Buildout Analyses as a Motivational Tool for Watershed Restoration

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NH Waters & Watershed Conference
Plymouth, New Hampshire

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AGENDA

1) Introduction- Lakes & Population

2) Buildouts- What are they, and how do they work?

3) Examples- ME/NH

4) Next Steps- Motivational Tools for Lake Communities
People Like to Live Near Lakes but Human Development Impacts Lakes
Does Anyone Recognize this Lake?
Since 1968 - > 1 ft. Annual Decline in Clarity

Source: UC Davis
Infiltration Trench facilitates infiltration of stormwater runoff from the roofs and decks and protects the soil from the impact of water coming off the roof, preventing soil erosion. The drain rock here is installed 5 feet wide around the entire structure, providing the dual purpose of a fire defensible space zone as well as a water quality BMP.
New Hampshire Lakes

NH's Lake Resources

- 4,000 lakes
- Low flushing rates = internal
- 1,000 over 10 acres
- High flushing rates = external
New Hampshire Lakes

~ 165,000 acres

59 surface water sources for drinking water supply

$1.5 billion/yr in total sales

$247 million/yr in tax revenue
NH’s Growing Population

- 6.5% increase 2000-2010
- 6.9% Rural, 6.3% Urban

Greatest Increases

- Strafford County (9.7%)
- Carroll County (9.4%)
- Grafton County (9.0%)
Lake Winnipesaukee Watershed
Population Growth (last 50 yrs)

• The population of Barnstead, Gilmanton, Madison and New Durham has more than quintupled.

• The population of Brookfield, Alton, Effingham and Moultonboro has more than quadrupled.

• The population of Guilford, Belmont, Tuftonboro and Sanbornton has more than tripled.

• The population of Meredith, Center Harbor, Sandwich, Holderness, Conway, and Wolfeboro has more than doubled.
How Impervious Surfaces Change the Water Budget

**Natural Cover**
- 10%
- 40%
- 50%

**Developed Land**
- 75-100% Impervious
- 55%
- 30%
- 15%

Courtesy: ME DEP
WILL WE LOVE THEM TO DEATH?

- Affected by mercury deposition
- 67 lakes with “exotic” aquatic plant infestations
- Water quality declining due to increased levels of nutrients
- ~ 62% of NH lakes & ponds are impaired for aquatic life

How will this affect the economy?
- Social - Quality of Place
- Economic - Jobs, Tourism
- Environmental - Clean Water

How do we motivate people to plan for the future?

1) **Introduction** - Sensitive Lakes

2) **Build-outs** - What are they, and how do they work?

3) **Examples** - ME/NH

4) **Next Steps** - Motivational Tools for Lake Communities
What is a Buildout Analysis?

- How Much Land is Currently Available for Development?
- Where & When will Development Occur?
- What are the Impacts from Future Development?
Impacts from Future Development

1. Projected Population
2. Water Usage (Gallons/yr)
3. Energy Usage (BTU’s/yr)
4. Roads
5. Water Quality
We Can Make Predictions

- Nutrient (P) Loading
- Algal Blooms
- Water Clarity
- Property Values
Buildout Analysis - Inputs

Buildout Results

- Zoning
- Assumptions
- Development Constraints
- Growth Rates
- Existing Buildings
Buildout Analysis - Inputs

- Assumptions
- Zoning
- Development Constraints
- Growth Rates
- Existing Buildings

Growth Rates:
1.8% for Brookfield and 2% for Wolfeboro (annually, based on past 30 years)

Buildout Results
Buildout Analysis - Inputs

- Assumptions
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Buildout Results
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Existing Buildings
Wolfeboro = (2,230 units), Brookfield = (86 units)

Buildout Results
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Buildout Results
Buildout Analysis - Inputs

Assumptions

Development Constraints

Zoning

Existing Buildings

Growth Rates

Buildout Results
Buildout Analysis - Inputs

Assumptions

- Conservation Land
- Steep Slopes
- Wetlands
- Existing Buildings
- Hydric Soils
- Highly Erodible Soils
- Street ROW (50’)
- Shoreland Zoning

Buildout Results
Buildout Analysis - Inputs

- Assumptions
- Development Constraints
- Existing Buildings
- Zoning
- Growth Rates

