

Making the case for OWTS management: lessons from case studies and research

Brian G. Rahm, Sohyeon Hwang, Tim Joo, Karin Teuffer, Sridhar Vedachalam, Deb Grantham, Susan J. Riha

New York State Water Resources Institute, Cornell University, Ithaca, NY 14853
<http://wri.cals.cornell.edu/>; nyswri@cornell.edu



Hudson River Estuary Program

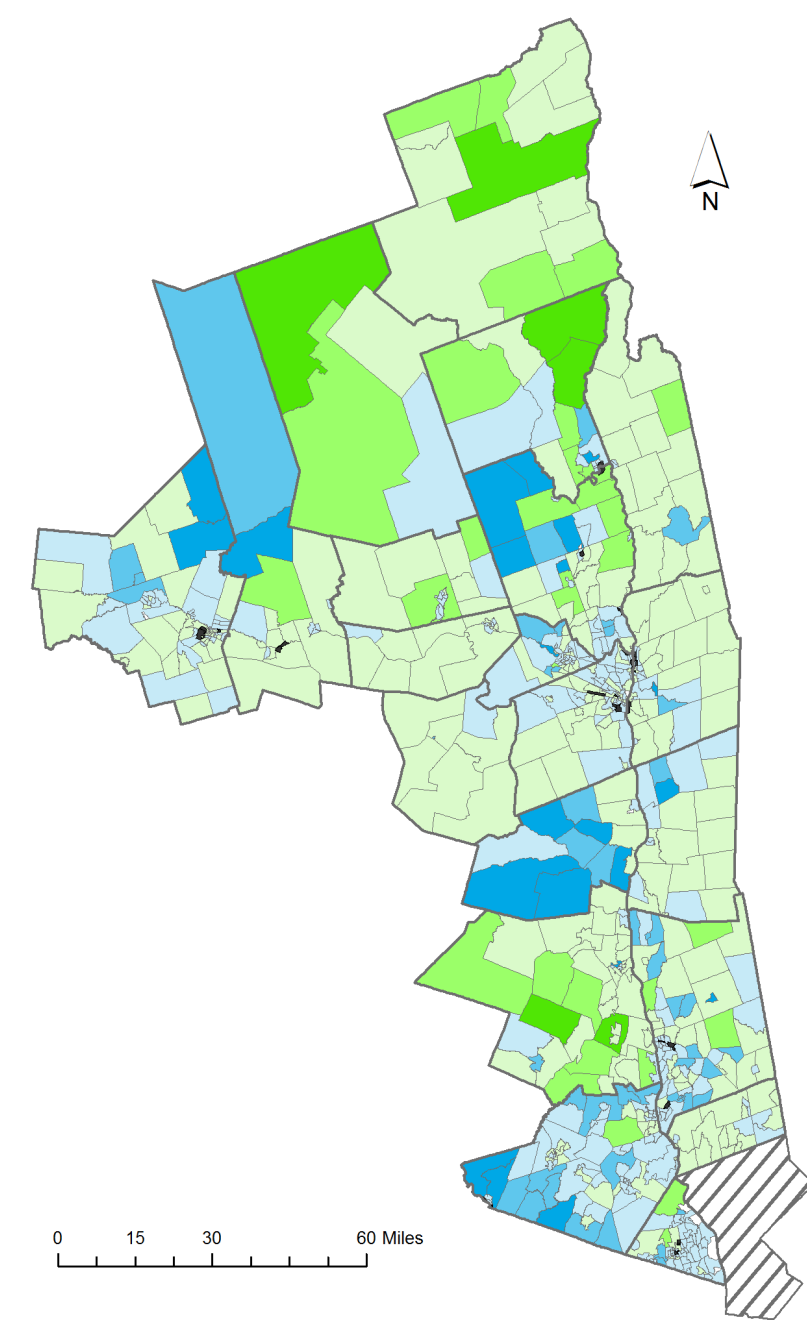
OWTS

On-site wastewater treatment systems (OWTS) are used in 20-25% of homes in the United States and can be an efficient and cost-effective alternative to conventional centralized systems. However, OWTS also represent a source of non-point nutrient, pathogen, and micro-contaminant pollution to surface and groundwater if they are poorly designed, sited and/or maintained. Despite their ubiquity and potential to negatively impact water resources, the contribution of OWTS to local and regional water contamination issues is poorly understood. There are no federal regulations or uniform standards for the operation, maintenance, and management of these systems. The effectiveness of educational programs and best management practices developed by the US Environmental Protection Agency, along with local and regional governments, remains uncertain. Here we describe attempts to increase our knowledge of the state of OWTS in relation to water resources and their management. Specifically, we summarize:

