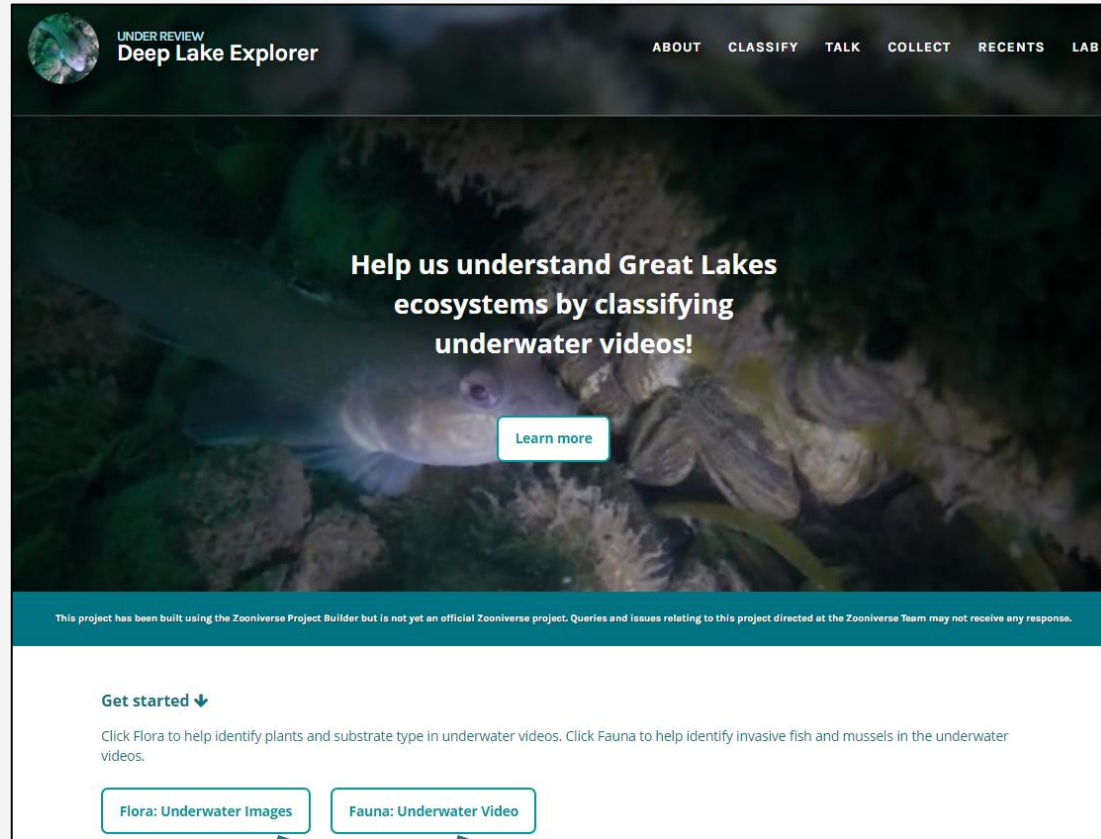


- Zebra (*Dreissena polymorpha*) and quagga (*Dreissena bugensis*) mussels
  - We don't know their distribution/abundance across Great Lakes through time or current status?
  - Where are invasive mussels present?
- Round Gobies (*Neogobius melanostomus*):
  - Difficult to survey - We don't know distribution, abundance, current status, or understand habitat or relation to dreissenids
  - Abundant in Erie and Ontario
    - 2002: 9.9 billion individuals in western Lake Erie!
  - Presence/absence
  - Association with habitat characteristics (substrate and vegetation)
- Keep analysis simple



