

Citizen Science, Urban Limnology & Dragonflies: A New Paradigm for Participatory Science

R. Bohanan, L. Penner, M. Tiller, M. Cieslik, A. Cassini, E. Brockley, B. Dantuma, J. Khoo, D. Burke, E. Klaasen, T. Smull, O. Bernauer, T. Allen, L. Berglund, S. Adibatha, J. Murphy, R. Valle, N. Morel, E. Wawa, M. Garcia, M. Waxman, E. Hemming, C. Thorstenson, R. Funk, S. Emmerich, M. Lawton, J. Kruger, C. Barbera, L. Hoffmann, M. Tjugum, K. Zeise, D. Cusma, C. Maxwell, A. Comins, K. Vang, Q. Xiong, D. Yang, W. Chen, H. Eidemann

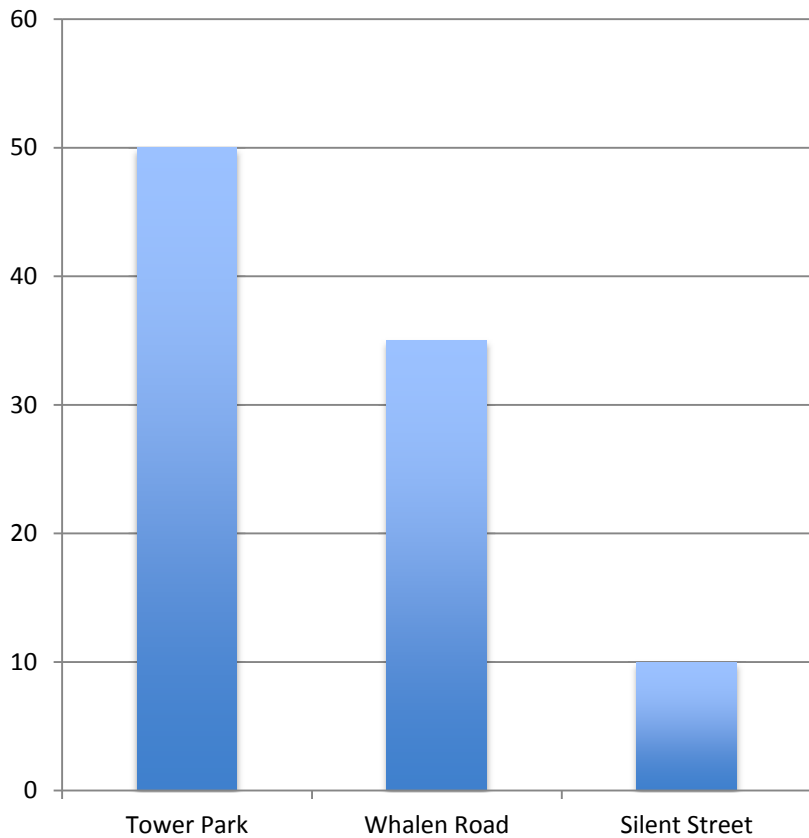


Driving Questions

- *Students: Who lives here?*
- *Neighborhood: How healthy is our pond?*
- *Watershed Associations: How healthy is our watershed?*
- *Public Works: What can we do to improve the health of our watershed?*
- *Ecologists/Limnologists: How do elevation and habitat affect water quality?*

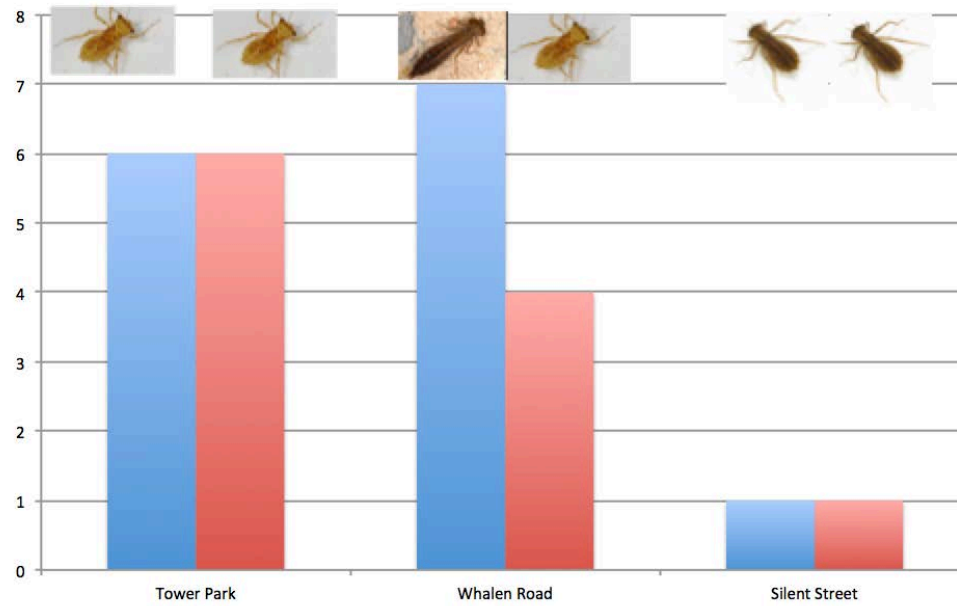
Elevation vs Water Clarity

Average Water Clarity (cm)





