Sustainable Saratoga

Advocate.
Educate.
Act.

Sustainable Saratoga

Advocate.
Educate.
Act.

CITY OF SARATOGA SPRINGS N.Y.
INCORPORATED 1915

Sustainable Saratoga

Advocate.
Educate.
Act.

June 3 2008
Saratoga Springs' City Council resolution

Authorized the Mayor to apply
for a cost-sharing grant (from NYS DEC)

to fund completion of

1) a Tree Inventory &

2) a Master Tree Plan

City Council Resolution - June 3, 2008

(passed unanimously)

"…this **City Council** finds and declares that the **preservation and expansion of the Urban Forest will serve the public interest** by improving the community's physical, social, cultural and economic environment"

PRESERVE

&

EXPAND

the urban forest

September 2008

THE TI

Lehman collapse sends shockwave round world

July 16, 2009

SARATOGA SPRINGS

City scraps urban forest project

Time and money already invested to yield no result

By ANDREW J. BERNSTEIN
The Saratogian

SARATOGA SPRINGS — Items cut from the city's 2009 budget in mid-year amendments range from vacated positions, the elimination of which will result in large savings, to items as small as $50 cut from the girls' lacrosse advertising budget.

Some cuts, however, have come with an associated reduction in revenue to the city.

One such example is an Urban Forestry Grant awarded to the city in early June.

The $20,000 grant required a $10,000 cash contribution from the city, and was intended to allow city employees to conduct a survey of trees and create a management plant for vegetation within the city. The funds were awarded by the New York State Department of Environmental Conservation.

Upon accepting the grant, the city was also required to contribute $10,000 of "in-kind" services. Administering the grant would have involved personnel for the city's Visitor Center, the mayor's office, and the Department of Public Works — all of which would have contributed to the city's in-kind contribution.

"The City Council of the city of Saratoga Springs proposes to develop a comprehensive Urban and Community Forest Master Plan designed and intended to guide the preservation, maintenance, improvement, expansion and long-term stewardship of the city's tree cover and canopy within the urban core," read a resolution adopted by the City Council on June 3. A previous motion pertaining to the same grant was adopted earlier this year.

When the mid-year budget cuts were approved by the council on July 7, the $10,000 contribution from the city needed to secure the grant was cut from the mayor's departmental budget, halting the project just before a bid to complete the work would have been awarded.

Lou Benton, the city's heritage area coordinator who applied for and administered the grant, estimated that about 100 to 125 hours of city employees' time had been used on the project, which would have to be scrapped.

"The amount of money is modest, and the potential benefits are significant," Benton said. "The urban forest played a major role in the evolution of this community."

Mayor Scott Johnson, who made the decision to scratch the item, said that the city's economic condition had led to tough choices concerning trimming some programs, even beneficial ones.

"It was a good program when the budget was healthier," he said. "Anything that requires matching funds has to be scrutinized."

One criticism leveled at the city in the wake of cutting the grant program is that the city will now be less likely to receive future grants, after failing to use funds awarded through this one.

"Given this economy, I couldn't justify a $10,000 cash expenditure," Johnson said. "I'm concerned about the future of certain grants, but I think the state will understand that these are difficult times."

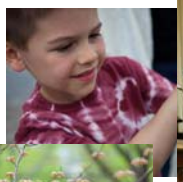
Sustainable Saratoga

Advocate. Educate. Act.

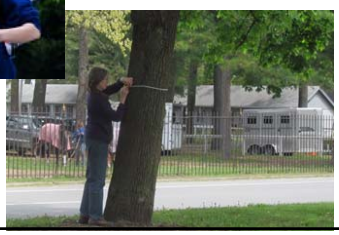
2012
COUNTING trees

EARLY PROGRESS

2013 – PLANNING for trees



2012
COUNTING trees



EARLY PROGRESS

2013 – PLANNING for trees

2014
PLANTING trees

2012
COUNTING trees

EARLY PROGRESS

What did we learn from the inventory?

2012
COUNTING trees

Snapshot of the urban forest

How many trees? What types?

How big? How healthy?

Maps:

Where are the trees? Where are they not?

GIS: does location relate to demographics?

Database as ongoing reference resource

Problems? Trends? Questions? Actions?

Data analysis

Cost-Benefit analysis?

