

# Water Use Issues in RI

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# Water Users

- Residential/Domestic – drinking water and household uses
  - General Business – restaurants, hotels, etc.
  - Industrial – processing, cooling, diluting
  - Agriculture – irrigation, livestock
  - Recreation – golf courses, swimming, canoeing/kayaking, fishing
  - Ecosystem
- 

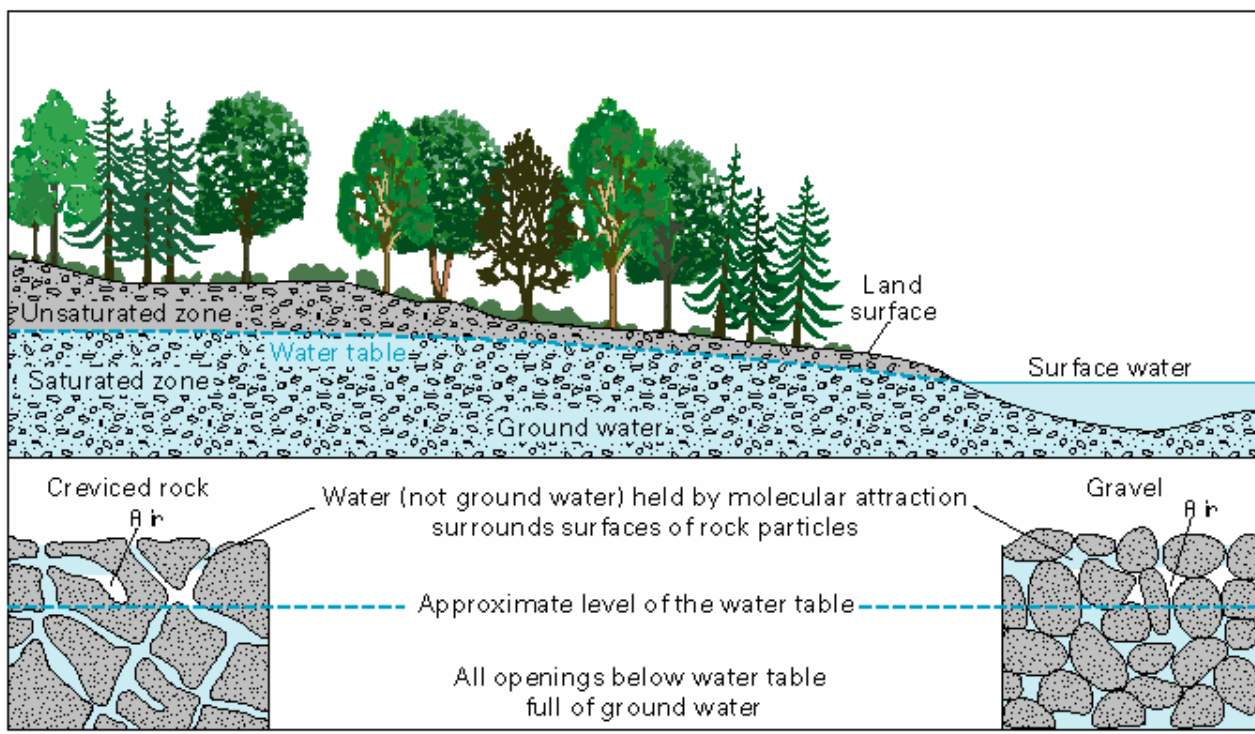
# Water Sources

## ➤ Surface Water

## ➤ Groundwater

- Groundwater feeds into surface waters, such as streams, ponds and wetlands
- All water resources are “connected” – use of one will affect the other
- Groundwater withdrawals remove water that would normally make its way to streams and ponds as “base flow”
- Although more uncommon, excessive surface water withdrawals may accelerate the rate of groundwater flow to streams, thereby “pulling” water away from groundwater rich areas

In the diagram below, you can see how the ground below the water table (the blue area) is saturated with water. The "unsaturated zone" above the water table (the greenish area) still contains water (after all, plants' roots live in this area), but it is not totally saturated with water. You can see this in the two drawings at the bottom of the diagram, which show a close-up of how water is stored in between underground rock particles.



Sometimes the porous rock layers become tilted in the earth. There might be a confining layer of less porous rock both above and below the porous layer. This is an example of a confined aquifer. In this case, the rocks surrounding the aquifer confine the pressure in the porous rock and its water. If a well is drilled into this "pressurized" aquifer, the internal pressure might (depending on the ability of the rock to transport water) be enough to push the water up the well and up to the surface without the aid of a pump, sometimes completely out of the well. This type of well is called artesian. The pressure of water from an artesian well [can be quite dramatic](#).