# Deep Lake Explorer

<https://www.zooniverse.org/projects/mollwick/deep-lake-explorer>

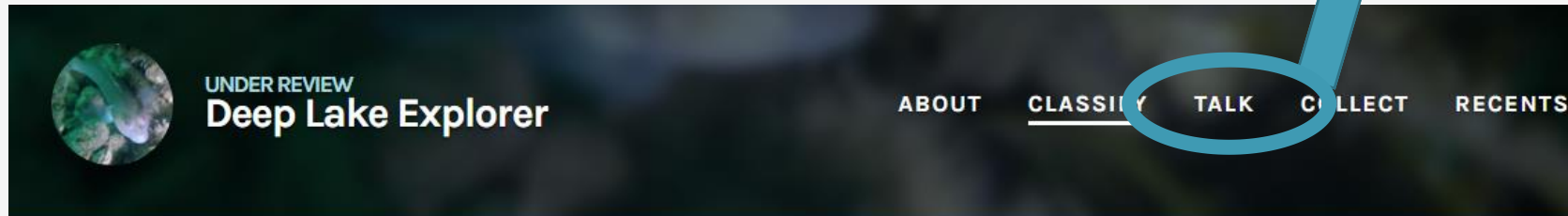


## About

- Background on the project
- Results as they become available
- Frequently asked questions
- Links: Map viewer of videos for all the sites

Two workflows: Flora & Fauna

# Deep Lake Explorer



Help beta-test the [Fauna workflow](#)! Provide feedback [here](#) if you have it. Thank you to all of our beta-testers!  
*This project works best in Google Chrome or Microsoft Edge.*



Speed: 0.25x 0.5x 1x



TASK

TUTORIAL

Did you observe any fish in the video?

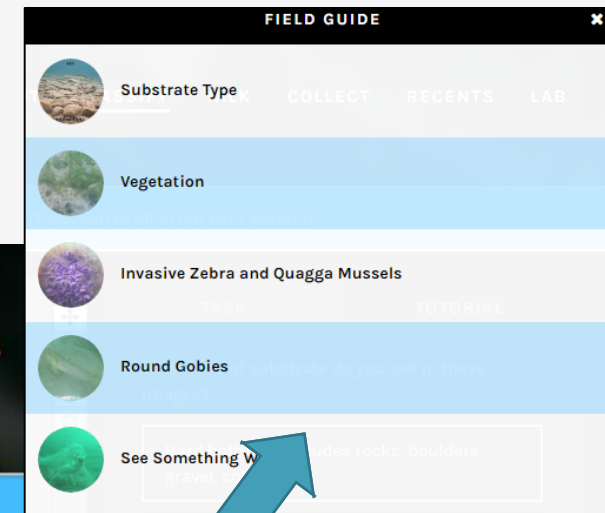
Yes

No

NEED SOME HELP WITH THIS TASK?

Done & Talk

Done



FIELD GUIDE

FAQ

<https://www.zooniverse.org/projects/mollwick/deep-lake-explorer>

# *Flora workflow*

- Screenshots from videos
- Classify habitat characteristics:
  - Is substrate mostly hard, soft, or mixed?
  - Is vegetation present?

