Value of Trees Primer
Bedford Arbor Resources

This Primer provides information on trees:

- **What they do for Bedford**
- **What they do for the planet**
- **Ways to reckon their value**
- **Importance of preserving mature trees**
- **Challenges in replanting**

Trees in general will be discussed. For clarity, some information in this Primer is presented using a real tree: a Northern Red Oak on residential property in Bedford.

Bedford Example: 28.5" diameter
As measured at 4ft
Approx. 45' tall
Approx. 115 yrs old
30' from house
Southwest exposure

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Trees Fight Climate Change

Trees are the most effective measure available for sequestration of carbon

- Global forests removed about one-third of fossil fuel emissions from the atmosphere annually from 1990 to 2007.
- On average, an acre of trees in Middlesex County sequesters 4+ tons of CO_2e per acre per year.

Consider the living storage of CO2e for our Bedford Northern Red Oak:

For 2024:

- **Sequesters 387lbs of CO2e this year**
- **Holds lifetime storage of 14,000+lbs CO2e – branches, trunk, roots**

By 2044:

- **Will sequester additional 8,900+lbs CO2e**

Trees mitigate and prevent several other effects of global warming, for example:

- **Reduce cooling and heating demand**
- **Cool hardscape heat sinks**
- **Intercept stormwater**
- **Filter pollutants**

Mature Trees are Many Times More Effective Climate Change Assets Than Small Trees

What happens when we remove our large Bedford Northern Red Oak?

Comparison:
Living Storage of CO2e

Typical replacement tree:
2.5” Northern Red Oak
38 lbs CO2e

28.5” Northern Red Oak
14,000 lbs CO2e

Many lost benefits cannot be purchased. They require decades:

- Property value boost from mature plantings—20 years
- Habitat and food for wildlife-20 years
- Groundwater uptake and runoff mitigation—30 years
- Restoration of shade, and concomitant energy savings—40 years

Removing a Mature Tree = Double Environmental Cost

Removing a tree =

- **Loss of carbon sink**
- **Creation of super greenhouse gases**
- **Negation of sustainability goals**

Tree removal results in production of nitrous oxide and methane. They are many times more potent greenhouse gases than carbon dioxide.

Trees removed from built up areas are ground up into chips and stored in piles. This results in anaerobic decomposition, with two phases. While the pile is warmest, decomposition generates nitrous oxide. As it cools, it generates methane.

The atmospheric warming impact of 1 pound of nitrous oxide is 265 times that of 1 pound of CO2. The impact of methane is more than 85 times more potent than CO2.

Removal & Mitigation Are Costly

Bedford Department of Public Works reports that hazard tree removal is usually between $3,000 and $5,000, with $4,000 being the most usual.

This price is based on a contract with a provider that is regularly renegotiated. For a homeowner, the price is typically double.

Hazard trees are typically easily accessible near roads and open space. Trees that are especially large or more difficult to access may require special equipment, crews. This can have escalating costs, including police details.

A 2.5" diameter tree is $840 for purchase, delivery, and planting. The DPW estimates that watering a collection of newly planted trees requires one day's labor for one staff person. There may be 20 watering days per year during a drought season.

Takeaways:

- **Costs for removal are high, financially and environmentally.**
- **Tree removal negates our sustainability goals.**
- **Preservation should be considered first**.

“New trees will eventually grow back, right?”

In a forest, natural processes produce a healthy tree canopy. The built-up environment is challenging for new trees, and replanting success rates vary widely.

Money, manpower, and expertise are required to ensure new tree survival:

- **The Right Tree in the Right Place**
- **Proper planting & care for the new tree.**

From: Arbor Day Foundation, “Tree Care Tips & Techniques.”