# Matching Water Needs to Water Sources

- Industry, Golf Courses and Farmers use either/both ground and surface water
- Public water supplies are largely provided from surface water for the northern and eastern side of the state; groundwater for all of Washington County
- Most recreational uses rely on natural conditions
- “Ecosystem” gets what is left unless actively managed to protect aquatic needs

# What Happens in a Drought?

- Conflicts arise between users, particularly agricultural/golf course interests with recreational/ecosystem needs.
- RI does not require farmers and golf courses to report water use or ask for permission to irrigate (most states do).
- RIDEM is responsible for ensuring that the state's waters are fishable and swimmable and of high quality.
- RI Water Resources Board has authority to allocate water statewide.
- The US Geological Survey has responsibility for monitoring water flows nationwide.

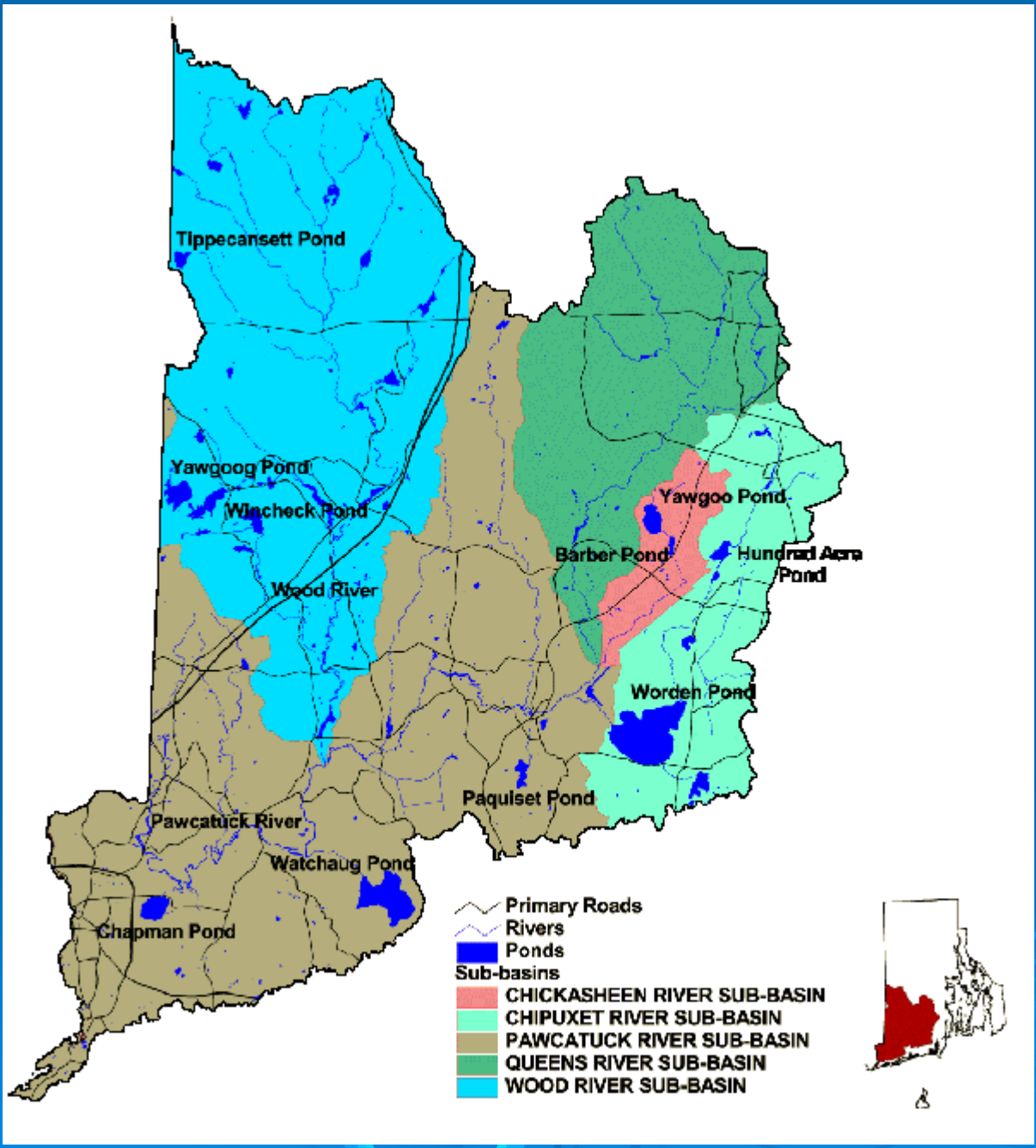
# Complicating Factors

- Out of basin transfers – occurs when public water is pumped from one watershed/area, but discharged to a different watershed through public sewage disposal systems.
- Water conservation in the public supply system – many systems are antiquated and “lose” water in transport before it reaches its intended end user.
- Public Water Suppliers are required to have enough water “in reserve” for fire control.