**Beta Testing Complete**

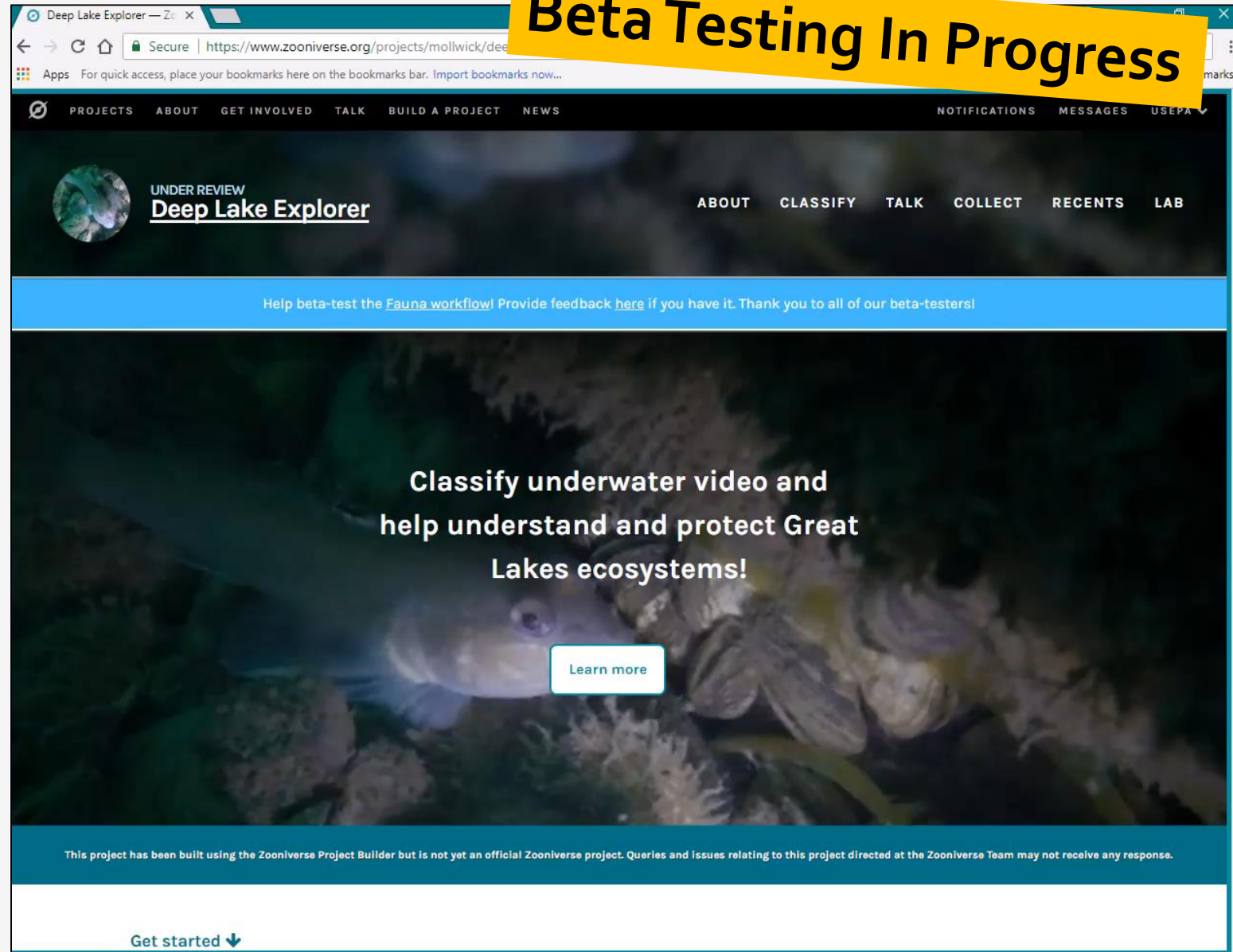
The screenshot shows the Zooniverse website interface for the 'Deep Lake Explorer' project. The browser address bar shows the URL: <https://www.zooniverse.org/projects/mollwick/deep-lake-explorer/classify>. The page has a dark header with navigation links: PROJECTS, ABOUT, GET INVOLVED, TALK, BUILD A PROJECT, NEWS, NOTIFICATIONS, and MESSAGES. Below the header, there's a section titled 'UNDER REVIEW Deep Lake Explorer' with sub-navigation: ABOUT, CLASSIFY, TALK, COLLECT, RECENTS, and LAB. A blue banner below the header says: 'Help beta-test the [Fauna workflow](#)! Provide feedback [here](#) if you have it. Thank you to all of our beta-testers!'. The main content area features a video player showing a lake bottom. The video has a red 'ALREADY SEEN!' banner in the top left corner. The video player displays coordinates: N 45° 58.4056, W 084° 29.7143, and depth: 642 FT. The video is labeled 'SEA VIEWER' and has a timestamp of 16:31:10. The video player has a play button and a progress bar. To the right of the video player is a 'TASK' panel with the question: 'What kind of substrate do you see in these images?'. The panel has three radio button options: 'Hard bottom - includes rocks, boulders, gravel, cobble.', 'Soft bottom - includes sand, silt or clay.', and 'Both hard and soft bottom.'. Below the options is a link: 'NEED SOME HELP WITH THIS TASK?'. At the bottom of the task panel are two buttons: 'Done & Talk' and 'Done'. A 'FIELD GUIDE' sidebar is visible on the right side of the task panel. The footer of the page shows the ZOO NIVERSE logo and links to Projects, Collections, Build a Project, About Us, Education, Our Team, Zooniverse Talk, Daily Zooniverse, and Blog. Social media icons for Facebook, Twitter, and Google+ are also present.

