

Water Supply and Usage Subcommittee Report

Committee Charge

a. Water Supply & Usage

- i. Goal: Make recommendations about the long-term viability of the campus water supply.
- ii. Tasks: 1) Identify key issues of concern for the drinking water system 2) Confer with other subcommittees regarding land use and development issues which will impact the water supply.

The University of New Hampshire (UNH)/Town of Durham Water System (UDWS) consists of three water sources: the Oyster River Reservoir (fed by the Oyster River and owned by UNH) from a reservoir above the UNH Dam; the Lee Well (owned by the Town of Durham); and the Lamprey River through a diversion (jointly owned by UNH and the Town of Durham) from a reservoir above the Wiswall Dam. The UDWS is operated by UNH Water Supply personnel and Town of Durham Department of Public Works personnel, and receives guidance from the Water, Wastewater, Stormwater Committee, which is staffed by representatives from both the University and the Town of Durham. The maintenance of the system is shared by UNH and the Town of Durham based on the location of the distribution lines.

The following is a list of ongoing measures that the UDWS has been actively developing and implementing over the years:

- Water System Audit (2007)
- Water Resource Management Plan
- Water conservation plan
- Spruce Hole Artificial Recharge Study
- Permitting a new municipal water supply well in the Spruce Hole Aquifer
- Participate in the Lamprey River Protected Instream Flow Pilot Program and the Lamprey River Water Management Area Advisory Committee
- Working closely with NHDES to develop UDWS's portions of the Lamprey River Water Management Plan

Very recently, the Lamprey River has become the principal year round source of water for the UDWS providing approximately 60-70 percent of the systems needs, and the Oyster River (until recently the primary water source) is used as a supplementary source. The Lee well is also used year round and supplies approximately 30-40 percent of the system's needs. A new groundwater well in the Spruce Hole Aquifer is in the process of being permitted and may be brought online as soon as 2014.

The UDWS is presently undergoing upgrades and expansion in response to the need for system security/redundancy as well as anticipated increases in system demand. By balancing the use of UDWS's water sources (the Lamprey and Oyster Rivers, and the Lee Well), the UDWS is able to respond to drought conditions when it is necessary to reduce withdrawals from the two surface water sources to maintain acceptable instream flows. The potential for utilizing aquifer storage and recovery in the Spruce Hole Aquifer, and the new well being permitted there, is expected to improve the UDWS's ability to balance the use of its water sources and provide necessary security/redundancy in the event of an extreme drought, environmental disaster, or mechanical failure. The Arthur Rollins treatment plant has overextended its design life, and a new treatment facility is being considered to improve the efficiency and quality of treatment.

The reality of the local sources of water are that:

1. On the average, there is plenty of water available in the ground and in the rivers;
2. The variability of the water sources is inverse to how we demand it (when demand is high, supply or streamflow, is low)

The Lamprey River is one of the State's Protected Rivers. Env Wq 1900 (at 1903) defines the amount of flow available to the aggregate of water users in the river basin, at a minimum the *de minimis* flow (5% of 7Q10) is always available to water users. More than this amount can be withdrawn when the rivers are flowing at high flows, however at low flows, users may be limited to the *de minimis* amount. For the period of record at the USGS gage (Packers Falls) on the Lamprey River, the *de minimis* amount is 0.21 cfs (or 135,600 gallons per day). As a point of reference, the UDWS has a present average day demand just over 1 million gallons per day. As a result, during times of drought when surface water sources are limited the UDWS needs to optimize their use of all available surface water and groundwater resources

There is a regional recognition that precipitation, and therefore runoff, have changed since 1970: on average it is wetter, yet at the same time, the extremes are more severe (the droughts are longer and drier, and the floods are more frequent and more intense). These are some of the characteristics resulting from climate change. In response, the Northeast Regional Climate Center increased the design precipitation values for common runoff designs (<http://www.northeastclimateimpacts.org/>).