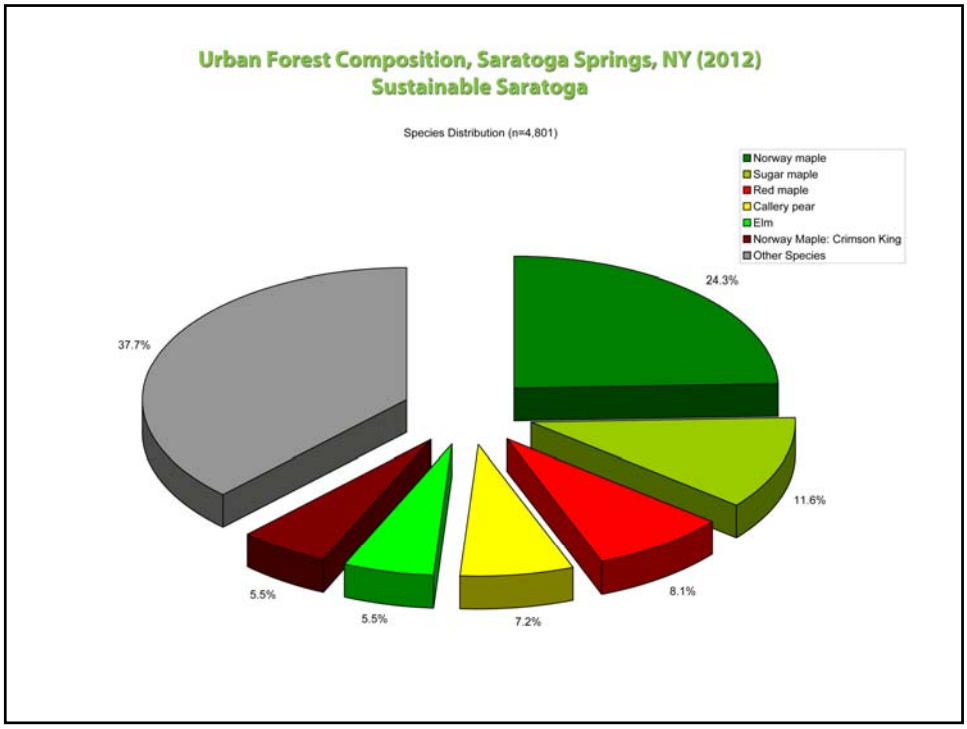
What value do the trees provide?

Species diversity?