<https://www.zooniverse.org/projects/mollwick/deep-lake-explorer>



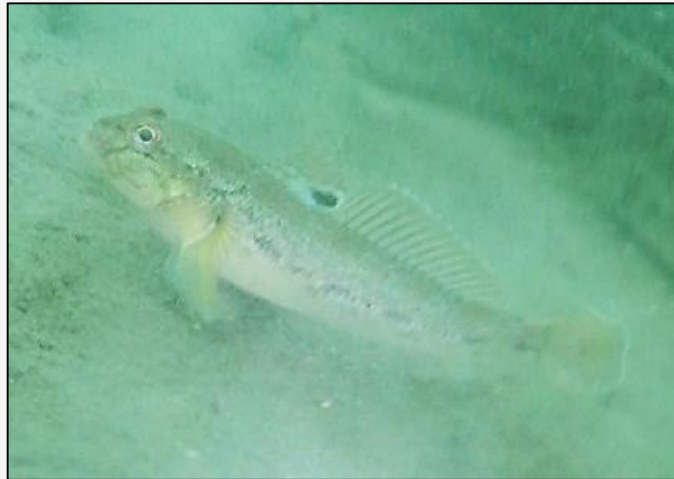
# *Fauna workflow*

- 15 second clips of videos
  - Need video to see movement of fish
- Classify fauna:
  - Do you see fish?
  - Do you see any round gobies?
  - Do you see invasive mussels?
- Currently in beta-testing and we need your help!



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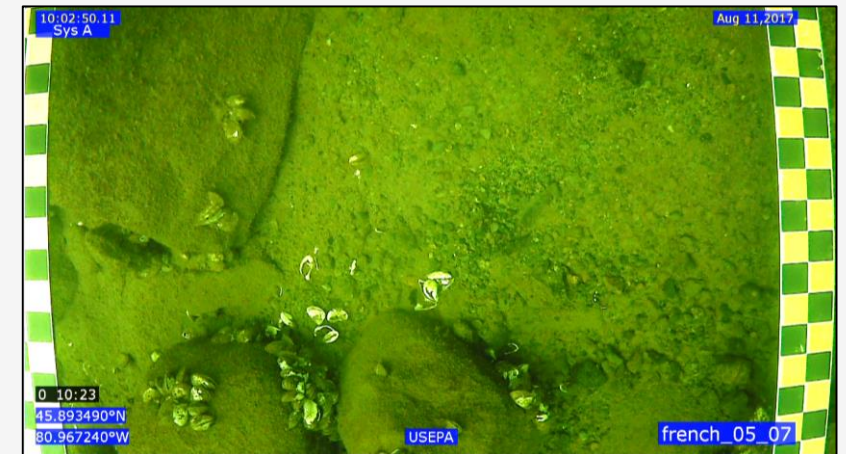


# *Lessons learned*

- Flora workflow beta-testing results:
  - 8 reviews needed for 75% agreement
- Video quality may be limiting factor
  - Balancing file size with loading time
- Different web browsers, devices, platforms, internet speed
- Potential for incorporating other datasets with higher quality video

# *Status and next steps*

- Complete beta-testing for Fauna workflow
- Launch Deep Lake Explorer for public
- Synthesize & report results to volunteers
- Incorporate other higher quality datasets
- Testing GoPro/framed rig for future NCCA



# *Thank you!*

**Molly Wick**

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**Stakeholder team**

Illinois Department DNR

Illinois EPA

Indiana DEM

Indiana DNR

Michigan DEQ

Michigan DNR

Minnesota DNR

Minnesota PCA

Minnesota Sea Grant

New York State DEC

Ohio EPA

Ohio Lake Erie Commission

Pennsylvania DCNR

USGS Great Lakes Science Center

University of Wisconsin – Extension Lakes

Wisconsin DNR

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*Check out Deep Lake Explorer at*

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Until the app is launched live, you will need direct link to this.  
After it is launched live, you can go to Zooniverse homepage to find it.

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