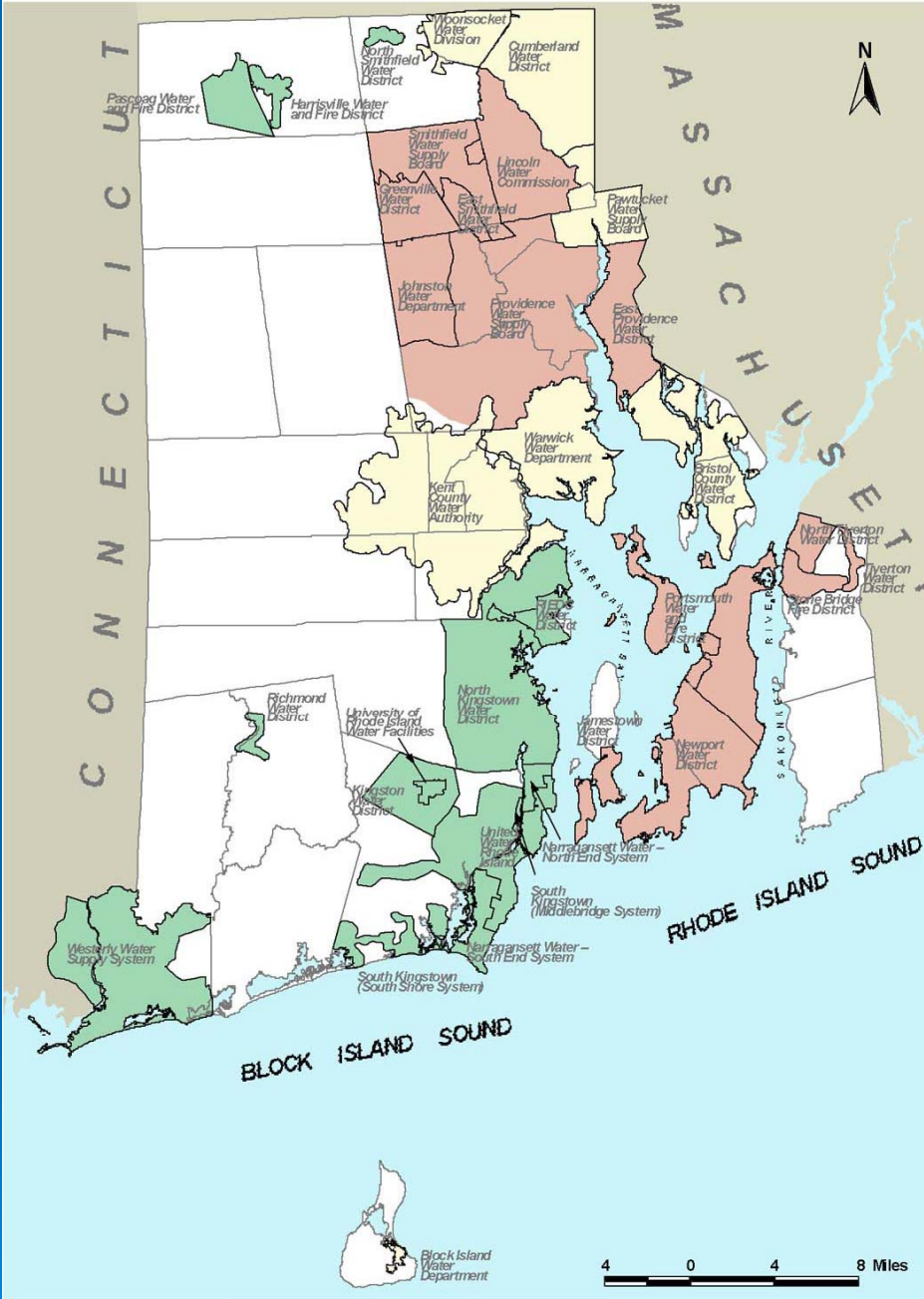
# Water Conservation Practices of End Users

- Homeowners complain about and/or don't follow mandatory restrictions.
- Many view irrigation of home lawns, crops (particularly sod farms), and golf courses as unnecessary.
- Problems are elevated in drought years, when irrigation needs increase and stream flows are naturally low.