- ① efforts to **modernize a NY State-wide inventory** of residential OWTS using GIS-based tools
- ② research aimed at better understanding the **impact of OWTS on surface and ground water** in upstate NY
- ③ lessons learned from **13 case studies of municipal OWTS management programs** across the US
- ④ observations on the roles of data, education and policy in **creating and evaluating successful municipal OWTS management programs**

① Why care about OWTS in NY - Modernizing a state-wide inventory

- Small or expanding communities face choice between centralized treatment and OWTS. We want to provide helpful guidance
- OWTS often cited as contributing factor to impairment of surface and groundwater. Is this true?
- Management of OWTS at a municipal or regional scale is an interdisciplinary challenge

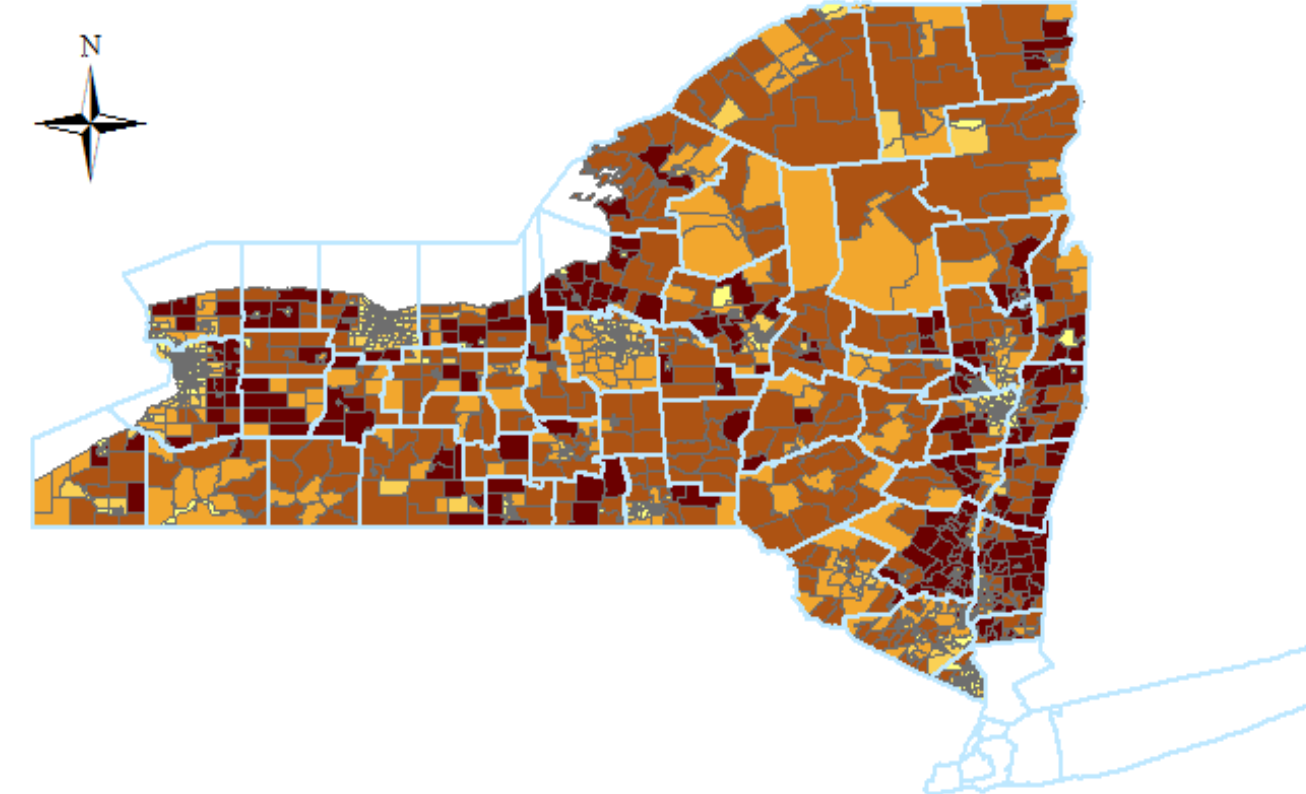


Map of select NY census tracts change in OWTS number (1990 to 2011): **Green** = OWTS increase; **Blue** = OWTS decrease

How many OWTS does NY have?