Not much

5 species = 62%

of street trees



Norway maples = 32%

56%

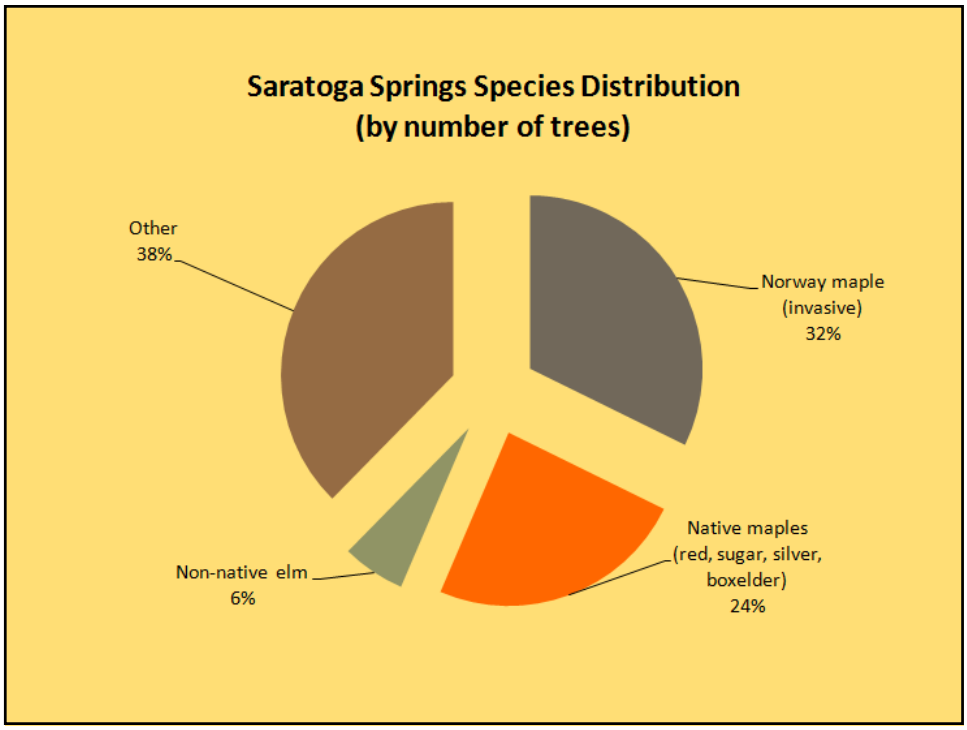
of our

street trees

are from

a single genus

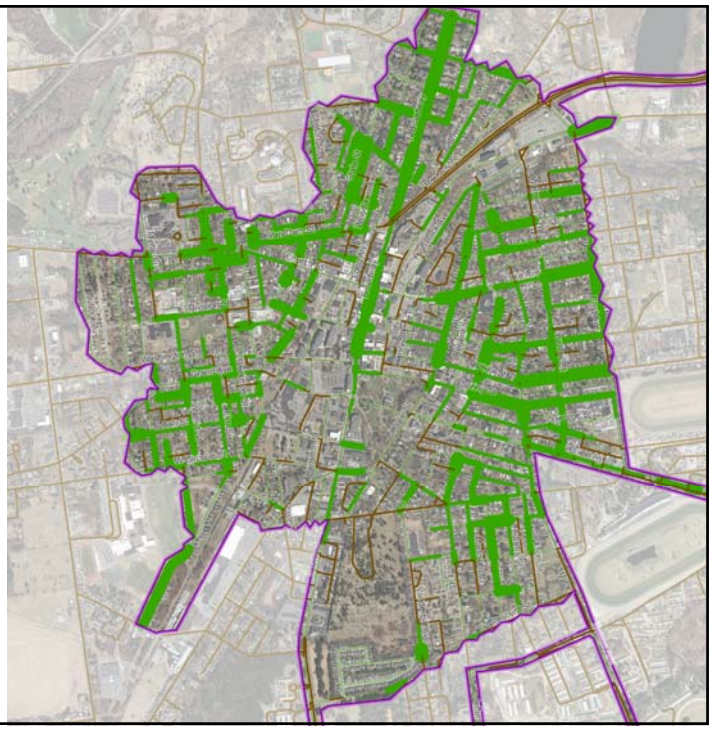
maples (acer)

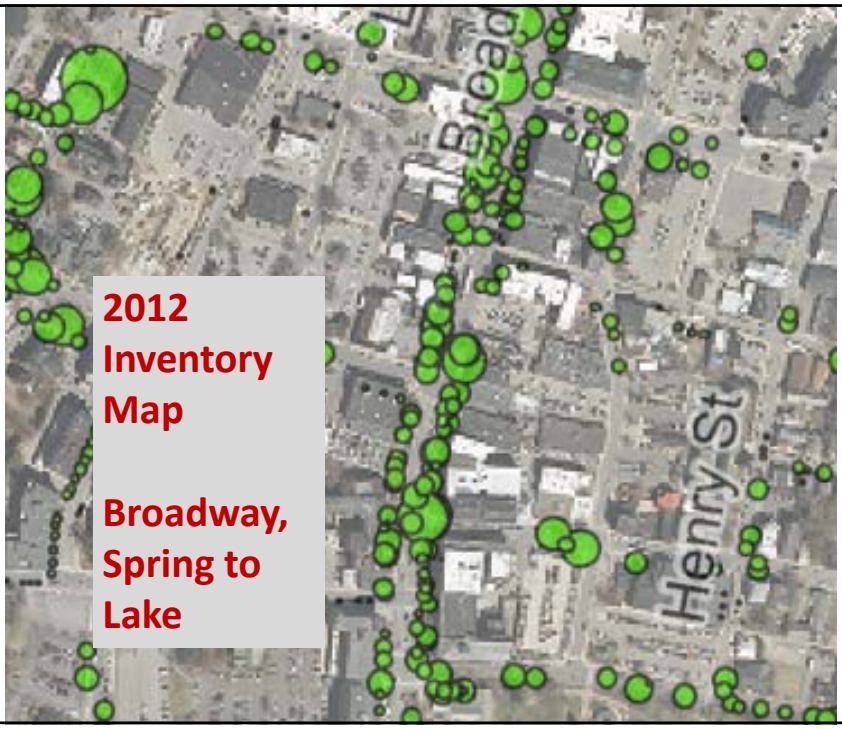


Policy changes?

Inventory Survey Area

Tree Bulk by Street Segment





2012 Inventory Map

Broadway, Spring to Lake

Policy changes?

What value do the trees provide?

Cost-Benefit analysis?

We analyzed the inventory data using
iTree

a US Forest Service software
for urban forestry analysis

Trees Pay Us Back !

