

Greening Our Grounds

Pacific Northwest National Lab



Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

Release #PNW-SA-34866 06/26/2002

1

What We Did



- Reduced irrigation water usage by over 35% per season
- Saved nearly 30% in electricity per season from our irrigation pumps
- Learned how to improve the health of our trees and lawns while saving water
- Learned to apply science to our landscaping challenges

A Little History

- PNNL began research operations 35 years ago.
- The site landscaping includes a tree-lined campus, extensive shrub beds, and large lawns.



Opportunity Knocks

- In 1999-2000 a project was launched to renovate and update PNNL's grounds.
- One of the objectives included replacing ageing plantings with more native, water efficient types.
- Other methods were also investigated to reduce water consumption and enhance sustainability and drought resistance.



New Ideas Take Root

Aged, water thirsty plants are being replaced with native plants which require less water and are more disease resistant.



Water Savings on the Tree Lines

The tree lines consist of over 580 mature London Plane Sycamore trees that define the campus borders.



Water Savings on the Tree Lines

- The tree lines used a bubbler type watering system.
- This system discourages proper root growth and can impact the health of the tree.



Water Savings on the Tree Lines

- The bubbler system was designed using manual valves located great distances from adjoining facilities.
- The system was labor intensive and wasteful.



Water Savings on the Tree Lines

We replaced the bubblers with impact sprinklers. This provides greater control over water deposition and encourages proper tree root growth.



Water Savings on the Tree Lines

We also replaced the manual valves with self-contained, battery operated, timer control valves.



Water Savings on the Tree Lines

Bottom Line:

- Water savings is over 45% per season.
- Trees are developing healthy, more drought resistant root systems.
- Green Belt under the trees also controls dust and helps retain moisture.



Next: Looking at the Lawn

- First, we learned about turf.
- We learned our turf was in poor condition and required ever increasing amounts of water to maintain an attractive appearance.



Looking Under the Lawn

We learned that through frequent, shallow watering we had developed a very shallow turf root system which would not be disease or drought resistant.



Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

Repairing the Soil

We learned that by aerating and topdressing the soil we could reduce thatch buildup, improve water penetration, and encourage root growth.

Aerate: to loosen or “open” the soil. Similar to what a plow does without disturbing the lawn.



Topdressing: the application of clean sand to aerated turf. The sand allows water and air to reach the root zone.

Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

The Results in the Soil:

- Aeration and topdressing resulted in significant root growth in one season's time.
- Deep roots need less water.
- Savings: Over 20% reduction in irrigation on the turf!

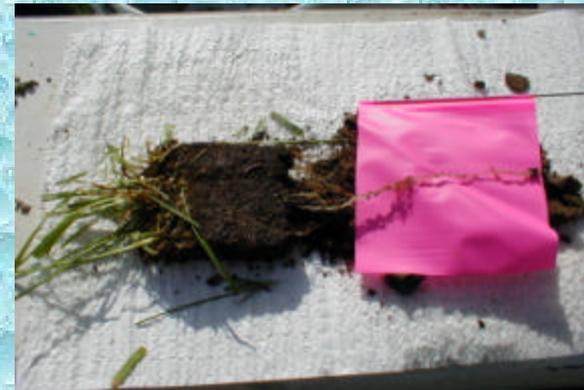
Right: Turf Sample from 2000.

Note complete lack of deep roots.



Below: Turf Sample from 2001.

Note deep root development.



Water Savings Driver

- The need to understand exactly what was happening with the irrigation system.
- The need to meet the regulatory requirements of our Water Right.
- Heightened visibility of water use due to drought condition.

Understanding the System

- Very little documentation existed, most information in “tribal knowledge”.
- Drawings were outdated and unusable.
- We decided to perform a system by system evaluation.

Methodology

- Each station was cycled from a clear zero to a solid flow, any anomaly required a repeat.
- Every 5th station was cycled 2 times as a data check.



Now,
THAT'S
dedication!

Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

Measurement Results:

- Real world flow data for each station.
- Many flow problems (broken heads, pipes) located and repaired.