Mean number naaid/per sample



Pre-Muskat
Post-Muskat

Whalen Pond Neighborhood Ecological Education Initiative

The Whalen Pond Neighborhood Ecological Education Initiative is an ongoing collaborative effort between the Verona Area School District (VASD), The City of Verona Public Works Department (VDPW), and the University of Wisconsin (UW) based on mutual interest in the Pond. Madison Community Foundation awarded a grant to VASD in 2012 to build the observation deck and purchase other supplies to support the use of the pond as an outdoor laboratory. Students and educators from VASD and UW have been using the Pond to study ecological concepts since 2007.

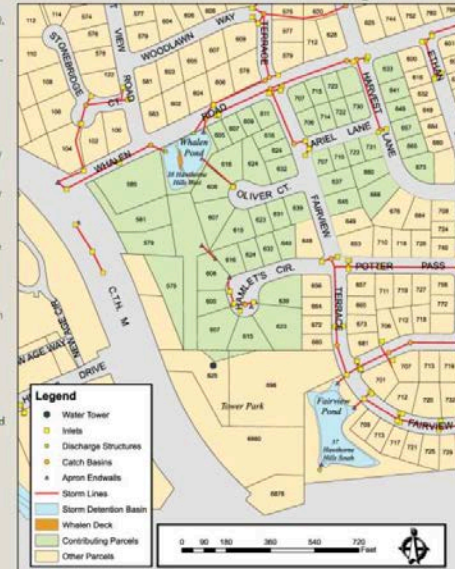
The information collected by VASD and UW students will, over time, help the City understand how the Pond is operating as a storm water management facility. Additionally the City is using the collaborative effort as a way to inform and educate the general public about storm water management issues. The Pond serves a defined set of properties which are all residential properties. Therefore the people that live around the Pond are directly responsible for the water quality in the Pond. The City encourages residential property owners to adopt storm water management practices through rebate programs for rain barrels and rain gardens. As more residents within the storm sewer shed put in rain barrels and rain gardens, the ongoing observations by VASD & UW students and teachers will provide information on the effectiveness of these storm water management practices.

The map to the right shows the properties that drain to the Pond via storm sewer pipes and surface drainage.

Storm water management practices home owners can implement on their own include:

