



Managing Seasonal Changes in Water Demand: Tools, Practices and Policies

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May 10, 2011

2011 Drinking Water Source Protection Workshop

New Hampshire Water Use Data

Water users that use > 20,000 gpd

- New Hampshire DES Registration Program
 - Name and location of facility
 - Sources, destinations, and transfers
 - Types of water using processes
- Measurement
 - Accuracy >90%
- Reporting
 - Monthly water use for each source / destination / transfer
 - Report quarterly, or annually if water use is seasonal

Analysis of Community Water System Data:

- Pumpage data only (what went “out the door”) to meet system demands
- Looked at a “Water Year”
 - October to September
- Determined Baseline Usage:
 - October through April data
- Summer and Peak Demand:
 - May through September Data

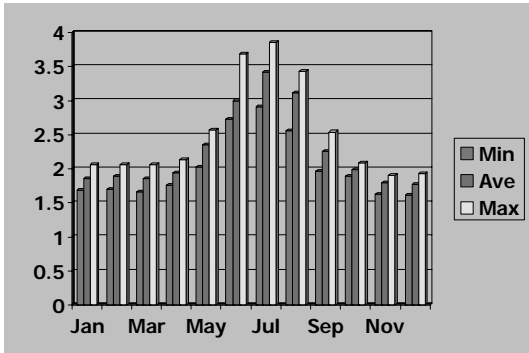
Analysis of Community Water System Data:

> Four categories of systems

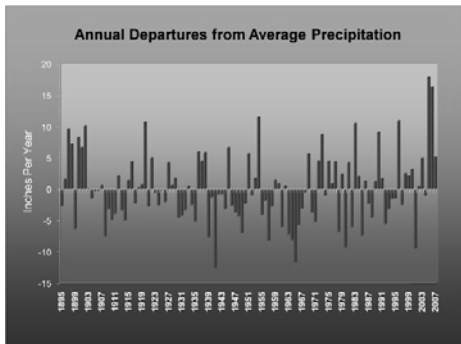
Category	Total Systems	Average Connections
Large	33	5,525
Medium	27	1,074
Small	80	356
Very small**	586	43

** Most very small community water systems do not use 20K / day

Typical Way to Look At Water System Trends – Annual Chart of Average Daily Demand



NH Precipitation Variability

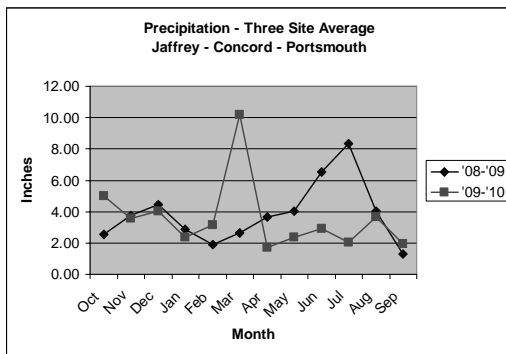


Source: New Hampshire Water Resources Primer

Effect of Weather on Public Water System Demands:

- Recent years in New Hampshire have been fairly wet.
- The summer of 2009 was fairly typical with respect to weather and precipitation, but was wet in late June and July.
- According to data from the Northeast Regional Climate Center, the summer of 2010 (May – Sep) was 5 degrees warmer, and received 6 inches less rainfall than the summer of 2009.

'08-'09 versus '09-'10:

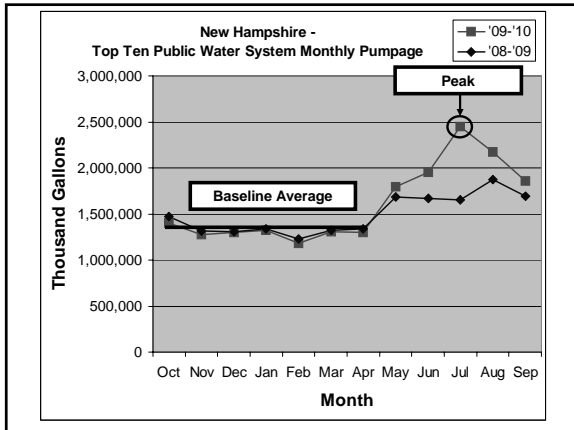


Large Water Systems



ID	Connections	Avg Daily (2 yrs) Million Gallons	Peak Month Average Daily Million Gallons
1	31,000	13.97	26.4
2	23,629	9.46	19.2
3	12,000	3.45	7.1
4	7,200	3.67	5.8
5	6,800	2.28	3.7
6	6,000	2.20	2.8
7	8,730	1.85	3.4
8	8,600	1.90	4.0
9	7,000	1.86	2.6
10	7,000	1.99	3.9
Tot	117,959		