Buildout Results
Buildout Analysis - Inputs

Assumptions

Development Constraints

Existing Buildings

Zoning

Growth Rates

Buildout Results

1) Building setbacks
2) Min. Separation
3) Street ROW's
4) Efficiency Factors
Model Benefits

- TOOL to assess current regulations & future dev.
- STIMULATES DISCUSSION at the local level
- Helps VISUALIZE IMPACTS
- Moves Planning Process FORWARD
Model Limitations

- Should be viewed as an ESTIMATE or prediction
- Models and analyses are only as good as the data that goes into them
- Growth rate estimates may change
- Buildings are placed first near existing roads, and then randomly across remaining buildable land area
1) **Introduction** - Lakes & Population

2) **Build-outs** - What are they, and how do they work?

3) **Examples** - ME/NH

4) **Next Steps** - Motivational Tools for Lake Communities
EXAMPLE
Long Pond

- BELGRADE
  LAKES, ME
Watersheds of Interest

LONG POND, BELGRADE, ME

- “Impaired” (TMDL) Lake
- WBMP
- Municipal Ord. Review
- Buildout for Long & Great Ponds
Long Pond Inputs

- **Growth Rate:** ~ 1.1%
- **Minimum Lot Size:** Town Specific (0.1 – 2 ac.)
- **Building Setback:** Most Common – 15 ft.
- **Road Setbacks:** Average – 50 ft.
- **Street Right of Ways:** Average 65 ft.
Long Pond Constraints

- ~64% of Watershed
Long Pond - Buildable Area

- 6,236 Acres
- ~ 36% of Watershed
- Results by Town

**Buildout Results**

Table 4: Long Pond Watershed Buildable Area

<table>
<thead>
<tr>
<th>Town</th>
<th>Total Area (acres)</th>
<th>Builda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgrade</td>
<td>3,083</td>
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</tr>
<tr>
<td>Mount Vernon</td>
<td>5,486</td>
<td></td>
</tr>
<tr>
<td>Rome</td>
<td>4,501</td>
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<tr>
<td>Rome - Wildwood Estates</td>
<td>295</td>
<td></td>
</tr>
<tr>
<td>Vienna</td>
<td>1,154</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,524</strong></td>
<td></td>
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</tbody>
</table>
Buildout Maps
Long Pond
Long Pond-Watershed Buildings

- Full Buildout 2200
- 4,239 New Units
- 9,000 more people
- > 4 million gallons oil/yr
- 500 million gallons water/yr
P Estimates for Long Pond

Without P Controls

1.5 ppb

With P Controls

0.3 ppb

Reduce P from New AND Existing Development

Acceptable Increase = 0.5 ppb

Figure 7. Increased phosphorus loading in the watershed can be limited by requiring Phosphorus Control Measures, also known as Best Management Practices, for all new development.
Effects of Future Development on In-Lake P Concentrations

Phosphorus Concentration (ppb)

Existing Concentration  |  W/P Controls  |  W/Out P Controls

Great Pond
- 9.5
- 9.7
- 10.4

Long Pond
- 8.3
- 8.6
- 9.8

Acceptable increase 0.5 ppb

Declining Water Quality
Prioritize Conservation Areas

- **Hubs** = 10,403 ac.
- **Buildable Land** = 2,425 ac.
- **Which hubs are most vulnerable?**
Buildout Scenario # 2

LAKE WENTWORTH
WOLFEBORO, NH

- High-Quality Water
- Stormwater/Septic Survey
- WBMP
- Municipal Ord. Review
- Buildout Analysis
- Since 1990, has exceeded the growth rate of Carroll County.
- Seasonal population = double the year-round population.
- Increase in second homes & percentage of retirement age (55-65+) seasonal residents.
Lake Wentworth Inputs

- **Annual Growth Rate:** 2%
- **Minimum Lot Size:** Variable, 0.5 – 5 acres
- **Building Setback:** Variable, 10-40 feet
- **Road Setbacks:** Variable, 20-50 feet
- **Street Right of Ways:** Variable 20 – 50 feet
Buildout Results

Buildable Land

Buildable Land
9,802 acres

Total % of Watershed
44%

The total watershed covers 22,055 acres within Wolfeboro and Brookfield. Of this area, 9,802 acres (44%) are buildable.