The anticipated climate change scenarios for the northeast United States (Frunhoff, et al, 2007) are well documented. As evidenced by the following figures, our region is predicted to exhibit serious water resources sustainability issues should climate change impacts manifest themselves. The Natural Resource Defence Council (NRDC, 2010), estimates a dramatic increase in the risk of water shortage by 2050 (Figure 1).

On the average, the UDWS operations appear to be sustainable, however especially during the surface water sources low flow periods the UDWS will need to continue to improve its efficiency in the future to reduce per capita demand and minimize the need to increase storage and/or increase supply.

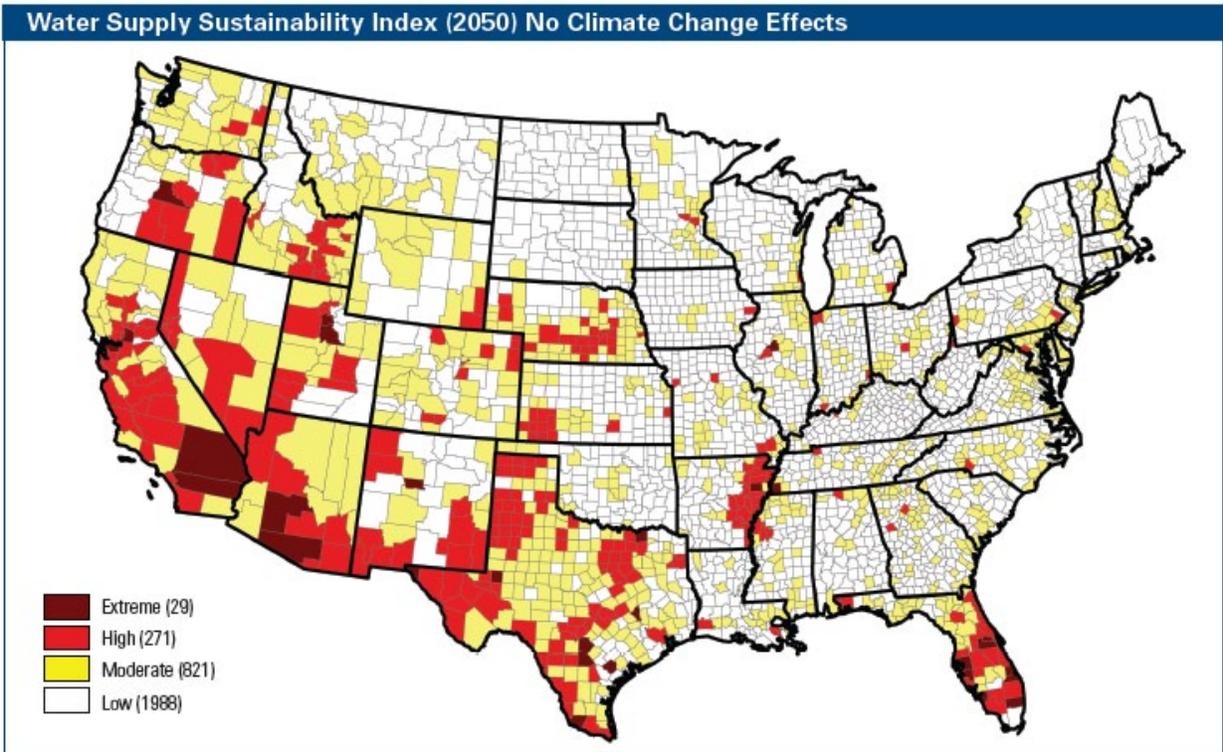
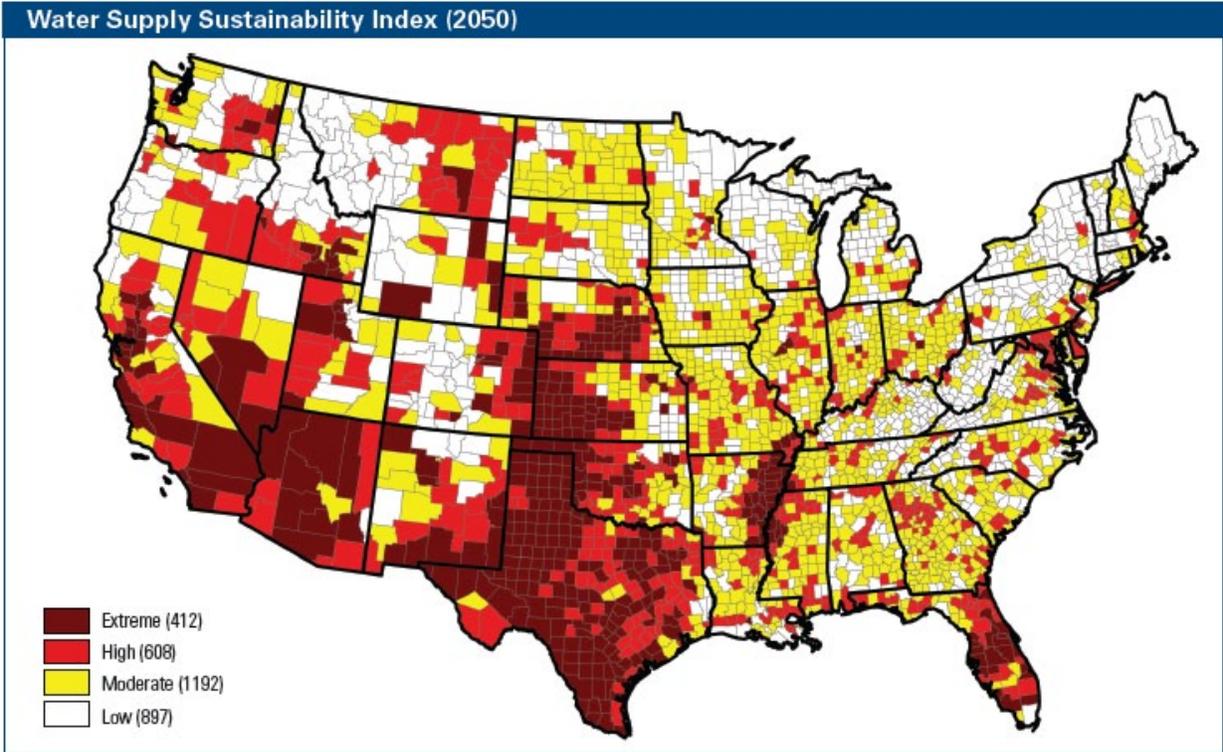