# RI Public Water Supplies



- LEGEND**
- SURFACE WATER SUPPLY (SW)
  - GROUND WATER SUPPLY (GW)
  - COMBINED SW & GW
  - ∇ WATER DISTRICT BOUNDARIES
  - AREAS NOT SERVED BY PUBLIC WATER SYSTEMS

**AREAS CURRENTLY SERVED BY MAJOR PUBLIC WATER SUPPLIERS IN RHODE ISLAND**

MAP BY THE RHODE ISLAND WATER RESOURCES BOARD



August 1, 2002



Map based data provided by the water utilities

# RI Department of Environmental Management

- Responsible for defining minimum stream flows needed to sustain the ecosystem.
- Must be done with an awareness of potential impacts – economic, political, social.
- Research provides needed data, as well as computer models, etc. – all of which must be tailored to specific conditions (what works in one watershed may not work in the next).
- <http://www.dem.ri.gov/programs/benviron/water/index.htm>

# RI Water Resources Board

- A quasi-state agency responsible for coordinating public water suppliers, as well as balancing water supply needs for all users.
  - Focus is on developing policies, based on science and economics, to manage the state's water supplies.
    - Kent County Water Authority news articles

<http://www.wrb.state.ri.us/>



Address <http://www.wrb.state.ri.us/wdata/waterrestr.html> Go Links

Organization Name	Phone #	Water Restrictions
Block Island Water Works	466-3232	No Restrictions
Bristol County Water Authority	253-5210	No Restrictions
Cumberland Water Dept.	658-0666	No Restrictions
East Providence Water Dept.	435-7500	No Restrictions
East Smithfield Water District	231-0510	No Restrictions
Greenville Water District	231-1433	Odd/Even Outdoor Watering - Voluntary
Harrisville Fire District	568-2224	No Restrictions
Jamestown Water Division	423-7220	No restrictions until JUNE 1
Johnston Water Control Facility	553-8819	No Restrictions
Kent County Water Authority	821-9300	Odd/Even Outdoor Watering - Mandatory
Kingston Water District	783-5494	No Restrictions
Lincoln Water Commission	334-6735	Odd/Even Outdoor Watering - Voluntary 5/31 to Labor Day
Narragansett Water Dept.	789-1044 Ext.639	No Restrictions
Newport Water Works	845-5600	No Restrictions
North Kingstown Water Dept.	268-1521	Odd/Even Outdoor Water Use <b>Mandatory JUNE 1-AUGUST 30</b>
North Smithfield Water Dept.	767-2202 Ext: 7	Odd/Even Outdoor Water Use - Mandatory
North Tiverton Fire District	624-8432	No Restrictions
Pascoag Utility District	568-6222	Outdoor Watering - Voluntary
Pawtucket Water Supply Board	725-9492	No Restrictions
Portsmouth Water and Fire District	683-2090	No Restrictions
Providence Water Supply Board	521-6300	No Restrictions
Quonset Development Corp.	295-0044	Voluntary night time watering, between 8 pm-6 am only
Richmond Water Supply System	539-0150	No Restrictions
Smithfield Water Supply Board	233-1034	Odd/Even Outdoor Water Use - Voluntary
South Kingstown Water Dept.	789-9331	No Restrictions
Stonebridge Fire District	624-4486	No Restrictions
URI Facilities & Operations	874-2723	No Restrictions
United Water Rhode Island	789-0271	No Restrictions
Warwick Water Department	738-2000 Ext: 6604	Voluntary Odd/Even Water Ban
Westerly Water Department	348-2559	No Restrictions
Woonsocket Public Works	762-6400	No Restrictions

# United States Geological Survey (USGS)

- Charged with monitoring water flows nationwide.
- Also work cooperatively with state and local partners to research and model specific issues.