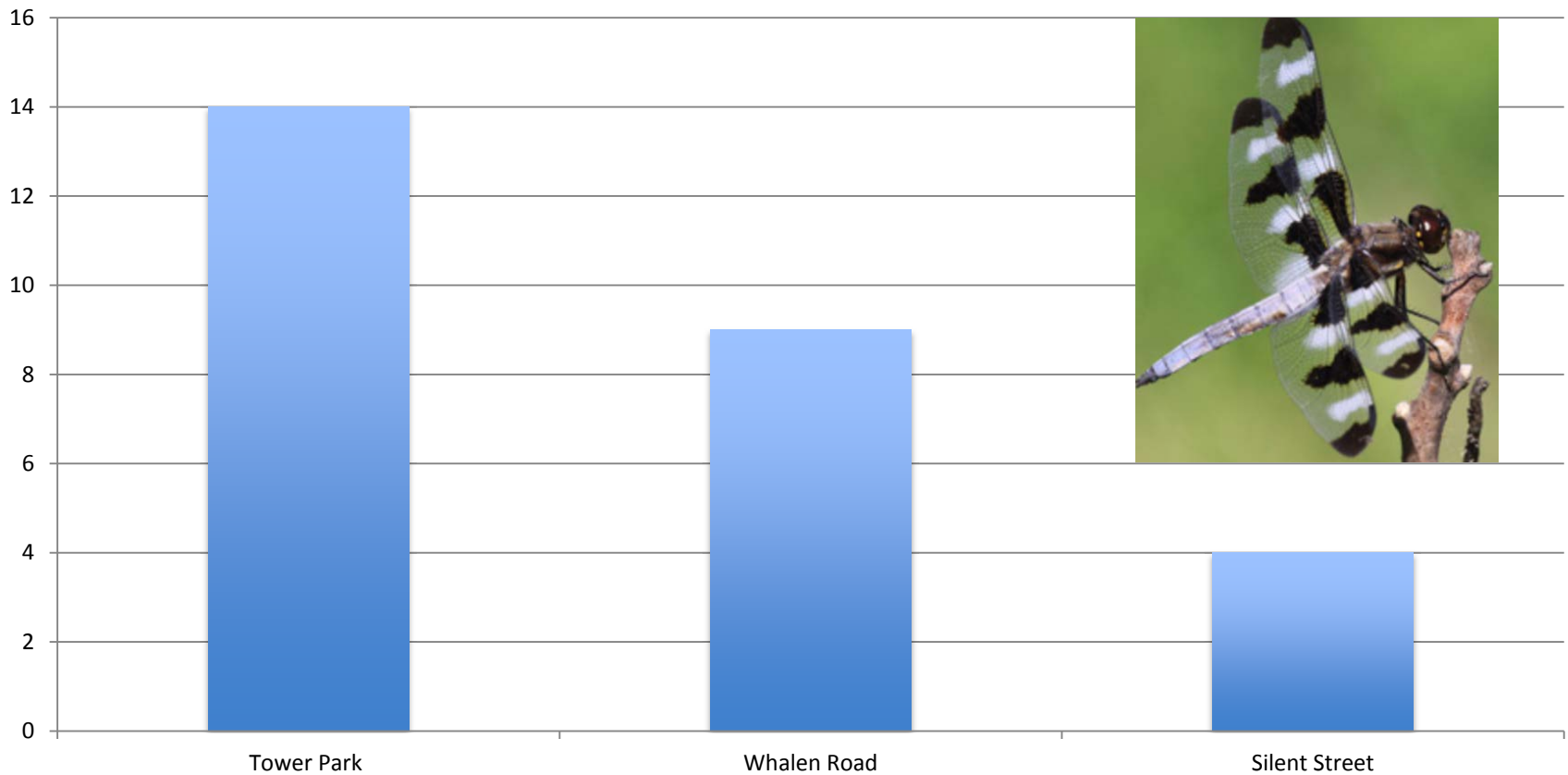
- Install a rain garden
- Install a rain barrel or several
- Limit the amount of leaves and grass clippings draining to the Pond
 - Compost your yard waste or take it to the City drop off at Public Works (610 Investment Court)
- Limit discharge of oil and grease from vehicles
- Use only the amount of fertilizer needed on lawns and in gardens
- Clean up spilt fertilizer
- Wash your car on the lawn not in the street or driveway
 - Consider taking your car to a car wash facility
- Pick up litter in the streets around the Pond