Figure 1. Water Supply Sustainability Indexes with and without considering climate change. (NRDC, 2010 - <http://www.nrdc.org/globalwarming/watersustainability/files/WaterRisk.pdf>)

Water Supply and Usage Subcommittee

The overarching sentiment of the subcommittee is the long term viability of our water resources and avoiding decisions today that could negatively impact future options.

Town/University water supplies become taxed when surface water sources are limited during droughts at which time capacity is at a premium for both the water sources thereby increasing the demand on the one groundwater source. In addition, the treatment plant has overextended its design life and is in need to replacement.

To this end, the following present day realities exist.

- There is the need for a new UNH water treatment plant within the next 10 years in which the following need to be carefully considered:
 - Site selection
 - Design flow
 - Water source variability

Should be accomplished within the next 7 years.

- The method and location for connecting the new Spruce Hole Well water supply into the existing system needs to be finalized and funded.
- Town and UNH population is expected to grow making it critical to be better understand the overall source capacity (both surface water and groundwater) relative to existing and future consumption.

In the near future, the following issues need to be considered and resolved.

- Impacts on UDWS from the Lamprey River protected instream flow rules and associated water management plan.
- Impacts on UDWS from the Oyster River nomination and likely acceptance into the protected rivers program.
- Conservation land and easement protections for Spruce Hole aquifer (most is already controlled by UDWS).
- Development at Lee traffic circle and potential effects (oil spills/truck rollover, etc.) on water supply quality and integrity.

- Nomination of upper Lamprey River into protected rivers program and possible opportunity for managing Pawtuckaway Lake dam releases for downstream water supplies and instream flow.

For the long term future the following issues should be addressed.

- Water Conservation
 - o Education
 - o Low flow fixture
 - o More prescriptive management (rather than suggestive)
 - o Create incentives to conserve (i.e. user rates)
- Water Resource Protection
 - o Identification of important water resources associated lands
 - o Land Use Regulations
 - o Tax Relief
 - o Land Conservation
 - o Incentives
- Optimization of Water Resources
 - o Artificial recharge
 - o Stormwater management
 - o Grey water systems/water reuse for irrigation
- Water System Redundancy
 - o Multiple sources
 - o Storage
 - o Distribution network
- Water System Inventory
 - o Pipes
 - o Storage
 - o Appurtenances
- Water Management and Emergency Plans
 - o Low flow
 - o Emergency
 - o Water quality

On the next page may be found the results of the water throughput monitoring indicators discussions.

Water Throughput:

Municipal

Water Supply*	Amount of water available for use (gal/yr)
Water Demand	Peak monthly water consumption per year.
Cost of Water	For campus (total) and per person
Total Water Consumption	Total annual water use on campus (gal/yr)
Per Building Water Use (include Memorial Field)	Use of water by building (gal/yr)
Per Capita Water Use+	Average water use per person (gal/yr)

*not exactly sure how to turn that into an effective monitoring metric

+I know this is not possible at the moment but I want to keep it on the radar as it is one of the more important comparative metrics

Commentary

- Most of the indicators in this table are for campus only. Is the intent to attempt to quantify water available to the campus only, or both the Town and the campus?
- Is the Water Supply indicator measurable, or should we drop it from the list?
- Total number of students, staff, and faculty is not an accurate indicator of water demand due the specific nature of water use on campus. Students living on campus vs. students living off campus vs. year round staff vs. faculty mostly during academic year vs. other large water uses unrelated to occupancy such as amount of work done on heating system during summer that might require filling of district heating system @ 1 million gallons +. Water demand should just be the peak water usage during a specified period such as the peak monthly water usage for a given year.
- The major cost of water for the campus is actually the sewer cost, which is based on gallons of water consumed. Should this be the combined water/sewer cost per CCF (100 cubic feet)? Should we eliminate the cost per person as difficult to quantify and almost meaningless, because the quantity of water consumed varies widely depending upon the category of person involved.
- Is per capita use measurable and does it mean anything? Per above, the categories of users and the water consumption per category are widely variable and can't necessarily be properly linked.

Non-municipal

Bottled Water	Bottled water usage on campus (gal/yr)
Irrigation (additional properties)	Amount of water used in agricultural irrigation (gal/yr)
Alternative Water Use	Amount of water used from non-municipal sources ie. rainwater (James) (gal/yr)

Commentary

- Who is going to collect the bottled information? How?
- Irrigation use is not measurable unless many new water meters are installed. Should we drop this from the list of indicators?
- In most cases Alternative Water Use is not metered (Mills Hall sump irrigation system) or not recorded (James Hall roof water). Should we drop this from the list of indicators?

Wastewater

Total Wastewater	Amount of total wastewater generated (gal/yr)
Per Building Wastewater	Wastewater produced per building per year (gal/yr)

Commentary

- Wastewater is not metered. Total wastewater for both the Town & UNH is metered at the waste water plant, but no data is available for just UNH. Should we drop this from the list of indicators?
- The per building data is not available. Wastewater is assumed to be the same as metered water consumption. Measuring wastewater per building would require installing sewer meters at every building. Should we drop this from the list of indicators?

References

Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions. Synthesis report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists (UCS).