Managing Storm Water to Protect Drinking Water

Communities Protecting Drinking Water Sources
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RI NEMO provides training and technical tools to help local decision makers manage impacts of changing land use on water resources.

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The Stormwater problem and a few useful indicators to manage it
In R.I. 22% of surface waters are not meeting fishable swimmable standards due to stormwater pollution. - RIDEM

In recent years, up to 75% of annual beach closures were traced to stormwater, with the remainder due to CSOs. - RI Health
Impacts of land use on hydrology

Natural Landscape
- Low runoff
- High recharge
- Healthy summer stream flow
- Natural pollutant treatment

Developed
- High runoff volume
- Flooding
- Low stream flow
- Bypass natural treatment
Impervious Surface and Runoff Volume

Nutrient inputs, wetland impacts

Water Quantity & Quality Impacts
Nutrients – too much of a good thing?
Phosphorus overfertilizes fresh water

Organic matter from aquatic plants affects taste & odor of drinking water

Algae and aquatic plants limit recreational use & aquatic habitat.
In unsewered communities, OWTS are often a major source of nitrogen to groundwater.
Nitrogen concentration (mg/l) is a concern in groundwater supplies

Major pollution sources to wells:

- Agricultural fertilizers and animal wastes.
- Densely sited septic systems.
- Septic systems and other sources within inner protected well radius (100 ft private wells, 200-400 ft public wells).
How much nitrogen is too much?

0.5 mg/l or less
- Natural background in RI groundwater in forested areas.
- Healthy shellfishing habitat at 0.3 mg/l or less.

1 mg/l
- Sign of impact to groundwater from waste water or fertilizer. (USGS,2000)
- Freshwater EPA guideline for Total N: lakes 0.32 mg/l, rivers 0.71 mg/l

5 mg/l
- Public drinking water action level. Triggers additional monitoring.
- Standard adopted by some towns.

10 mg/l
- Drinking water standard.
- Acute health effects to infants. With “blue baby syndrome” nitrate replaces oxygen in blood.
- Suspected risk of cancer other health effects.

Increasing nitrogen
Increasing pollution risk
LID Approach: Avoid, reduce, manage stormwater impacts
Managing Impacts through Density?  
A case study
Existing conditions

Soils

Wetland perimeter

46 acres total

10 acres wetland  22%

36 acres buildable  77%
18 lots, 80,000 sf
Avg lot size 2.5 acres
6.5% Impervious
Proposed Cluster Subdivision

- 18 lots
- Avg lot size 1.4 acres
- Open space 27 acres
- 6.5% Impervious
- Estimated 3.6 mg/l nitrate concentration in built area
If wetlands were included in the density calculation:
24 lots, average 61,000 sf / lot
7.8 impervious
5-6 mg/l Nitrate concentration estimated based on 18-24” recharge
If the site was 40% wetland and included in density calculation:
24 lots, average 47,400 sf / lot
10% impervious
6-7 mg/l Nitrate concentration estimated at 18-24” recharge; 11mg/l w/ 10”
Final thoughts
Wetlands, hydric soils and buffers are critical treatment zones. Bacteria and Phosphorus removal in unsaturated soil. Potential for denitrification in high water table soils: $\text{NO}_3 \rightarrow \text{N}_2\text{O} \rightarrow \text{N}_2$. Wetlands are excluded from calculation of impervious area stormwater treatment area.
WHAT A HEROIC FIGURE!

HE QUIT WATERING HIS LAWN
SAVED OUR WATER SUPPLY
BROWN IS THE NEW "GREEN" LAWN STANDARD.

GEE, A REAL LOW-Maintenance GUY!!

DON BOUSQUET
Thank you for your attention!

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