- Previous data outdated (1990 Census)
- We estimate ~ **1.2 million upstate** (closer to 2 million including Long Island and Westchester County)
- Only Florida has more!

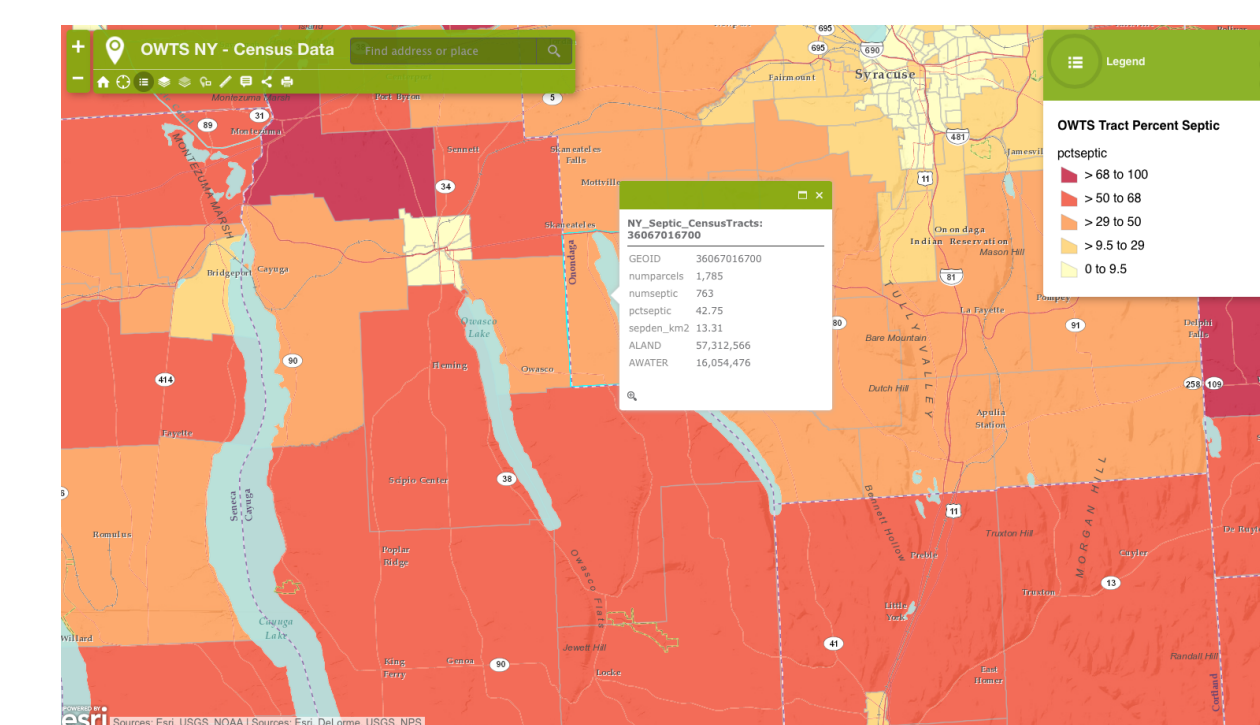
Where are NY's OWTS located?



Map - % population utilizing OWTS by census tracts: **Darker shading** = higher %

- High % in Hudson valley (good soils; ex-urban growth)
- High % in Lake Ontario lowlands
- Low relative % in Adirondacks & other mountainous areas; major urban areas