<http://ma.water.usgs.gov/>

# WaterWatch -- *Current water resources conditions*

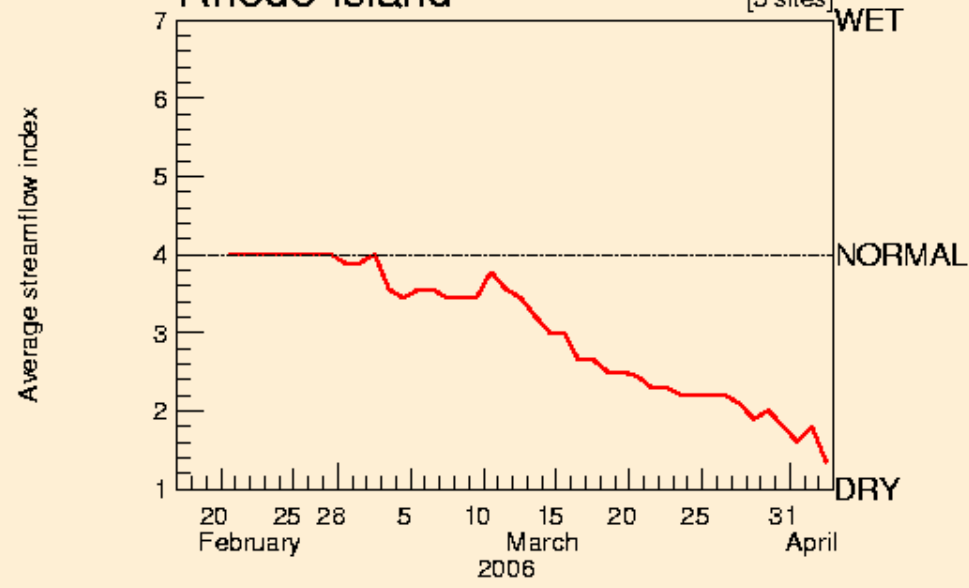
## Time series plot of real-time streamflow compared to historical streamflow for the day of the year (Rhode Island)

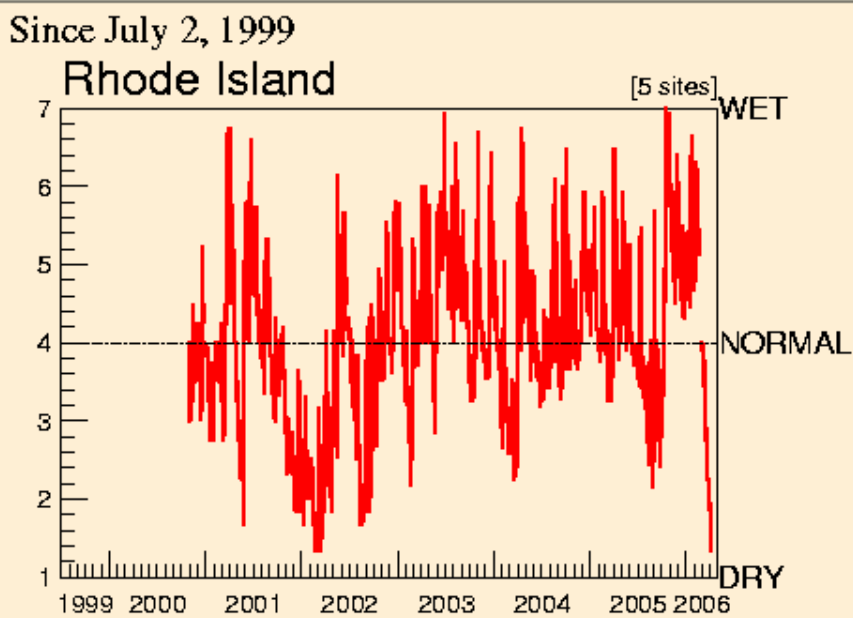


Last 45 Days

### Rhode Island

[5 sites]