Buildable Area by Zone
Buildout Maps
Lake Wentworth
Buildout Buildings
2062 (50 years)

Total Buildings = 4,301
Buildout Results

# of New Units

Wolfeboro - Buildout Units by Zoning District

Buildings

Zoning District

- Municipal Watershed: 16
- Agriculture: 23
- Village Residential: 32
- Commercial -C2: 57
- Shorefront Residential: 133
- Residential: 193
- General Residential: 314
- Rural Residential: 444
- Residential - Agricultural: 658
## Buildout Results

### Time Scope Analysis

<table>
<thead>
<tr>
<th>Years into Future</th>
<th>Buildout Date</th>
<th>Brookfield Buildout Units</th>
<th>Wolfeboro Buildout Units</th>
<th>Combined Buildout Units</th>
<th>Estimated Land Area Associated with Buildout Units (acres)</th>
<th>Watershed Total (Incl. Existing Buildings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2017</td>
<td>11</td>
<td>240</td>
<td>251</td>
<td>1087</td>
<td>2567</td>
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<tr>
<td>10</td>
<td>2022</td>
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<td>30</td>
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<td>60</td>
<td>1870</td>
<td>1930</td>
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<td>4246</td>
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<td>4516</td>
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<td>98</td>
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<td>394</td>
<td>1870</td>
<td>2264</td>
<td>9802</td>
<td>4580</td>
</tr>
<tr>
<td>Full Buildout</td>
<td>2110</td>
<td>394</td>
<td>1870</td>
<td>2264</td>
<td>9802</td>
<td>4580</td>
</tr>
</tbody>
</table>

*Full buildout predicted for Wolfeboro in 2043, and 2110 in Brookfield*
### Buildout Results

**Additional Phosphorus Loading**

<table>
<thead>
<tr>
<th>Location</th>
<th>Existing P Load (kg/yr)</th>
<th>20-Year Buildout P Load (kg/yr)</th>
<th>Full Buildout P Load (kg/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Wentworth</td>
<td>931</td>
<td>1521</td>
<td>2261</td>
</tr>
<tr>
<td>Crescent Lake</td>
<td>467</td>
<td>682</td>
<td>874</td>
</tr>
</tbody>
</table>

#### Effects of Future Development on In-Lake P Concentrations

**Phosphorus Concentration (ppb)**

- **Lake Wentworth**
  - Existing Concentration: 6.4 ppb
  - 20 Years: 8.9 ppb
  - Full Buildout: 13.4 ppb

- **Crescent Lake**
  - Existing Concentration: 7.4 ppb
  - 20 Years: 10.6 ppb
  - Full Buildout: 12.2 ppb

**HQW Threshold = 7.2 ppb**

*Declining Water Quality*
PLANNING for the FUTURE

1) Introduction- Lakes & Population
2) Build-outs- What are they, and how do they work?
3) Examples- ME/NH
4) Next Steps- Motivational Tools for Lake Communities
Motivating Your Lake Community

Get the Facts: Identify & Protect Important Resources

Natural Resource Assessments

- Complete a Natural Resource Inventory (NRI)
- Prioritize High Value Open Space & Wildlife Habitat
- Map vernal pools, wetlands and streams

Source Assessments

- Conduct a GIS-based shoreline survey
- Conduct a watershed survey or Septic Survey
Motivating Your Lake Community

Lakes Belong to Everyone

Including your Grandchildren’s Grandchildren!

• Meet with Local Planning Board & Selectmen
• Hold a Community Forum
• Develop New Ordinances
  ✓ New development & Additions
  ✓ Incorporate Low Impact Development (LID)
  ✓ Septic System Maintenance & Inspections
Motivating Your Lake Community

Demonstration Projects

• Promote the use of natural vegetation and topography to the maximum extent possible to minimize runoff.
Next Steps for Lakes
What are Other Communities Doing?

**LONG POND/OTHERS**
- Formed a Steering Committee
- Developed a Water Quality Fund
- Focus on Enforcing Existing Ordinances

**LAKE WENTWORTH**
- Center Street Rezoning
- Community Forum
- 2 Demo Projects- YCC
Questions?

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