36 Timers

283 Stations

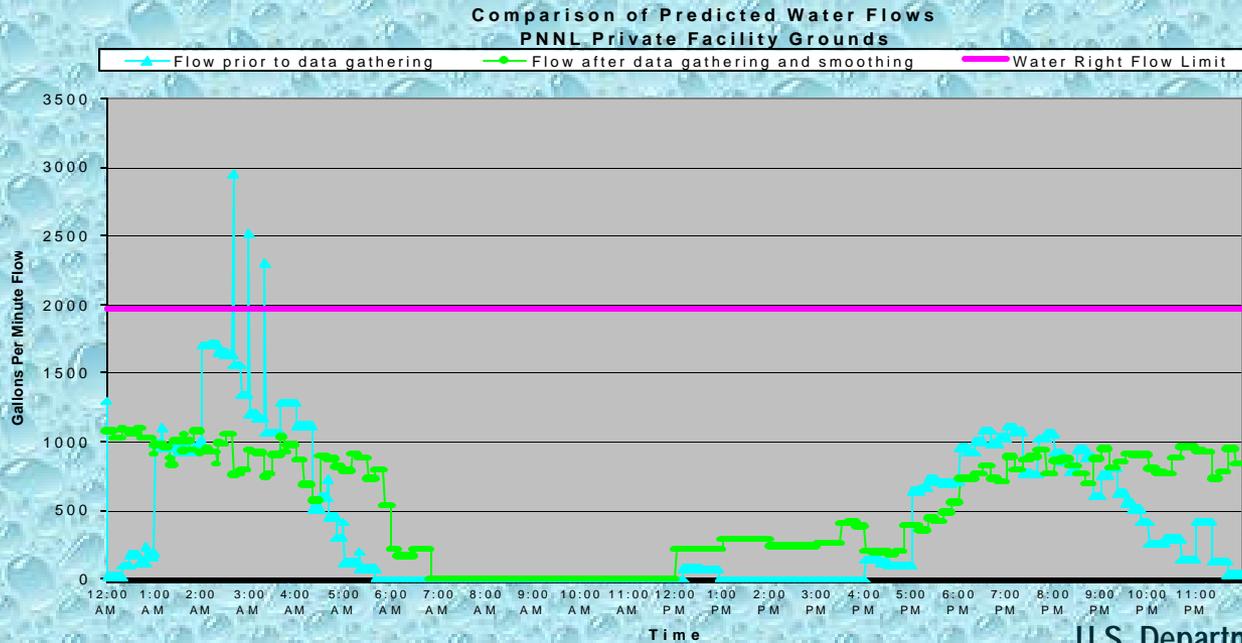
Over 6300 sprinkler heads

Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

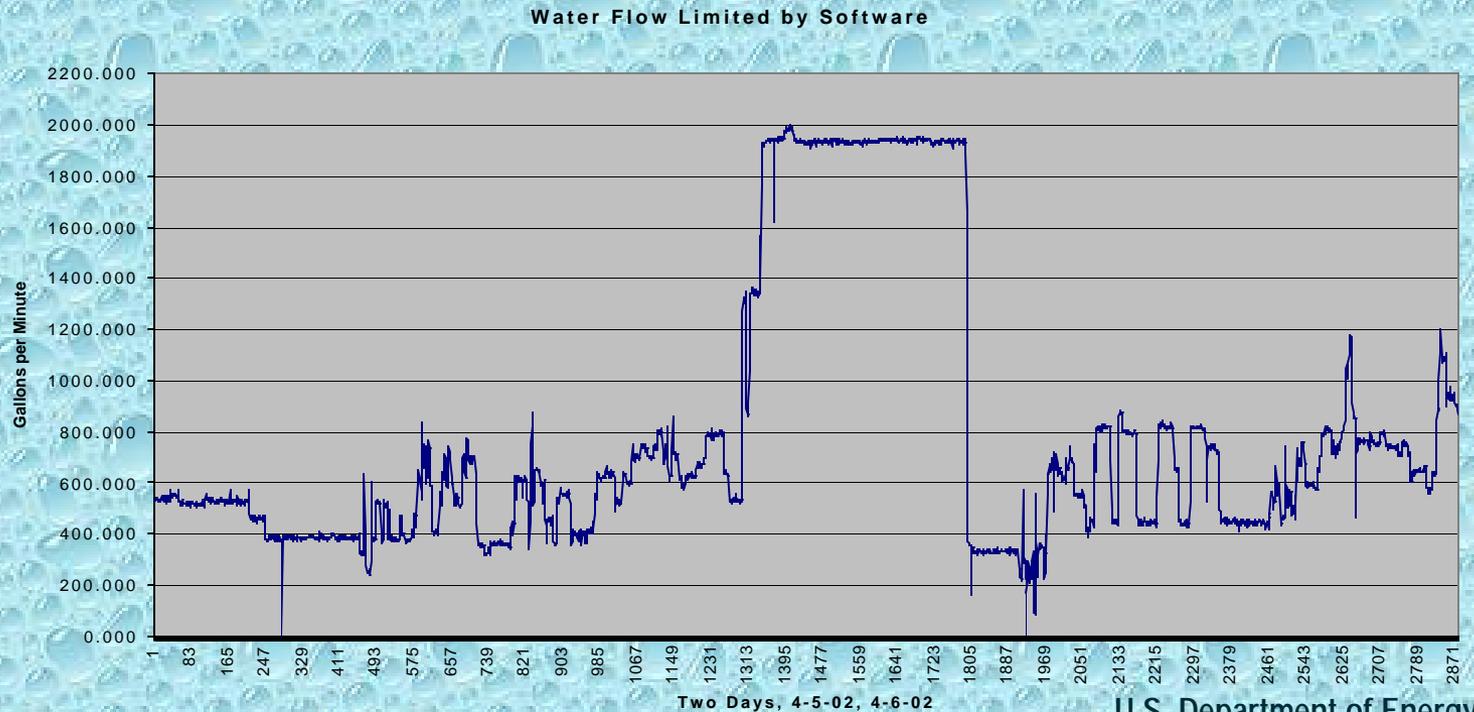
Before and After:

- Smoothing the flow allows better use of pumps and less stress on system components. (PNNL only)



Software Control

- Software designed to prevent flows over allowance.

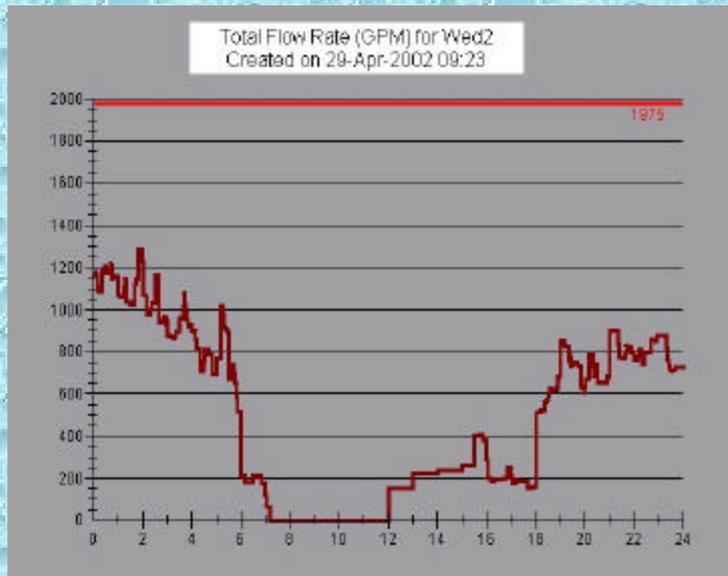


Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory

Predictive vs. Real

■ Compare



Conclusion:

- Understand water requirements of turf, trees, and shrubs.
- Look into replacement with more water efficient cultivars, especially in older landscapes.
- Understand soil conditions, both chemically and hydraulically.
- Perform real measurements, don't guess or use tribal knowledge.
- Question everything; procedures, practices, performance
- Don't be afraid to experiment, but document the results.

The End

- Water and electricity savings and a good looking, healthier landscape.

We really are "Greening Our Grounds"!



Mike Moran

Mike.j.moran.jr@pnl.gov

509-372-2680

For more info:

www.pnl.gov/conserves-energy

Battelle

U.S. Department of Energy
Pacific Northwest National Laboratory