**Explanation - Percentile classes**

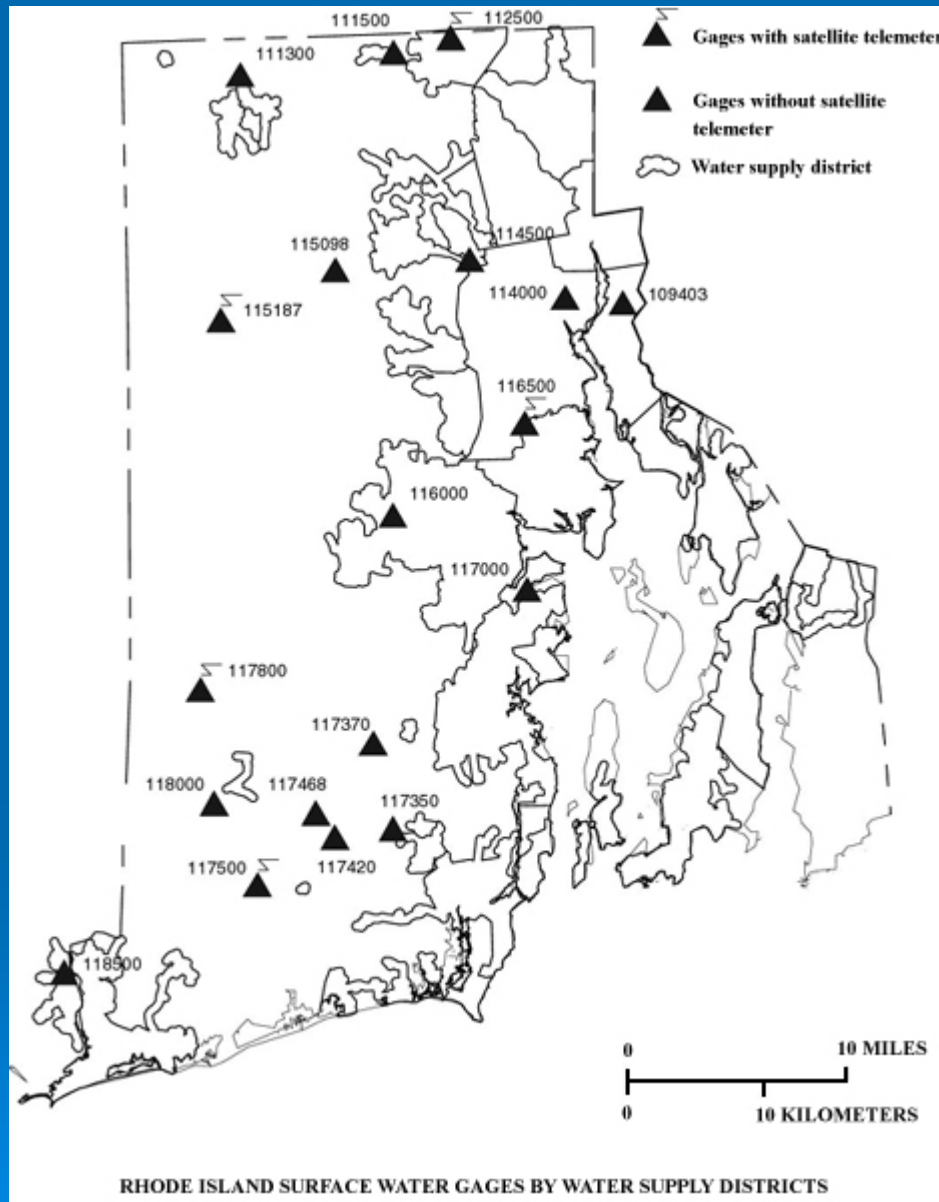
1	2	3	4	5	6	7
New low	< 10	10-24	25-74	75 - 89	≥ 90	New high

**Explanation of the Streamflow Conditions Plots**

The Average Streamflow Index, plotted as the red line on the above graphs, is calculated each day as the average of the streamflow index values for all the stream gaging stations in the state or water resource region having at least 30 years of record

The streamflow index value at a station compares the real-time measured flow value to historical values for the