33 Large Systems
Average Connections: 5,525



Large System Monthly Trends

- › Baseline Average – 1,314 million gallons
- › Summer Average – 1,879 million gallons
- › **2009 Summer Average** – 1,714 million gallons
 - 1.30 to 1.00 ratio
- › **2010 Summer Average** – 2,045 million gallons
 - 1.56 to 1.00 ratio
- › **2010 Peak Month** – 2,449 million gallons
 - 1.86 to 1.00 ratio

~ 20% increase over summer of 2009

Medium System Trends

- › Baseline Average – 36 million gallons
- › Summer Average – 44 million gallons
- › **2009 Summer Average** – 41 million gallons
 - 1.14 to 1.00 ratio
- › **2010 Summer Average** – 47 million gallons
 - 1.29 to 1.00 ratio
- › **2010 Peak Month** – 53 million gallons
 - 1.45 to 1.00 ratio

~ 15% increase over summer of 2009

Small System Trends

- Baseline Average – 11.8 million gallons
- Summer Average – 16.6 million gallons
- **2009 Summer Average** – 14.8 million gallons
 - 1.26 to 1.00 ratio
- **2010 Summer Average** – 18.3 million gallons
 - 1.55 to 1.00 ratio
- **2010 Peak Month** – 21.3 million gallons
 - 1.81 to 1.00 ratio

~ 24% increase over summer of 2009

Very Small Water Systems

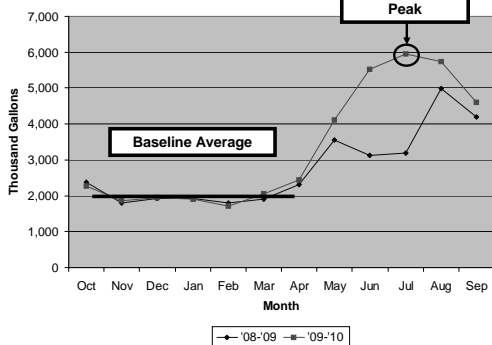
Most Community Water Systems are not in this database because they don't hit the 20,000 GPDay threshold



ID	Connections	Avg Daily	Peak
1	103	16,000	36,000
2	72	13,000	42,000
3	53	8,000	24,000
4	47	8,000	38,000
5	47	8,000	19,000
6	28	8,000	32,000
7	30	6,000	17,000

586 Very Small Systems
Average Connections: 43

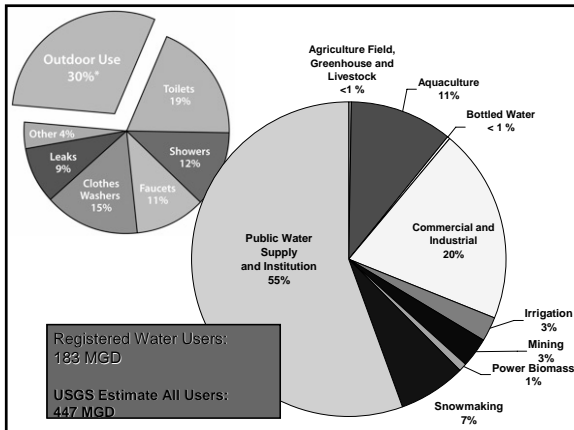
Very Small Systems Combined Water Pumpage

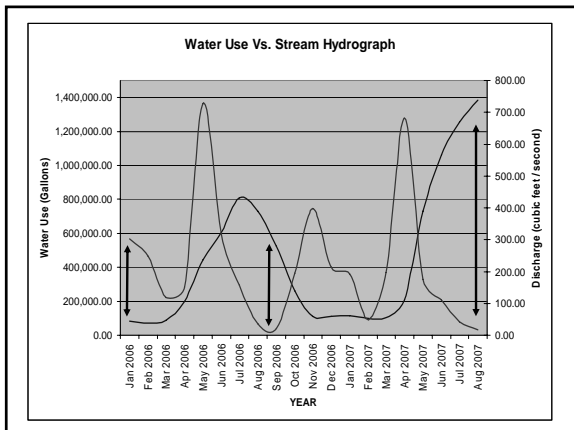


Very Small System Trends

- Baseline Average – 2.0 million gallons
- Summer Average – 4.5 million gallons
- **2009 Summer Average** – 3.8 million gallons
 - 1.89 to 1.00 ratio
- **2010 Summer Average** – 5.2 million gallons
 - 2.57 to 1.00 ratio
- **2010 Peak Month** – 5.9 million gallons
 - 2.95 to 1.00 ratio