Right Tree in the Right Place

Trees in built-up areas need to be carefully selected for several factors:

- **Height & Spread:** Will the tree grow into a streetlight, bridge, or power line?
- **Form or shape:** Will the mature form of the tree fit here?
- **Growth:** Slow growing species typically live longer than fast growing species.
- **Soil and Moisture:** is this tree suited to this soil, this drainage, available water?
- **Traffic and Hazards:** Is this tree resilient to foot traffic, bumps from bicycles, etc. ?
- **Hardiness zone:** Does this tree belong here?
- **Sun:** Is there enough sun for this tree? Will sidewalks or windows reflect too much heat or light?
- **Rooting habits:** some trees are best away from sidewalks

Proper Care Is Needed for a New Tree

Proper Planting

Tree Death – planted with the burlap and wire basket still fastened. Death due to strangulation within five years.

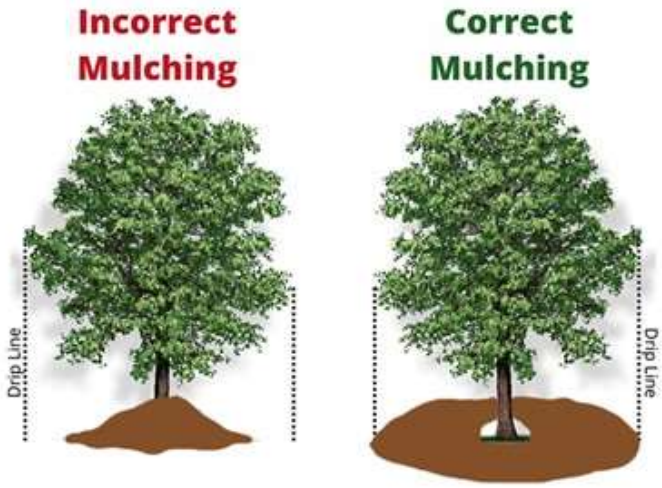
New trees die every year from insufficient watering and care.

Newly planted tree needs water for three years, and daily during drought.

Bedford Department of Works estimates that one man is needed for one day's labor for each watering day. A typical season requires 20 or more watering days.

Native trees evolved to rely on deep leaf litter in the forest. Mulch approximates it:

- **helps regulate root temperature and moisture**
- **protects the rootzone from foot traffic.**
- **feeds microbes that exchange nutrients with the tree**
- **Must be replenished on a regular basis**



Trees benefit Bedford, the Environment, the Planet

TREES WORK 24 x 7 x 365 for FREE

Remove air pollutants

Trees remove pollution from the atmosphere, improving air quality and human health.

- In Los Angeles, trees remove nearly 2,000 tons of air pollution yearly.
- In Chicago, trees remove more than 18,000 tons of air pollution yearly.
- In Greater Kansas City, trees remove 26,000 tons of air pollution yearly.
- Roadside trees reduce nearby indoor air pollution by more than 50%.

Filter drinking water

Forested watersheds provide quality drinking water to more than 180 million Americans.

- In 1997, New York City spent $1.5 billion to preserve the forested watershed that supplies New York City's drinking water by purchasing thousands of upstate acres of forested watershed.
- A filtration plant large enough to clean New York City's water supply would have cost more than $6 billion dollars

Wildlife habitat

Consider the example of our Bedford Northern Red Oak

- Oaks are a top value resource for support of native wildlife.
- Acorns feed blue jays, wild turkeys, squirrels, small rodents, whitetail deer, raccoons and black bears.
- Deer browse the buds and twigs in wintertime.

Big returns on investment

Every tax dollar spent on planting and caring for trees yields benefits that are two to five times that investment

- In Indianapolis, each dollar invested in the city's community trees yielded $5.55 in benefits.
- In New York City, it has been calculated that community trees provide $5.60 in benefits for every dollar spent on tree planting and care.
- In Cincinnati, a $1 investment in the city's community trees returns $4.44.

There's even more!

Other quantifiable benefits not covered here include:

- Reducing crime
- Relieving stress
- Dampening street noise
- Raising property values
- Increasing foot traffic and sales for commercial zones

Trees Reduce Energy Usage

Carefully positioned trees can reduce a household's energy consumption for heating and cooling by up to 25%.