## Real-Time Data for Rhode Island: Streamflow -- 11 site(s) found

**PROVISIONAL DATA SUBJECT TO REVISION**

**Updated 2006-04-04 10:20:02 US/Eastern**

--- Predefined displays ---  
 Rhode Island Streamflow Table

Group table by  
 County

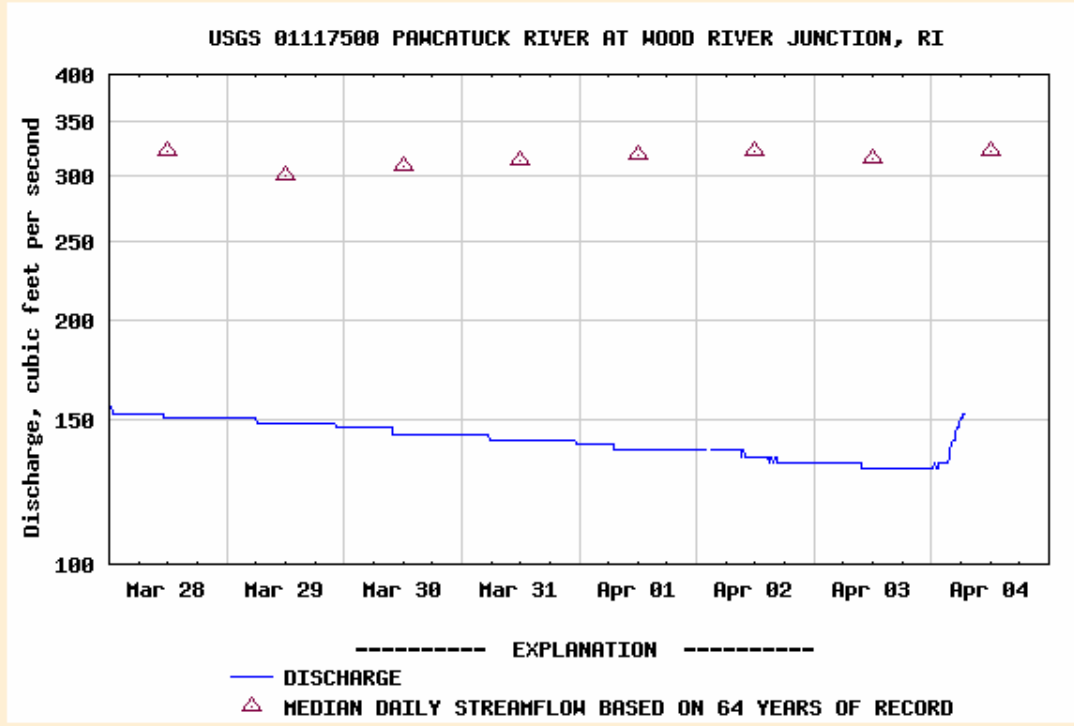
Select sites by number or name  
 go

[Customize table to display other real-time parameters](#)

Station Number	Station name	Date/Time	Gage height, feet	Stream-flow (ft <sup>3</sup> /s)	Long-term median flow 4/4
<b>● Kent County</b>					
<a href="#">01116000</a>	SOUTH BRANCH PAWTUXET RIVER AT WASHINGTON, RI	04/04 08:30	1.71	71	229
<b>● Providence County</b>					
<a href="#">01112500</a>	BLACKSTONE RIVER AT WOONSOCKET, RI	04/04 08:45	1.99	406	1,470
<a href="#">01114000</a>	MOSHASSUCK RIVER AT PROVIDENCE, RI	04/04 06:45	2.87	168	56.0
<a href="#">01114500</a>	WOONASQUATUCKET RIVER AT CENTERDALE, RI	04/02 01:45	2.22	<a href="#">Eqp</a>	119
<a href="#">01115187</a>	PONAGANSET RIVER AT SOUTH FOSTER, RI	04/04 10:00	1.66	17	46.0
<a href="#">01116500</a>	PAWTUXET RIVER AT CRANSTON, RI	04/04 09:15	4.07	242	578
<b>● Washington County</b>					
<a href="#">01117350</a>	CHIPUXET RIVER AT WEST KINGSTON, RI	04/04 07:15	5.04	21	38.5

### Discharge, cubic feet per second

Most recent value: 153 04-04-2006 06:45



Download a [presentation-quality graph](#)