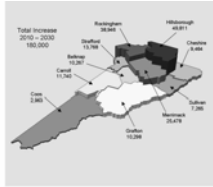
~ 37% increase over summer of 2009





Landscape Trends Not Sustainable

- Climate Change
- Aging Infrastructure
- Population Growth



Demand Management Tools

Water System Side Loss Control

- Meter Installation & Maintenance
- Water Accounting and Water Audits
- Leak Detection and Repair
- Pressure Reduction

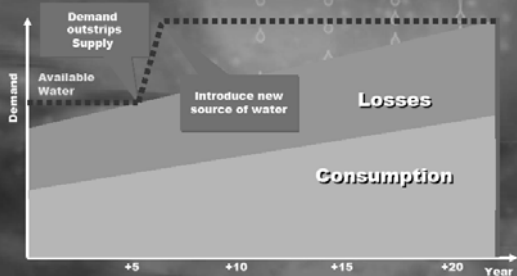
- Conservation rates
- Outreach
- Customer audits
- Rebate programs
- Efficiency ordinances
- Restrictions

Consumer Side Consumption

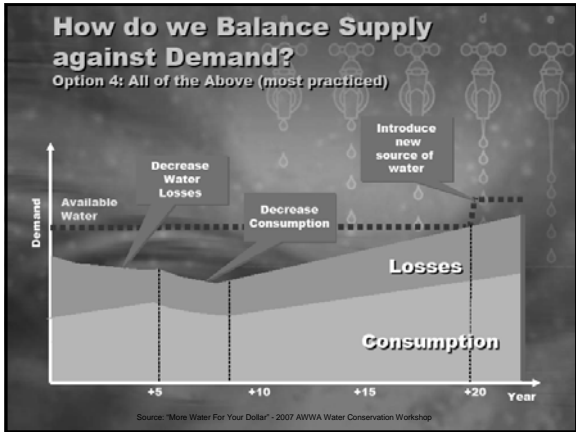
- Engineering changes inside the home
- Engineering changes outside the home
- Changes in behavior

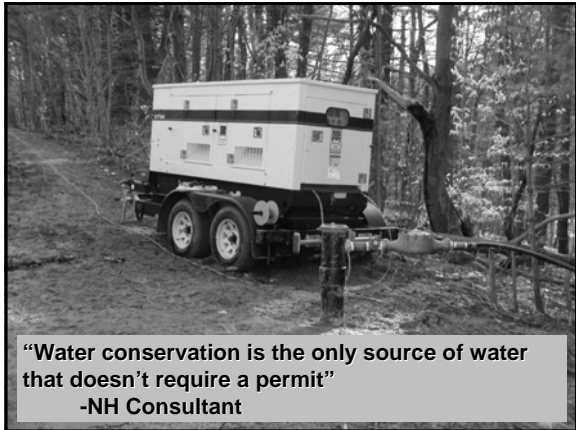
How do we Balance Supply against Demand?

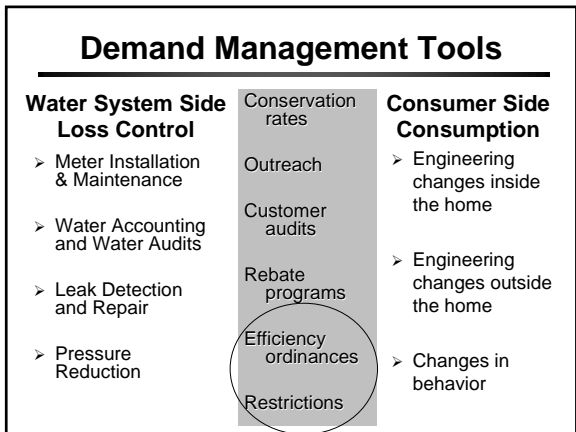
Option 1: Increase Water Availability



Source: "More Water For Your Dollar" - 2007 AWWA Water Conservation Workshop







Water Efficient Landscapes and Water Use Restrictions

- [Model Regulation for Water Efficient Landscaping](#)
- [Model Regulation for Water System Restrictions](#)
- [Model Regulation for Restricting Lawn Irrigation](#)

<http://des.nh.gov/index.htm>

General Site Requirements

- Minimize site disturbance
- Preserve existing non-invasive vegetation
- Preserve small stands of trees
- Retain and redistribute topsoil following disturbance



Artificially Watered Lawn Areas

Plants don't waste water, people do.

