Introduction
Watersheds are one of the most challenging human-environmental systems for community coalition building. Because watershed divisions cut across jurisdictional and ownership boundaries, they involve stakeholders with often-competing values and needs that complicate collaborative action, planning, and policy making.

Our Objective: To empower citizens to work together with researchers and community partners to:

- Assess water quality using citizen-science engagement coupled with certified lab testing
- Foster community connections across a watershed through stakeholder coalition building and use of an Agent-Based Model

Methodology & Engagement

This project is part of Iowa State University’s Translational Research Network (Fig. 1):

- Expanding network of collaborating community partnerships:
  - Squaw Creek Watershed Management Authority Board (Story, Boone, and Hamilton County Soil and Water Conservation District committee members, county supervisory staff, city staff)
  - Certified labs: Iowa State University Water Quality Research Lab; State Hygenic Lab; City of Ames Water/Wastewater Lab
  - City of Ames - Public Works Dept., Pollution Control & Water Dept., Smart Watersheds program
  - Other NGOs: Iowa Stormwater Education Partnership, Iowa Rivers Group
  - College and pre-K-12 student groups - ISU Environmental Science Club, ISU Chemistry undergraduate labs, Ames High School science teachers and students, The Community Academy
  - Ringgenberg Park Homeowner Association and residents of other neighborhoods in watershed
  - Izaak Walton League of America – IWLA Save Our Streams & Clean Water programs

Our U-TuRN team devises its methods and questions in partnership with community stakeholders within urban-rural watersheds with these two key foci:

- Water quality & flow: data collection and data sharing, connecting environmental health to public health & well-being
- Collaborative community building: integration of social-hydrological modeling, storytelling, and participatory action

Initial community partners:

- Expansion of ISU’s Translational Research Network
- Enhanced Community Systems/Capacity
- Sustainable Community Health Impact

Coalition Building & Action
We have built an agent-based computer simulation model (ABM) to be used in community engagement workshops that bring into coalition citizen stakeholders, researchers, and community partners. Our “Watershed Community” ABM has these key features:

- Fosters creative thinking & stakeholder ownership
  - Allows stakeholders to explore and configure—for themselves—multiple lines of socio-environmental response to environmental change. By creating their “what if” scenarios, users engage in creative, adaptive thinking and get to probe areas that match their needs and values
- Uses simple, open source software (making it portable & flexible)
  - Built on the computer platform NetLogo, the model can be downloaded onto laptops for use in community settings, and users change parameters themselves to test scenarios and outcomes
- Has storytelling-based from the humanities
  - Stories that invite multiple interpretations and inspire imaginative ownership do so, in part, when they have gaps—spaces left for each reader to fill with local knowledge, values, and needs. Using rigorous simplicity, our model leaves space for stakeholders to tell their stories, set goals, devise collaborations, and take action

Coalition Building & Action
We have built an agent-based computer simulation model (ABM) to be used in community engagement workshops that bring into coalition citizen stakeholders, researchers, and community partners. Our “Watershed Community” ABM has these key features:

- Fosters creative thinking & stakeholder ownership
  - Allows stakeholders to explore and configure—for themselves—multiple lines of socio-environmental response to environmental change. By creating their “what if” scenarios, users engage in creative, adaptive thinking and get to probe areas that match their needs and values
- Uses simple, open source software (making it portable & flexible)
  - Built on the computer platform NetLogo, the model can be downloaded onto laptops for use in community settings, and users change parameters themselves to test scenarios and outcomes
- Has storytelling-based from the humanities
  - Stories that invite multiple interpretations and inspire imaginative ownership do so, in part, when they have gaps—spaces left for each reader to fill with local knowledge, values, and needs. Using rigorous simplicity, our model leaves space for stakeholders to tell their stories, set goals, devise collaborations, and take action

Assessing Water Quality via Citizen-Science & Certified Testing Labs

HARNESSING THE POWER OF CITIZEN SCIENCE: The U-TuRN project partners notably rely heavily on citizen-collected data. Adult and youth volunteers were recruited from Squaw Creek Watershed Coalition, ISU Environmental Science Club, Ames High School, other stakeholders, and residents in the watershed. We determined nitrate concentrations using three methods to assess citizen-derived field vs. lab results (Fig. 7):

- Iowa DNR volunteer field test kit
- ISU Water Quality Research Lab
- Deltasire Nitrate cell phone app

- Lab test results from the certified laboratory WQRRL was used as a baseline from which the accuracy of the other testing results were compared, including that from an Iowa Department of Natural Resources field test kit provided to volunteer water quality monitors and a free cell phone app developed the Dutch company Deltaires
- We found that the Deltasire and Iowa DNR field testing methods were very similar to the results obtained from the WQRRL (Fig. 7)
- Finding supports the argument that data collected through citizen science methods can produce valid results

We found that the Deltares and Iowa DNR field testing methods were very similar to the results obtained from the WQRRL. EPA Class A1 surface water quality standard is 0.03 mg/L for Total P, 1 mg/L for Non-soluble P and 2 mg/L for Dissolved Oxygen. We found that the Deltares and Iowa DNR field testing methods were very similar to the results obtained from the WQRRL. EPA Class A1 surface water quality standard is 0.03 mg/L for Total P, 1 mg/L for Non-soluble P and 2 mg/L for Dissolved Oxygen.