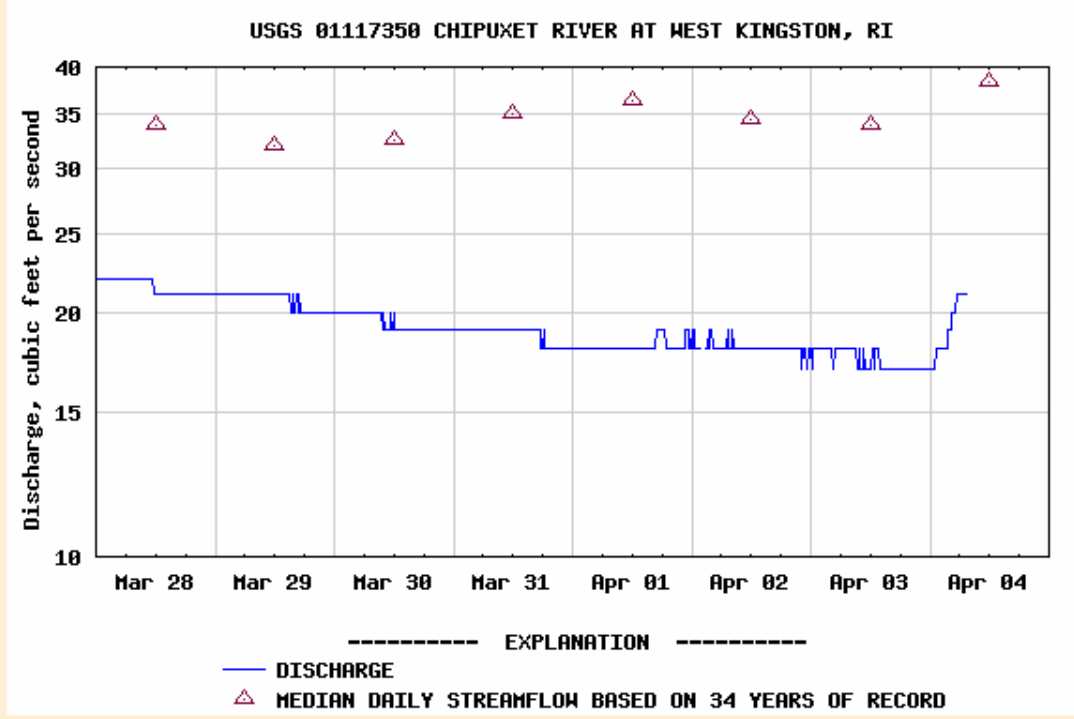
Parameter Code 00060; DD 01

#### Daily mean flow statistics for 4/4 based on 64 years of record in ft<sup>3</sup>/sec

Current Flow	Minimum	Mean	Maximum	80 percent exceedance	50 percent exceedance	20 percent exceedance
153						

### Discharge, cubic feet per second

Most recent value: 21 04-04-2006 07:15



Download a [presentation-quality graph](#)

Parameter Code 00060; DD 02

#### Daily mean flow statistics for 4/4 based on 34 years of record in ft<sup>3</sup>/sec

Current Flow	Minimum	Mean	Maximum	80 percent exceedance	50 percent exceedance	20 percent exceedance
21	11	40.7	90	27.0	38.5	51.0

Percent exceedance means that 80, 50, or 20 percent of all daily mean flows for 4/4 have been greater than the value shown.

# Other Interest Groups

- RI Farm Bureau
- RI Agricultural Council
- RI Conservation Districts
- Non-profit organizations, such as the Audubon Society, Wood-Pawcatuck Watershed Association, The Nature Conservancy
- Public Water Suppliers

# Water Allocation

## *Who Comes First?*

- Domestic Needs are always first priority
- Business Needs generally are next in line
  - agriculture and golf courses are “businesses”
  - Environmental groups do not feel that irrigation is necessary, and that irrigation should cease or be cut back
  - Any changes to water use may negatively impact profit/loss, and in the long run, viability of the business
- The ecosystem is “protected” by the Clean Water Act, but defining acceptable low flow rates is VERY difficult.

# Water Allocation

- A delicate **balance** between protecting the ecosystem; providing for long-term economic stability/growth, including maintaining viable farms; and meeting the existing domestic supply needs as well as accommodating future population growth.
- Requires a blend of politics and science, along with conflict resolution/mediation, and patience!

# WE ALL USE WATER

- Direct Use – Drinking water, showering, cleaning, watering our lawn/garden, etc.
- Indirect Use – virtually everything we buy was manufactured with water





# Global Water Use Issues

- Water/crop subsidies to farmers lower the “real” cost of producing food, which leads to unfair trade on the world market
- Most developing countries provide water for domestic uses and to support economic development – ecosystem needs are often not even considered



# Climate Change and Agricultural Water Use

- Erratic weather patterns may increase both the frequency and duration of droughts.
- Irrigation needs will increase world wide.
- Irrigation is needed to grow the crops needed to sustain the world's population.
- Increases in carbon dioxide will result in greater plant growth, requiring even more water.
- Conflicts are likely to intensify, particularly in countries where ecosystem needs are protected.

# What Can Farmers Do?

- Implement water conservation practices, if not already in place
- Stay abreast of latest technology available to conserve water
- Improve soil organic matter, which improves water holding capacity in the soil.
- Select drought tolerant crops/varieties when available.

# Water Conservation on Farms in RI

## Conveyance of Water

- Replace leaky above ground pipes with buried lines.
- Use most efficient sprinkler system available for the crop: trickle, linear move or center pivot systems, solid set sprinklers. Trickle irrigation is NOT suited to all crops.

## Management of Water

- Improve management of the timing and rate of irrigation water applications: apply just enough to fill the root zone; don't apply when windy; keep a running tally of rainfall received and irrigation water applied (checkbook method); use moisture sensors to determine when to irrigate and to help calibrate how much to put on; measure and record how much is pumped and applied.

# Pawcatuck Watershed Water Use and Optimization Project

- Studying current and future water supply needs to determine existing impacts on ground and surface water, as well as investigate potential impacts if management changes are implemented.
- Goal of the project is to find the most sustainable source of water (ground or surface) to meet agricultural water needs while protecting aquatic ecosystems.

# What Can You Do?

- Save Water
- In times of drought and mandatory restrictions, try to keep your own water issues in perspective with those making a living from the land and businesses that rely on water in their manufacturing/processing operations.
- Buy Wisely – remember that virtually everything you buy needs water somewhere in the manufacturing process
  - Recycle often; buy recycled or second hand products

Get involved! Follow legislation, contact your legislators, or volunteer for organizations that are doing the above.