- Artificially watered lawn areas no more than 40% of total
- No less than 6 inches of loam at least 10% organic matter
- Water efficient grass mixes

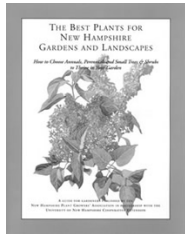


Windham, NH



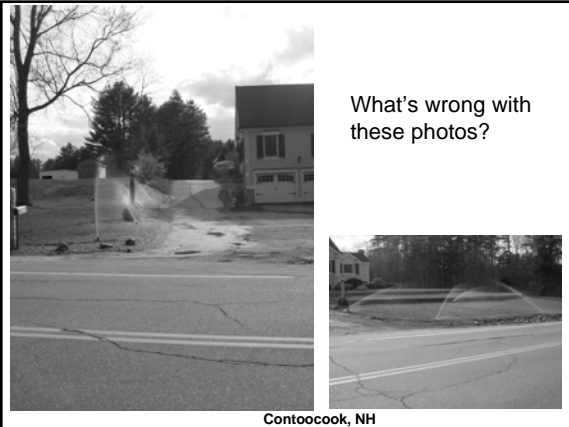
Tree & Plant Areas

- Selected based on site condition
- Native species encouraged
- Non-native / non-invasive permitted: no irrigation
- Exposed soils shall be mulched



Have Irrigation, Will Water

- Beautiful lawns and landscapes were not created by the irrigation industry (Vickers, Feb 2007)
- Tweaking the water efficiency of lawn and landscape irrigation equipment is a step in the right direction, but not a leap forward (Vickers, Feb 2007)
- Homeowners continue to overwater even drought tolerant turf – plant type restrictions do not cure the irrigation addicted (Vickers, Feb 2006)



What's wrong with these photos?

Contoocook, NH

Rain Gauge Data

DATE	PRECIPITATION
04/15/2011	0.00
04/16/2011	0.00
04/17/2011	1.52
04/18/2011	0.04
04/19/2011	0.01
04/20/2011	0.04
04/21/2011	TRACE
WEEK TOTAL	1.61
04/22/2011	0.00
04/23/2011	0.02
04/24/2011	0.55
04/25/2011	0.00
04/26/2011	0.19
04/27/2011	0.15
04/28/2011	0.00
WEEK TOTAL	0.91

AWWA Research Foundation (1999)
Irrigation systems use 30% to 47% more than manual sprinkler usage

EPA WaterSense (2006)
Up to 50 percent of water applied by irrigation systems is lost to wind, evaporation, improper system design, installation, or maintenance.

Irrigation systems prohibited, unless...

Irrigation System Criteria

1) Designed and installed by WaterSense professional

WaterSense
Certified
Professionals

NH: 25
MA: 49
ME: 11
VT: 6



"The WaterSense label makes it easy for consumers to recognize products and programs that save water without sacrificing performance or quality."

Irrigation System Criteria

2) No runoff or overspray



3) Distribution uniformity
Pressure
Nozzle Flow Rates
Head Spacing

"A measure of how uniformly water is applied to an area being watered, expressed as a percentage"

Irrigation System Criteria

4) Sensors to override automatic controllers



Smart Controllers (2 Types)
Soil Moisture Sensors
ET Based



WaterSense Labeled Products

- Currently Labeled
 - Showerheads 2.0 gpm
 - Toilets 1.28 gpf
 - Bathroom Faucets 1.50 gpm
 - Urinals 0.5 gpf
- Under Consideration
 - Water Softeners
 - PreRinse Spray Valves
 - Irrigation Controllers



Irrigation System Criteria

- 5) Audited once every three years for performance and leaks



victurfconsultancy.com



Watermotion.com

Sustainable Landscapes

- **Non invasive species**
- **Adapted to site conditions**
- **Plants chosen for function, beauty, and wildlife appeal**
- **Promote water & energy efficiency**
- **Better stormwater management**
- **Eliminate chemical dependent, thirsty lawns**



When Efficient Landscapes Are Not Enough



Grantham, NH – August 2010



Contoocook, NH – September 2010

Water Use Restrictions

38:26 Bylaws and Ordinances. –

I. In municipalities with public water systems the governing body, or the board of water commissioners, if any, may adopt such ordinances and bylaws relating to the system or structures as required for proper maintenance and operation.