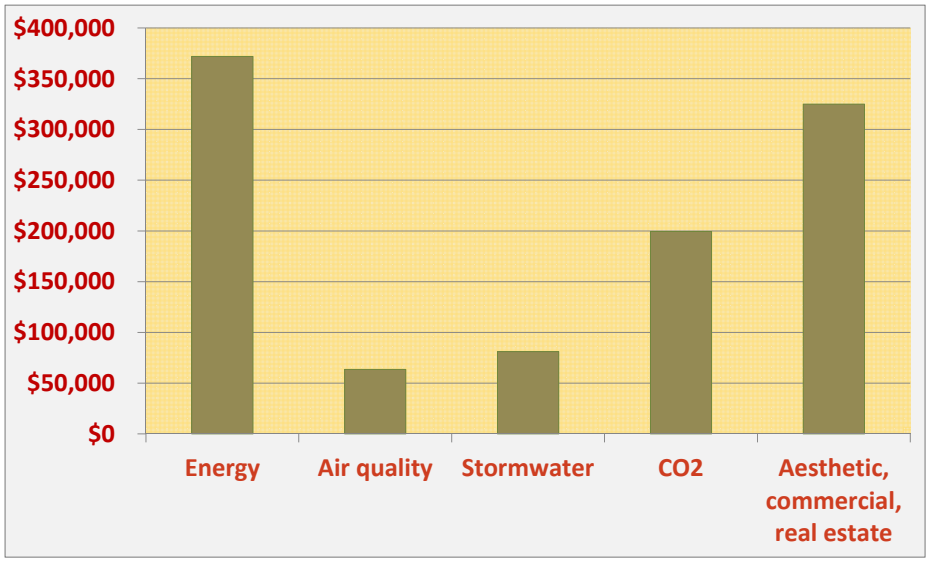
Trees Pay Us Back !

ealthier citizens

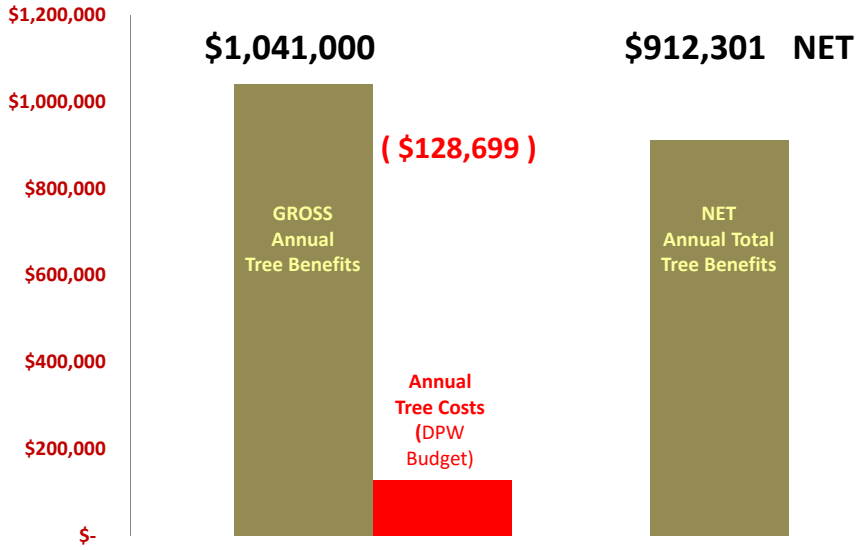
Profitability for retail & restaurants

Gross Tree Benefits (by type)

(All city-owned trees= 5600 street & park trees)



SARATOGA's TREES: COST-BENEFIT ANALYSIS (annual)



2012 Gross Tree Benefits (annual: 5,600 City trees)	$ 1,041,000
2012 Costs: DPW tree budget	($ 128,699)
2012 NET Tree Benefits (annual)	$ 912,301

Policy changes?

2013 – PLANNING for trees

Urban Forest Master Plan
(adopted by City Council, May 2013)

Saratoga Springs' Urban Forest Master Plan

TWO BASIC PREMISES

1. **Trees are infrastructure**

(trees do work; trees provide services to us)

2. **Trees "pay us back"**

(benefits from trees far outweigh costs)

The Urban Forest Master Plan

(adopted by City Council, May 2013)

Five Main Action Strategies

The Urban Forest Master Plan

(adopted by City Council, May 2013)

Five Main Action Strategies

1. **Use planning, legislation, and enforcement to integrate trees more fully into Saratoga Springs' infrastructure**

The Urban Forest Master Plan

(adopted by City Council, May 2013)