Data made available online through interactive GIS-based tool



② Water quality impact of OWTS

What we tried

- Simple statistical models relating OWTS to water quality

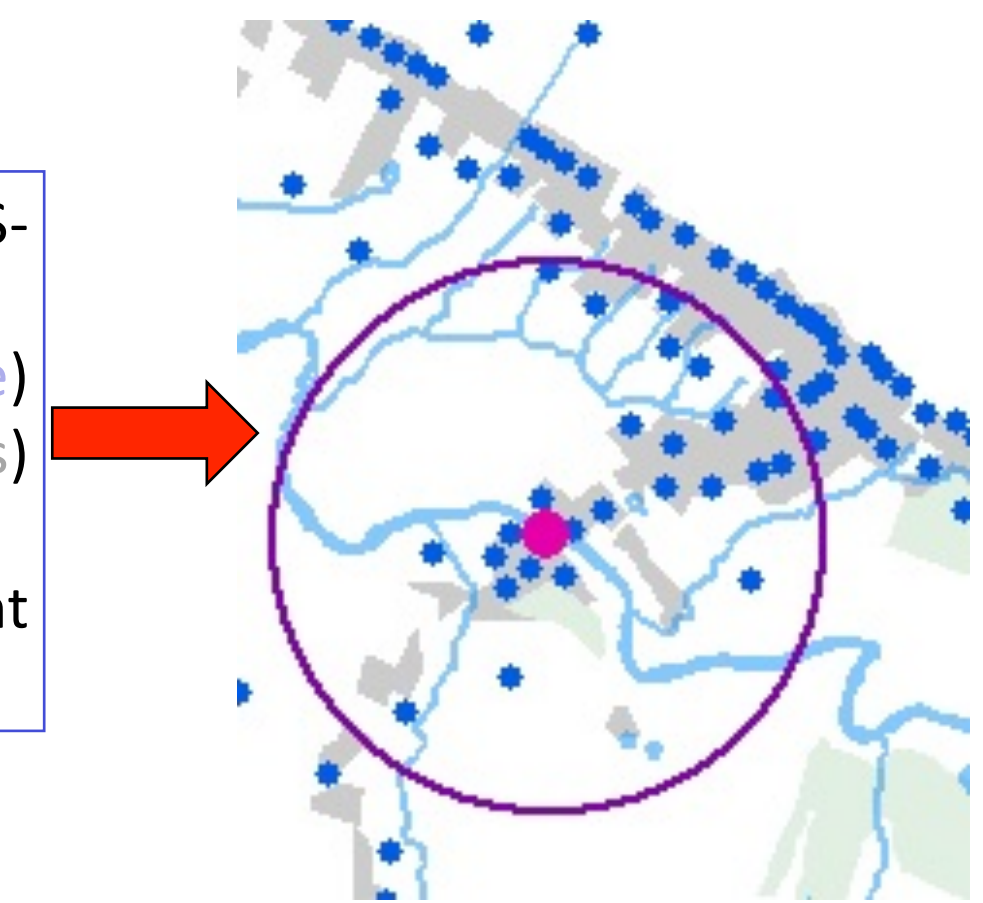
OWTS characteristics

Number
Density
Distance to surface water

Water quality parameters

Fecal indicator bacteria
Nutrient concentration
Impairment classification

Example image from GIS-based analysis:
surface water (light blue)
residential (gray polygons)
OWTS (blue dots)
water quality at central point assessed



