Streamflow Depletion by Pumping Wells and the Michigan Water- Withdrawal Assessment Process

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Water in the West, Groundwater Data Workshop
Stanford University
January 28-29, 2016
Brief History of Great Lakes Water Management

- 1909 – Boundary Waters Treaty
  International Joint Commission

- 1978 – Great Lakes Water Quality Agreement

- 1985 – Great Lakes Charter
  uneven implementation by States

- 1986 – Water Resources Development Act (WRDA)
  Governors’ unanimous approval for diversions out of the Great Lakes

- 1998 – Nova Group proposal
  - bulk water shipments to Asia from Lake Superior
  - 158 million gallons per year
    (Lake Superior storage- 3.2 x 10^9 million gallons)
  - permitted by Ontario
Brief History of Great Lakes Water Management

- 2001-2008 Develop Great Lakes Compact
- 2008 – Great Lakes-St. Lawrence River Basin Water Resources Compact
  - Interstate Compact among the Great Lakes States
- 2008 – Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement
  - Agreement between Great Lakes States and Canadian Great Lakes Provinces

USGS
The Michigan Story: Compact Implementation

Prevent an **Adverse Resource Impact** from new withdrawals

- Governors and Premiers
- Great Lakes Regional Compact – working groups and advisors
- State Legislative Leadership: Vision, Science, & Collaboration
- State Legislative Water Advisory Council representing stakeholders
- Investment in Fisheries Research: ecology-temperature-flow relations
- Investment in Water Resources Science: surface water and groundwater

[USGS Logo]
Water withdrawal assessment: components

- Define an adverse resource impact
  - Ecological response to withdrawal

- Estimate streamflow
  - 1:100,000 NHD streams
  - Median flow for low-flow summer month (index flow)

- Estimate potential streamflow depletion by new wells
  - High-capacity wells
  - Greater than 70 gpm (100,000 gpd), 30-day period

- Management framework
  - Stream classification
  - Allowable impact
  - Accounting system -> Cumulative impacts
Stream Classification and Ecological Response

- Classification based on drainage area, stream temperature, and fish community
- Represents diversity in settings across the state
- Used to estimate impacts of withdrawal on fish communities
- Allows setting of thresholds
  - Thresholds are different for different settings
  - Set through legislative process

*Preserve the geography of flow*
Increasing level of user involvement and responsibility

EXPLANATION
- Thriving Fish Species
- Characteristic Fish Species
- A-Line
- B-Line
- C-Line

Adverse Resource Impact

FRACTION OF INITIAL POPULATION METRIC

FRACTION OF INDEX FLOW REMOVED

Zone A
Zone B
Zone C
Zone D
Screening Tool: Identify withdrawals less likely to cause adverse resource impacts

- Recognize and allow withdrawals that will likely not have adverse impacts
- Increase efficiency and limit regulatory oversight
- Make system more user driven
- Identify potential problems,
  - withdrawals that do not pass screening may be submitted for site-specific review
Screening Tool

- Analytical equation for stream depletion by a well by Hunt (1999) chosen for the screening tool.
- Drawdown computed by this approach is consistent with methods used in standard aquifer-test analysis.
- Low data requirements and ease of use.
- Simple solution consistent with screening tool, does not imply more knowledge of the system.
Well 500 ft from stream
Welcome

The Water Withdrawal Assessment Tool (WWAT) is designed to estimate the likely impact of a water withdrawal on nearby streams and rivers. Use of the WWAT is required of anyone proposing to make a new or increased large quantity withdrawal from the waters of the state, including all groundwater and surface water sources, prior to beginning the withdrawal. You must use the WWAT to determine if a proposed withdrawal is likely to cause an Adverse Resource Impact, and to register the withdrawal. The results page provides a quick link to submitting a registration. A registration is valid for 18 months; the withdrawal capacity must be installed within that 18 months or the registration becomes void.

Start
User places new withdrawal: interface identifies watersheds, distances to streams, and retrieves estimated aquifer properties.
Water withdrawal screening results

ARI Zone Graph

Result: Zone D
The proposed withdrawal has failed the screening process.
You must request a site specific review below in order to begin using this withdrawal.

The graph above illustrates the estimated impact of the proposed withdrawal on the affected stream, and its potential for causing an adverse resource impact (ARI).

Results:
The proposed withdrawal has failed the screening process. The projected impact of the withdrawal lies within 'Zone D' and is likely to cause an adverse resource impact.

Registration:
A large quantity withdrawal (LQW) with a capacity of 70 or more GPM must be registered before the withdrawal can begin. To register this withdrawal as you just entered it, use the button at the right.

A registration must be verified within 18 months by installation of the withdrawal. A registration that does not match actual installation, or that has not been installed within 18 months becomes void.

Stream Classification: Warm stream

Disclaimer: The Water Withdrawal Assessment Tool is designed to estimate the likely impact of a proposed water withdrawal on nearby streams. It is not an indication of how much groundwater may be available for your use. The quantity and quality of groundwater varies greatly with depth and location. You should consult with a water resources professional or a local well driller about groundwater availability at your location.
Data Requirements

- Streamflow data
- Fish presence and abundance
- Stream temperature
- Aquifer distribution and characteristics

Steinman and others, 2011.
Resources