Whalen Pond Storm Sewer Drainage Basin

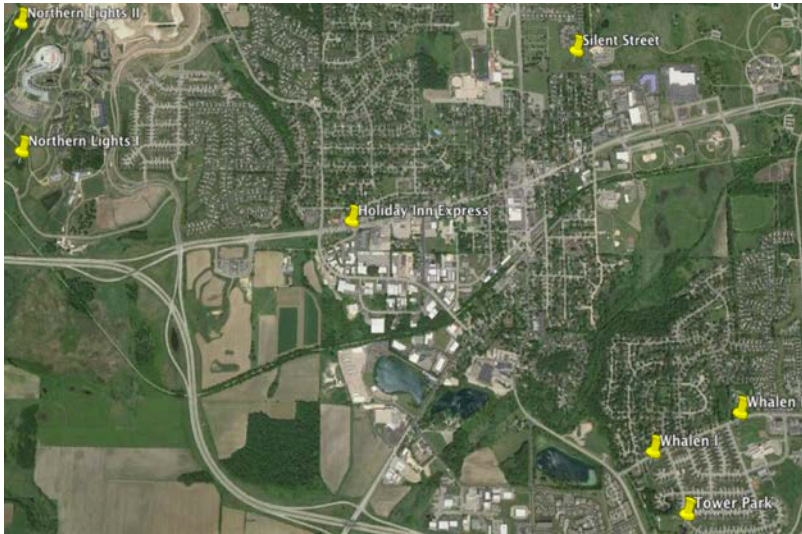


Elevation vs Adult Dragonfly

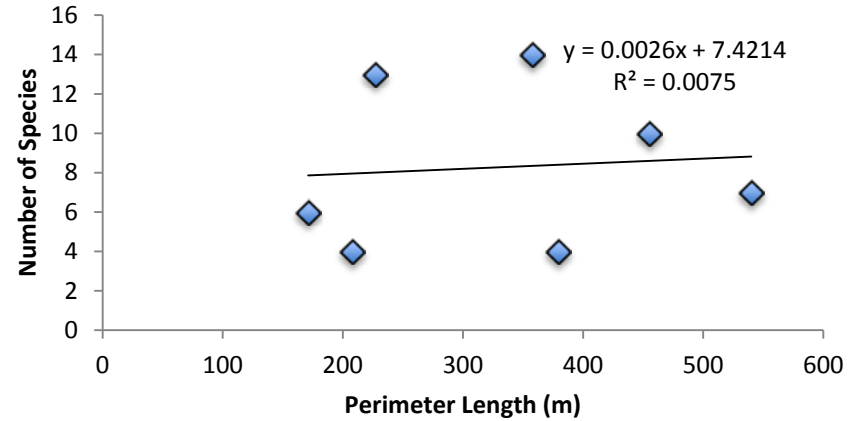
Median number of adult dragonfly species



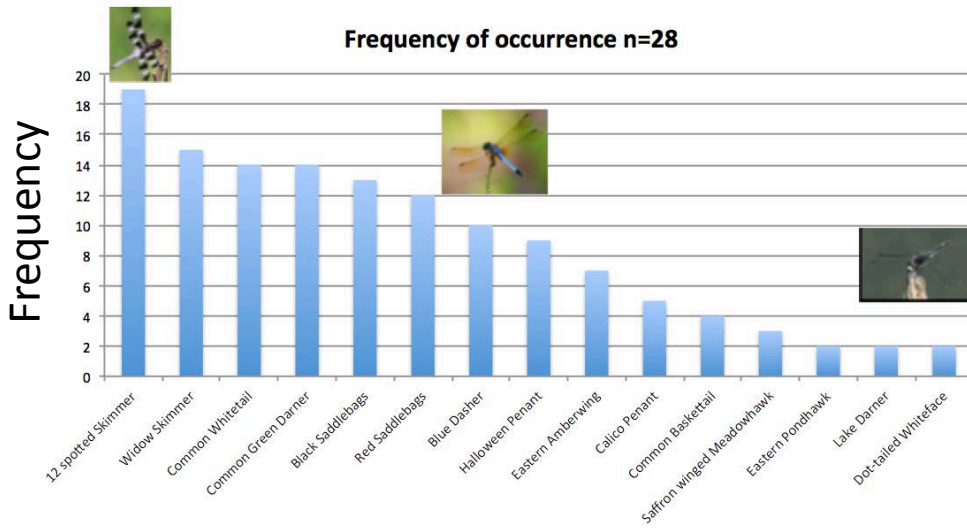
Dragonfly Adult Survey



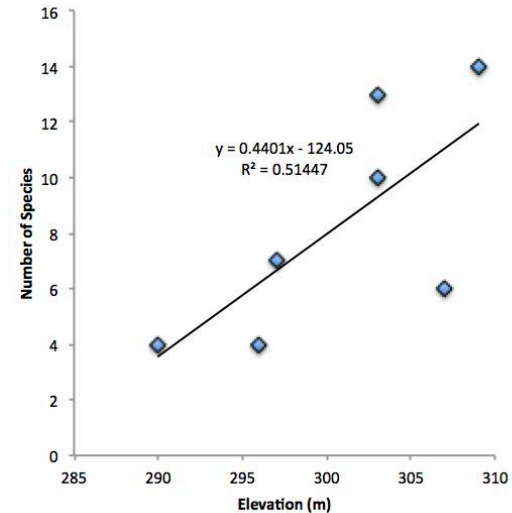
Perimeter Length vs. Number of Species



Frequency of occurrence n=28



Elevation and Number of Species



Key Citizen Science Paradigm Shift

Prevalent Citizen Science Framework

1. Citizen scientists training prioritizes accuracy and reliability of data collection
2. Citizen science participation prioritizes data collection
3. Citizen science contribute data that scientists 'own' and access by requests
4. Citizen scientists depend on scientists and public works to provide management recommendations
5. Curriculum development situated within institutions of higher education or nature centers with teachers as reviewers, testers and implementers

Emergent Citizen Science Framework

1. Citizen training includes discipline epistemology, seminal case studies emphasizing prevailing models, research design, diverse sampling methodology, co-development/adaptation off data visualization, analytical and presentation tools
2. Citizen scientists participate in development of research agenda, hypotheses, methodology, analyses, presentations
3. Citizen scientists 'co-own' data
4. Citizen scientists develop stewardship vision and negotiate adaptive management practices with neighborhood associations, broader watershed associations and public works
5. Curriculum development situated within schools and informs citizen science