What we found

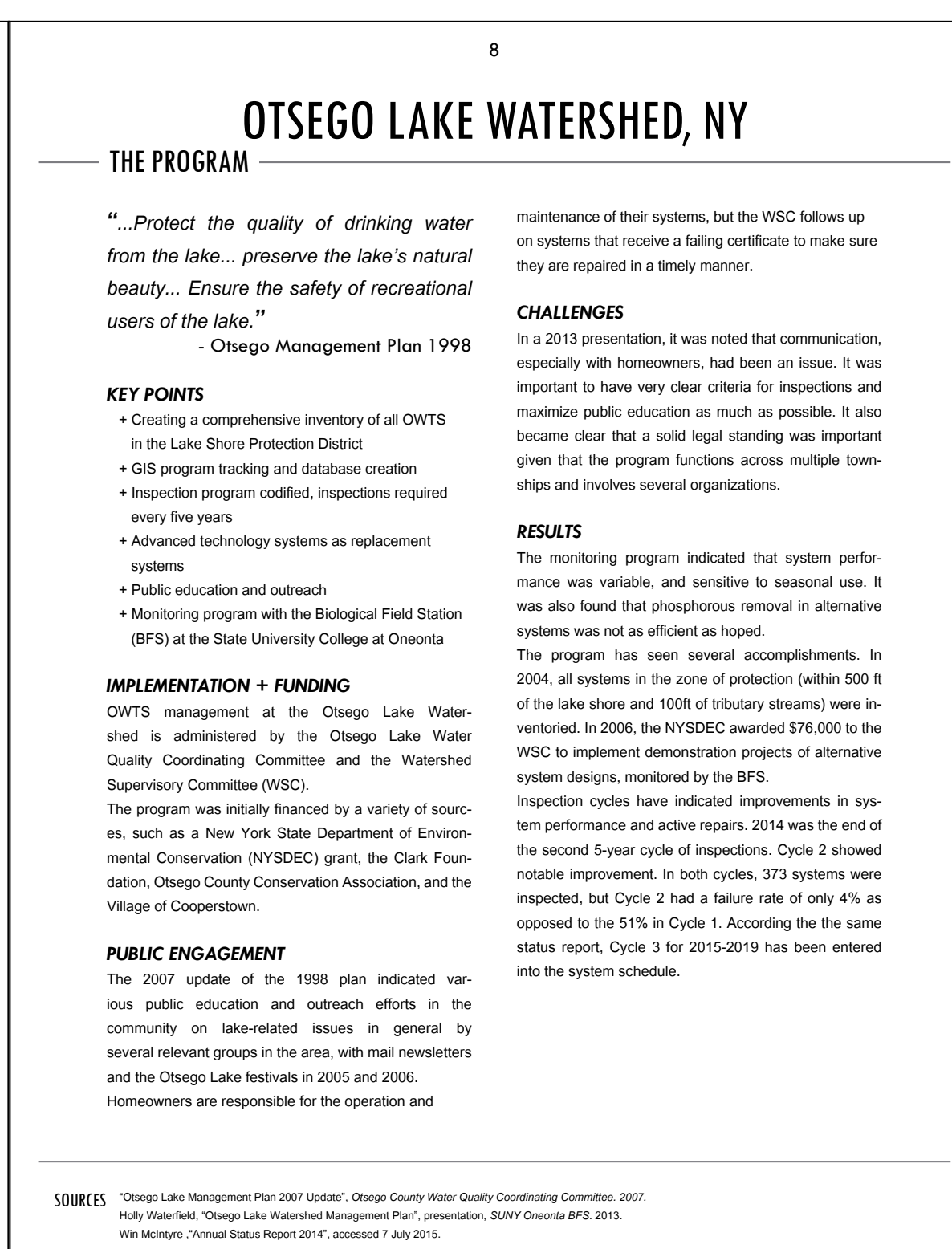
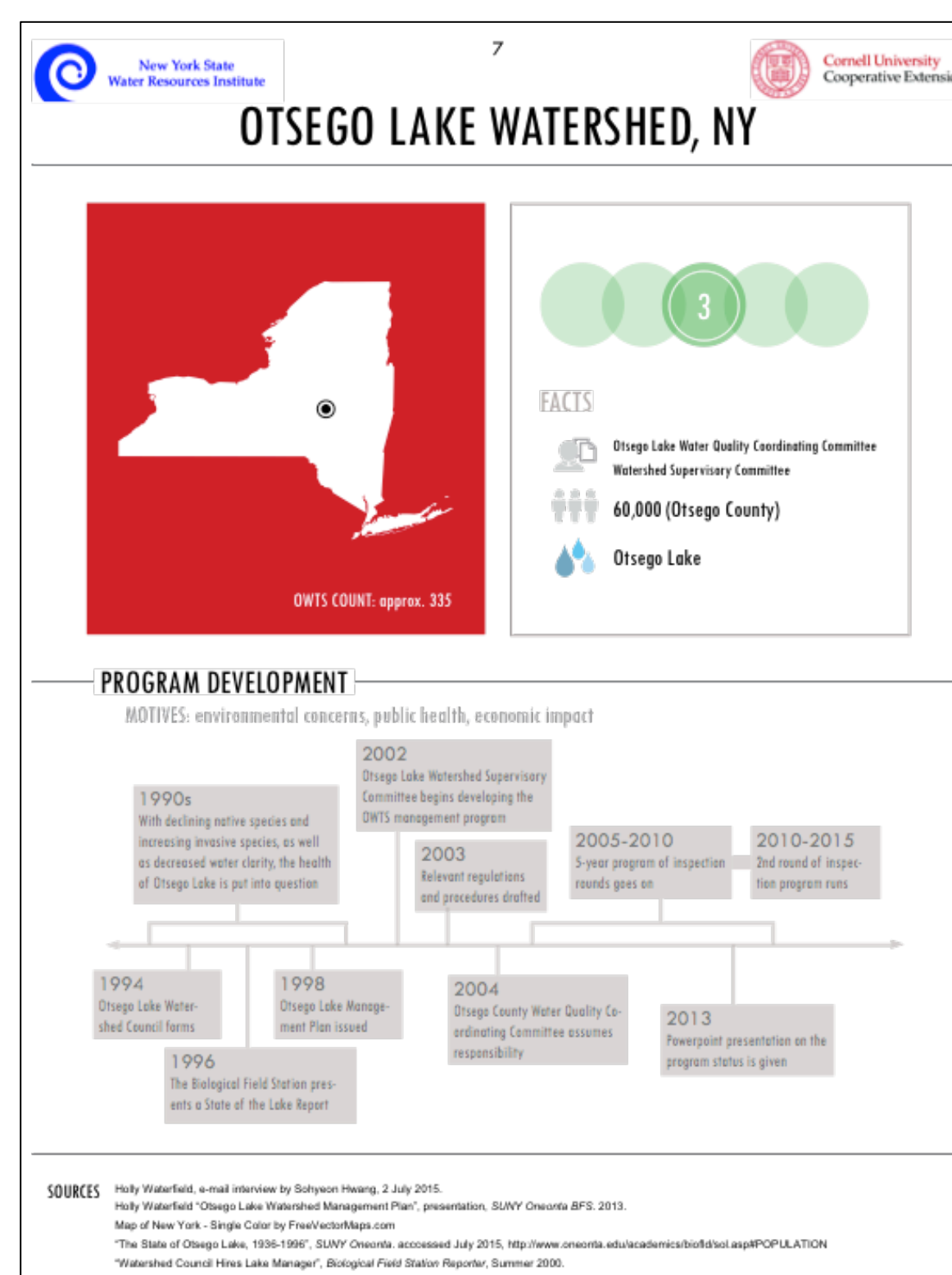
- OWTS characteristics not consistently predictive of water quality
- Confounding seasonal variables
- Other land use characteristics (e.g. proximity or % agricultural land use) stronger water quality predictors