Five Main Action Strategies

1. Use planning, legislation, and enforcement to integrate trees more fully into Saratoga Springs' infrastructure

2. **Appoint City Arborist; update inventory information regularly; review plans and adjust strategy annually**

The Urban Forest Master Plan

(adopted by City Council, May 2013)

Five Main Action Strategies

1. Use planning, legislation, and enforcement to integrate trees more fully into Saratoga Springs' infrastructure
2. Appoint City Arborist; update inventory information regularly; review plans and adjust strategy annually
3. **Develop and implement Best Management Practices in DPW**

The Urban Forest Master Plan

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Five Main Action Strategies

1. Use planning, legislation, and enforcement to integrate trees more fully into Saratoga Springs' infrastructure
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3. Develop and implement Best Management Practices in DPW
4. **Identify, leverage, and commit more resources for the trees**

The Urban Forest Master Plan

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5. **Promote and cultivate citizen involvement**

The Urban Forest Master Plan

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Five Main Action Strategies

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4. **Identify, leverage, and commit more resources for the trees**
5. **Promote and cultivate citizen involvement**

2014
PLANTING trees

April 26, 2014

We need YOU !

Arbor Day tree planting & festival

TREETOGA
GROWING SARATOGA'S URBAN FOREST

TREE HOSTS

NEEDED

35 people who want a street tree planted at their home and will give it TLC for a few years

April 26, 2014

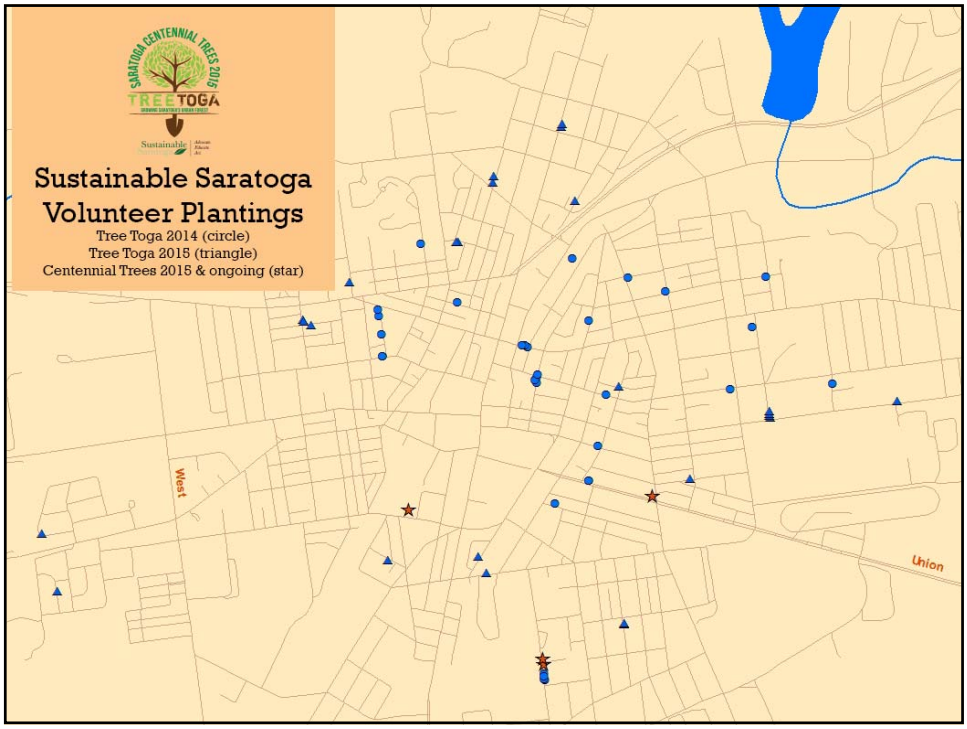
TREETOGA
GROWING SARATOGA'S URBAN FOREST

TREE PLANTERS

NEEDED

100 people who want to spend an hour or two digging a hole and planting a street tree.