II. Any person who violates any ordinance or bylaw adopted pursuant to paragraph I of this section shall be subject to a civil penalty not to exceed \$10,000 per day of such violation.

Known Water Use Restrictions
Last Update: September 16, 2010

Legend

- Town Line
- County Line

Community Sources

RESTRICTION TYPE

- OUTDOOR WATER BAN
- LAWN IRRIGATION BAN
- RESTRICTION
- ALERT (VOLUNTARY)

79 WATER SYSTEMS
IN 39 TOWNS



A New Drought Mitigation Option

Effective August 24, 2007

41:11d

Restricting the Watering of Lawns. –

I. The local governing body may establish regulations restricting the use of water from private wells or public water systems for residential outdoor lawn watering when administrative agencies of the state or federal government have designated the region as being under a declared state or condition of drought.

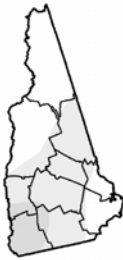
Replacement / Deepened Wells

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
1984	13	24	17	32	40	33	44	58	49	72	70	48	500	
1985	20	25	21	46	78	69	70	98	74	91	59	37	688	
1986	29	22	26	57	64	53	67	61	72	92	55	40	638	
1987	26	17	42	40	68	84	70	93	114	77	72	46	749	
1988	32	21	41	40	52	73	73	87	68	92	68	46	693	
1989	31	35	61	65	67	54	52	75	80	85	29	26	660	
1990	26	16	20	38	42	53	68	77	59	52	42	19	512	
1991	20	20	9	29	42	40	79	123	64	54	39	33	552	
1992	27	21	26	28	59	72	52	51	78	63	69	25	571	
1993	31	20	18	23	42	44	110	117	164	138	89	45	841	
1994	21	22	15	29	50	85	76	101	108	82	80	54	723	
1995	26	23	27	40	70	86	93	126	196	176	62	32	957	
1996	17	13	22	40	59	64	63	83	99	98	42	37	637	
1997	33	31	14	31	57	93	105	110	102	160	97	42	875	
1998	35	25	22	42	66	79	88	93	111	142	86	54	843	
1999	29	23	29	56	85	101	122	181	151	98	92	52	1019	
2000	26	39	40	38	70	89	89	92	85	93	75	55	791	
2001	30	26	34	26	69	100	89	117	176	162	227	176	1232	
2002	177	112	99	98	95	88	102	177	171	211	133	54	1517	
2003	32	36	35	51	86	92	103	86	86	75	63	35	770	
2004	26	34	32	55	68	74	80	79	64	61	58	35	666	
2005	18	30	18	32	52	59	65	63	95	91	61	32	616	
2006	18	22	24	30	44	51	42	62	54	75	45	29	496	
2007	17	24	18	19	43	55	52	71	85	91	40	21	536	
2008	23	7	16	21	45	43	49	31	38	31	25	23	352	
2009	9	3	8	8	21	47	40	47	38	45	50	36	22	366
2010	14	5	10	37	36	66	64	93	122	103	42	26	618	

U.S. Drought Monitor September 28, 2010

New Hampshire Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	44.1	55.9	11.4	0.0	0.0	0.0
Last Week (9/21/2010 map)	44.1	55.9	11.4	0.0	0.0	0.0
3 Months Ago (6/28/2010 map)	100.0	0.0	0.0	0.0	0.0	0.0
Start of Calendar Year (1/1/2010 map)	100.0	0.0	0.0	0.0	0.0	0.0
Start of Water Year (10/15/2009 map)	100.0	0.0	0.0	0.0	0.0	0.0
One Year Ago (9/29/2009 map)	100.0	0.0	0.0	0.0	0.0	0.0