③ Case studies of municipal OWTS management



OWTS case studies

- 13 case studies
- 12 different states
- 2 previously documented in EPA report
- 8 municipalities, 4 counties, 1 consolidated area



④ Components of success (or failure)

Communication - clearly communicating standards and requirements to homeowners and service providers

Identity – clearly identify what (eg. a lake) is being protected, and how that water body is central to identity of community. Support influenced by individual or institutional champions

Legal Structure - legal backing in the form of legislation and compliance measures (such as fines), especially in context of existing state or local laws

Funding – steady funding for programs can be obtained in a variety of ways, including fees, taxes, and grants

Data & Outreach - data upon which program justification and assessment can be built (e.g. number and condition of septic systems); environmental monitoring, sometimes through local partners, in combination with proper recording of inspection results

So what?

- NY has a **large number of OWTS** within context of a wide spectrum of land uses and landscapes
- Total OWTS numbers **continue to grow**, particularly in **ex-urban migration** areas
- Simple statistical models relating OWTS to water quality **not conclusive**; more powerful tools needed and/or data at individual system scale
- This has **implications for management** approaches: preventing failure of individual OWTS may be just as effective as attempts to bring all OWTS up to high level of performance
- Management success often measured with indirect metrics (e.g. # of inspections performed); **more environmental data needed to build evidence-based case** for OWTS management

Thank you

This work was prepared for NYS WRI and the NYSDEC HREP, with support from the NYS Environmental Protection Fund and the USDA National Institute of Food and Agriculture Smith-Lever project.

Additional thanks to Sandeep Vanka, Fiona Woods, Alyssa Kirsch and Steve Smith for the assistance putting this material together. Links to all products can be found at the NYS WRI website:

<http://wri.cals.cornell.edu>