April 26, 2014



Green

Stormwater

Infrastructure

Trees

reduce

stormwater

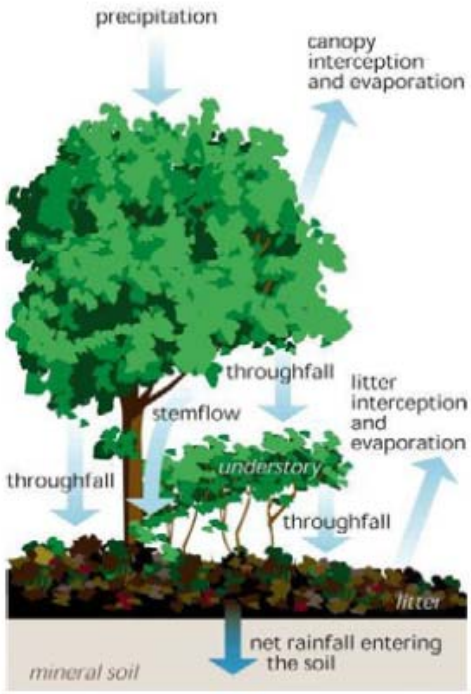
Green Stormwater Infrastructure

A range of soil-water-plant systems that
protect water quality

by putting stormwater back
into the ground (& air)
where it fell

= **BIO-RETENTION**

RESULT:
Keep stormwater & pollutants
out of the sewer and water systems



intercept

absorb

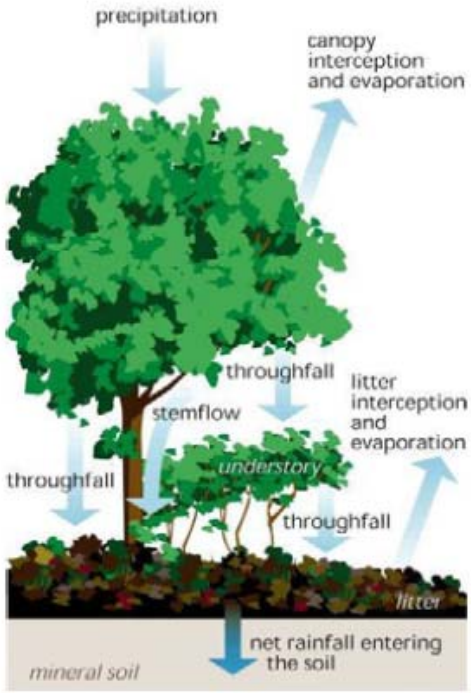
consume

filter

evaporate

disperse

…… stormwater that would otherwise carry pollutants to our streams.