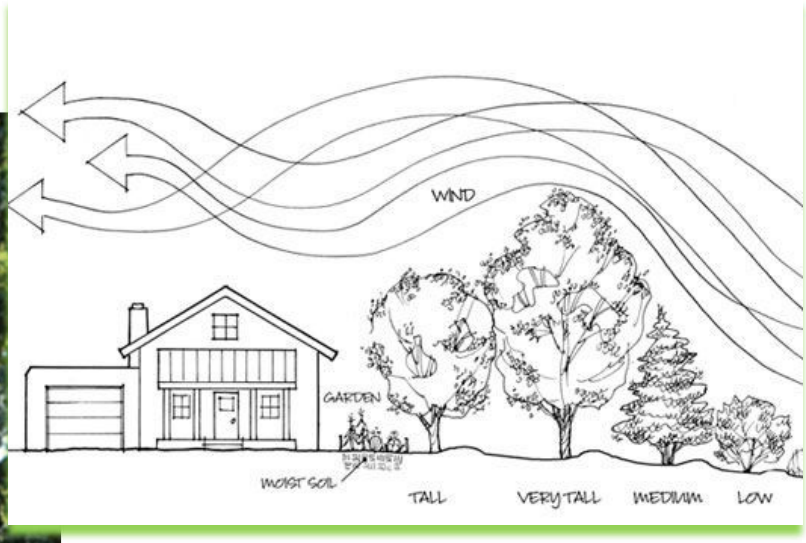
Computer models devised by the U.S. Department of Energy predict that the proper placement of only three trees can save an average household between $100 and $250 in energy costs annually.

- **Trees lower surface and air temperatures by providing shade.**
- **Shaded surfaces may be 20–45°F cooler than the peak temperatures of unshaded materials.**
- **Trees cool the city by up to 10°F by shading our homes and streets and releasing water vapor into the air through their leaves.**
- **Evaporation of water from trees has a cooling influence.**

For our Bedford Northern Red Oak:

- The shade from this tree alone will reduce the cooling demand at 10 Winchester Drive by an estimated 108kWh in 2023.
- Over 20 years, cooling reduction will total 2,757.01 kWh.

Well-funded research continues worldwide to develop effective strategies and tools to leverage this benefit.