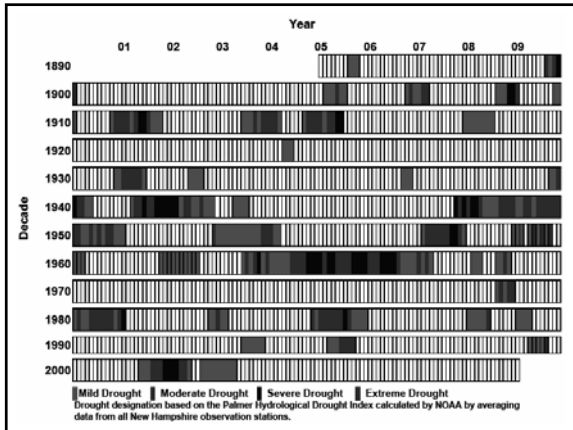
Intensity:
 D0 Abnormally Dry D3 Drought - Extreme
 D1 Drought - Moderate D4 Drought - Exceptional
 D2 Drought - Severe

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



Released Thursday, September 30, 2010
 Author: R. Heim/L. Lov-Brotak, NCDC/NOAA

<http://drought.unl.edu/dm>



Implementing 41:11-d

- Three day notification
 - paper of general circulation
 - two public places
- Restriction Levels
 - 1 (odd / even)
 - 2 (two days per week)
 - 3 (ban)
- Enforcement (sworn officers)
 - First offense: Warning
 - Second Offense: Fine
 - Each Additional Offense: Up to \$1,000 fine

**RESIDENTIAL
LAWN
WATERING
ONLY**

Successful Water Efficiency and Water Use Restriction Programs

Derry Meadowbrook Community Water System

- 60 residential customers
- History of water supply issues during summer
- Aggressive water efficiency program
 - Electronic metering on all customers
 - Two-day a week irrigation schedule
 - Extensive customer outreach



Derry Meadowbrook Trends

- 2009 Summer Average
 - 1.11 to 1.00 ratio
- 2010 Summer Average
 - 1.24 to 1.00 ratio
- 2010 Peak Month
 - 1.35 to 1.00 ratio

Very Small System Average
 2009 Summer Average
 •1.89 to 1.00 ratio
 2010 Summer Average
 •2.57 to 1.00 ratio
 2010 Peak Month
 •2.95 to 1.00 ratio

~ 12% increase over summer of 2009

Five of Pennichuck's Smaller Community Water Systems

Water Restrictions

CONSERVE DAY LAWN WATERING PROGRAM

This is a reminder that you are an ODD/EVEN day lawn watering program. Although we are restricting irrigation and lawn watering, please do not stop watering your lawn completely. Watering your lawn is important to keep your lawn healthy and green during the dry summer months. For more information please call Customer Service at 800-853-1311 or 800-853-1312. Thank you for your cooperation!

Water Restrictions:

If your address is an ODD # you're able to water on Even # Days
 If your address is an EVEN # you're able to water on Odd # Days

Water Saving Tips

Saving Water At Home

Water is a valuable natural resource. Safe, reliable, good-tasting drinking water is a carefully manufactured product. It's collected, treated, tested and delivered to your home and business 24 hours a day. Use it wisely and with confidence for your pleasure and good health.

Conserving water inside your home: (Illustration of a faucet with a drop)

Conserving water outside your home: (Illustration of a lawn with a water drop)

Water Restrictions for Pennichuck Customers ONLY
 Last Updated on August 20, 2010

TOWN	RESTRICTIONS	DATE	2 DAYS A WEEK	LAWN	TOTAL OUTSIDE
DREW WOODS (DERRY)	LAWN IRRIGATION BAN				
HI AND LO ESTATES (DERRY)	LAWN IRRIGATION BAN				
TWIN RIDGE (PLAISTOW)	ODD / EVEN RESTRICTION				
HARDWOOD HEIGHTS (WINDHAM)	RESTRICTION TO LAWN IRRIGATION BAN				
W AND E (WINDHAM)	LAWN IRRIGATION BAN				

(5) Pennichuck System Trends

➤ 2009 Summer Average

- 1.26 to 1.00 ratio

➤ 2010 Summer Average

- 1.26 to 1.00 ratio

➤ 2010 Peak Month

- 1.40 to 1.00 ratio

Very Small System Average

2009 Summer Average

- 1.89 to 1.00 ratio

2010 Summer Average

- 2.57 to 1.00 ratio

2010 Peak Month

- 2.95 to 1.00 ratio

~ 0% increase over summer of 2009

Summary

- Water use increases 30 – 50% during summer months...Peaks are much higher
- New developments with inground irrigation showed increases of 195%
- Many tools to assist with demand management
- Sustainable landscape design needs to be incorporated into planning
- Water Use restrictions are necessary and can be effective



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http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm