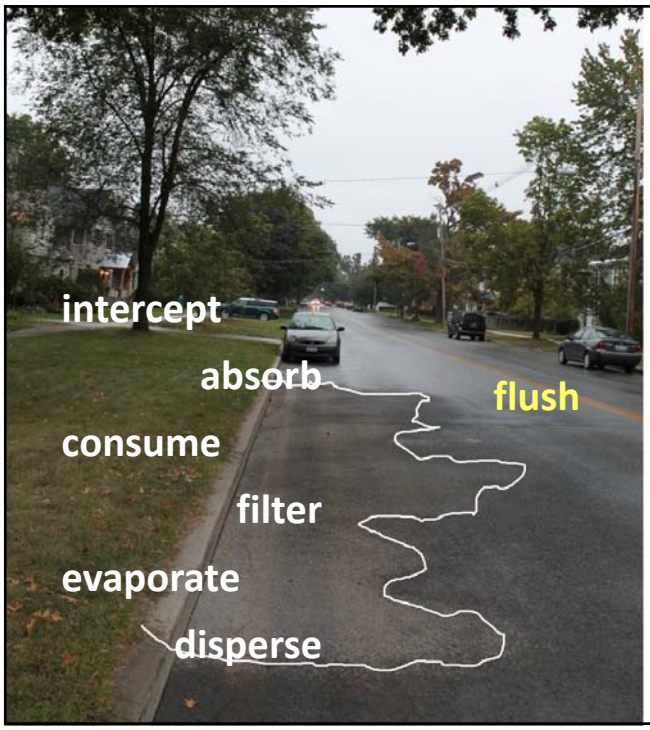


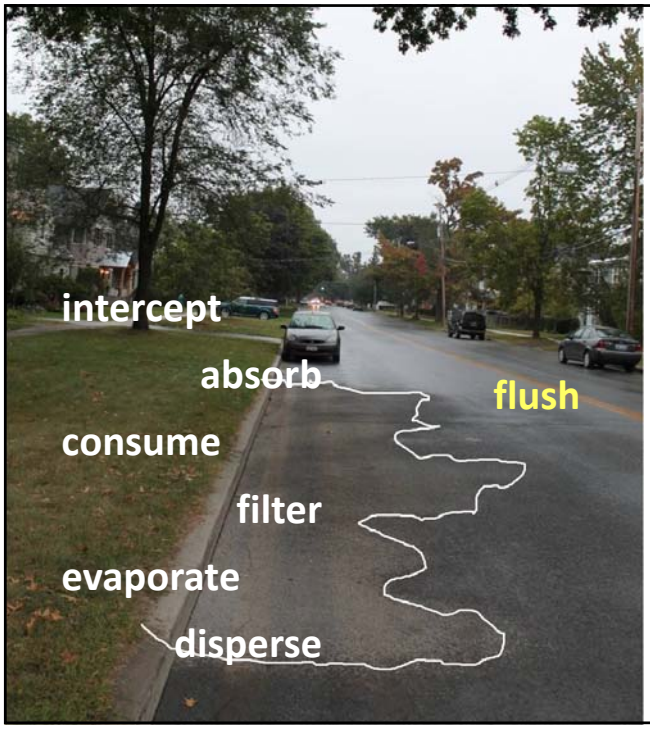
Interception By Species

20 Year Old Trees

- **Crabapple** — **144 gal/yr**
  22ft tall x 21ft spread
- **Kwanzan Cherry** — **312 gal/yr**
  17ft tall x 17ft spread
- **Red Oak** — **767 gal/yr**
  40ft tall x 27ft spread
- **Red Maple** — **1,014 gal/yr**
  29ft tall x 24ft spread
- **Zelkova** — **1,624 gal/yr**
  38ft tall x 34ft spread
- **White Pine** — **786 gal/yr**
  32ft tall x 20ft spread
- **Hackberry** — **1,394 gal/yr**
  47ft tall x 37ft spread

Source: USDA FS PSW-GTR-202 August 2007 & PSW-GTR-199





Bio-retention

Phyto-remediation

(pollution removal)

Trees remove pollutants from soil and water, including

metals,
pesticides,
solvents,
oils,
& hydrocarbons

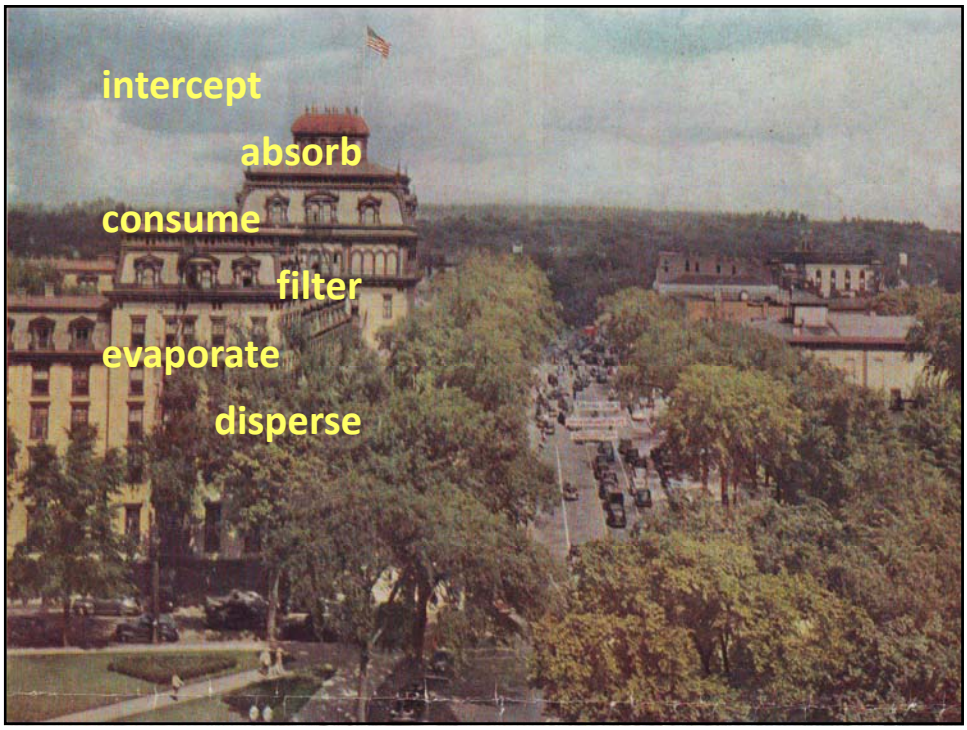
BMPs for Stormwater Mgt (PA)

preserve and utilize natural systems (soil, trees & shrubs, etc.)

design infrastructure to mimic natural systems (porous pavement & soil; trees & shrubs, etc.)