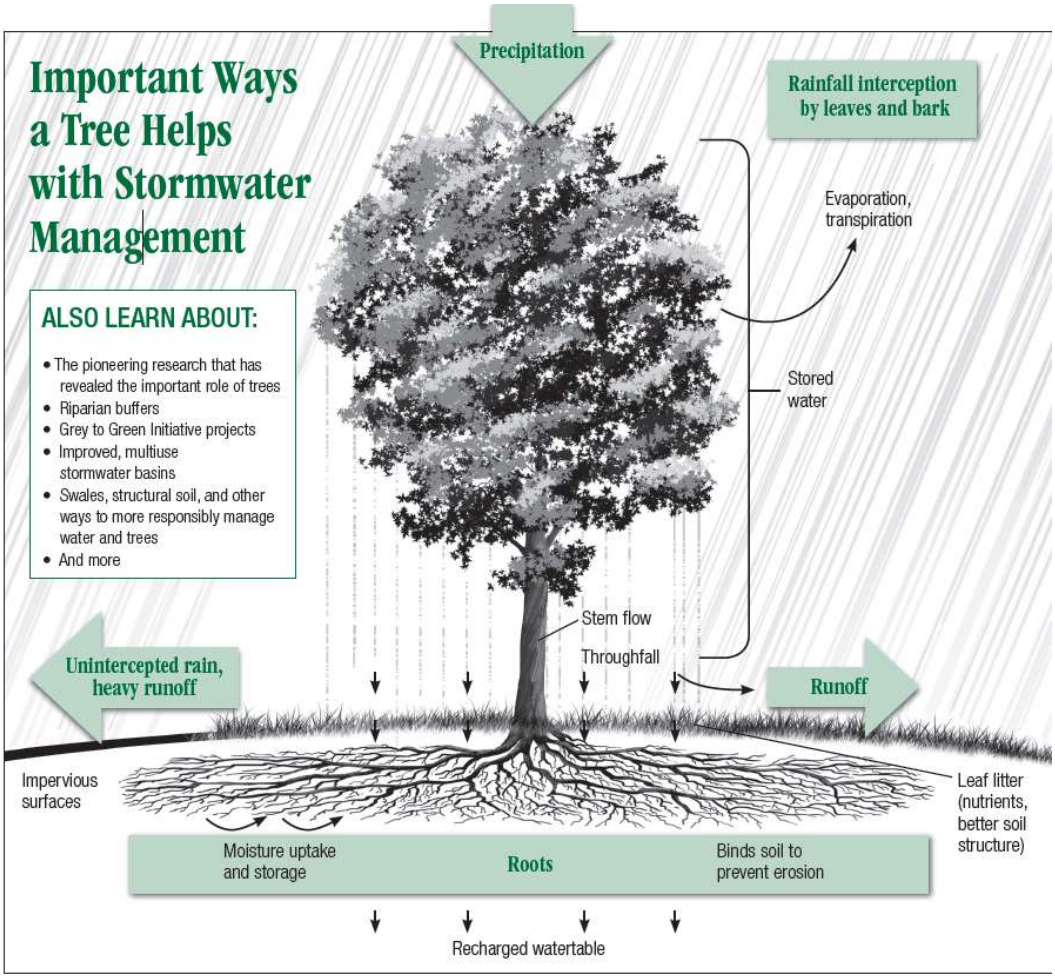
Trees Help Us Weather Storms

Trees secure soil from erosion. They divert stormwater runoff from homes and storm drains, diminishing municipal costs.

Research has shown that large deciduous trees can capture over a thousand gallons of stormwater each year in their canopies. Large evergreens or conifers can capture two to three times that amount because they are in leaf year- round and have more leaf surface area. Our Bedford Northern Red Oak takes up 3,705 gallons of rainwater a year, and diverts 807 gallons of stormwater from storm drains.

On larger trees, a significant amount of rainfall never even reaches the ground but instead evaporates off the leaf surface following the storm. The trees canopy also slows down rainfall which reduces local flooding.

In one study, soils with trees allowed for 10 inches of rain to infiltrate per hour, while nearby soils converted to lawn could only infiltrate four inches of rain per hour.[1]



Information about a hard-working tree from the Arbor Day Foundation

[1] https://extension.psu.edu/how-do-trees-reduce-stormwater-and-flooding#:~:text=And%20depending%20on%20the%20size,rainfall%20which%20reduces%20local%20flooding.

The Takeaways

- **Loss of a mature tree is a loss to the community:**
  - **Financial**
  - **Environmental**
  - **Sustainability**
  - **Climate change**

- **Trees provide many other quantifiable, direct benefits the community, including:**
  - **Improve safetly**
  - **Improve health**
  - **Increase small business**
  - **Improve quality of ife**

- **New trees require substantial Town investment**

Preservation needs to be considered first.

Tools and Resources

US Forestry Service's flagship software suite: iTree Tools

- i-Tree delivers current, peer-reviewed tree benefits estimation science from the USDA Forest Service to all types of users with free tools and support
- Science based and data driven
- The global mission of i-Tree is to:
    - Quantify the benefits and value of trees.
    - Advocate for better tree and forest management.
    - Show potential risks to tree and forest health.
    - Assist with environmental justice efforts.
    - Provide standardized metrics for carbon offset plans.
- i-Tree is the worldwide standard when it comes to discussing the benefits that trees provide.
- i-Tree can be used with Individual Trees or on areas of Tree Canopy in many regions around the planet.
- These are free tools and free support is available via email.

References and Sources

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