→ **BIO-RETENTION**

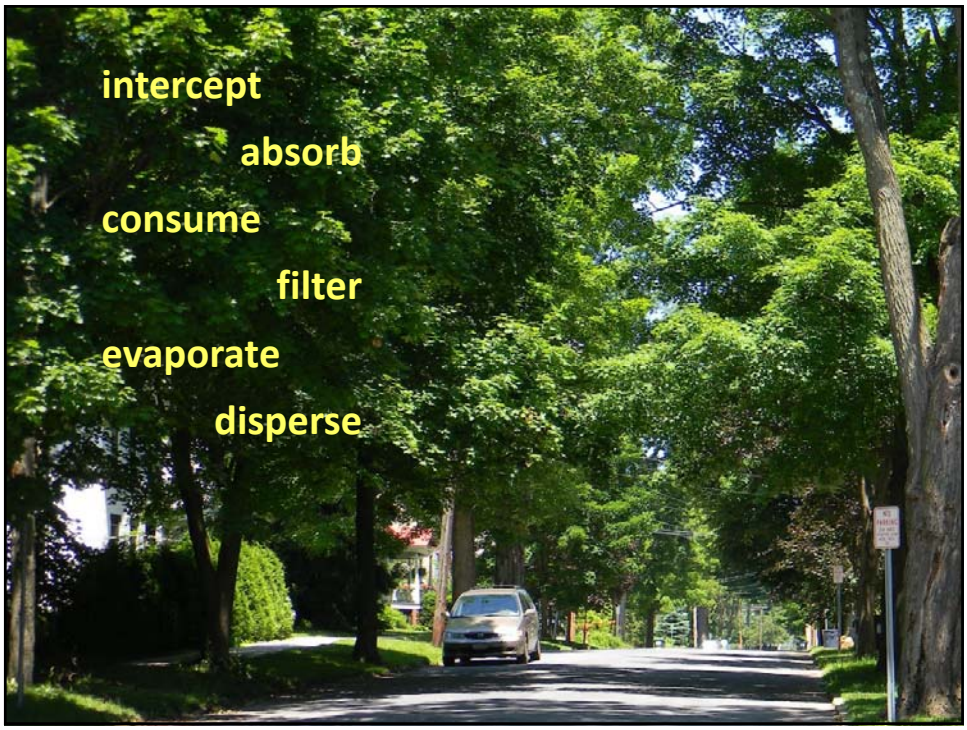
COST-EFFECTIVE



flush

intercept
absorb
consume
filter
evaporate
disperse

flush



flush

flush

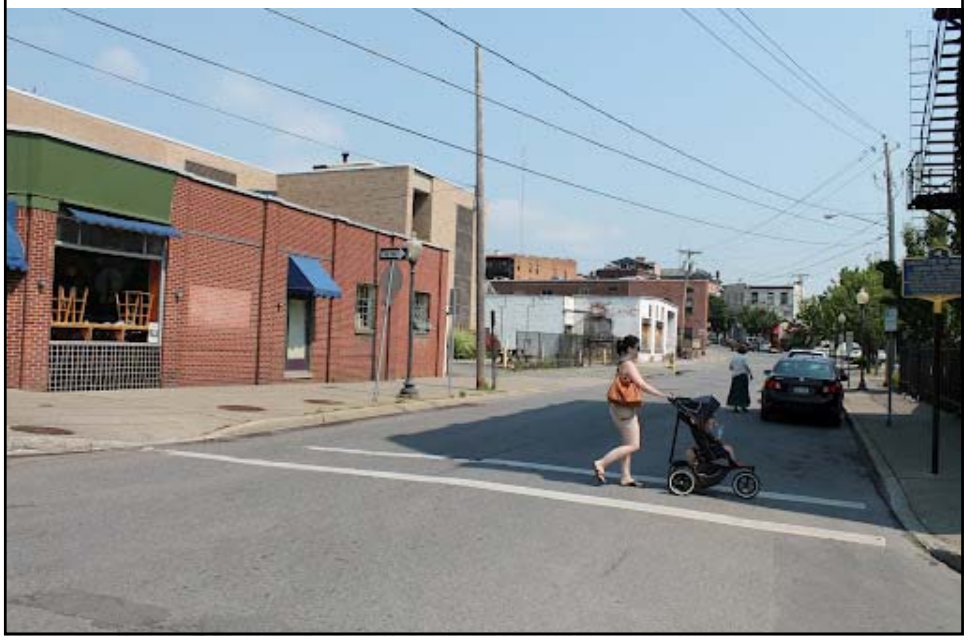
BMPs for Stormwater Mgt -
"preserve & utilize natural systems"

PRESERVE

&

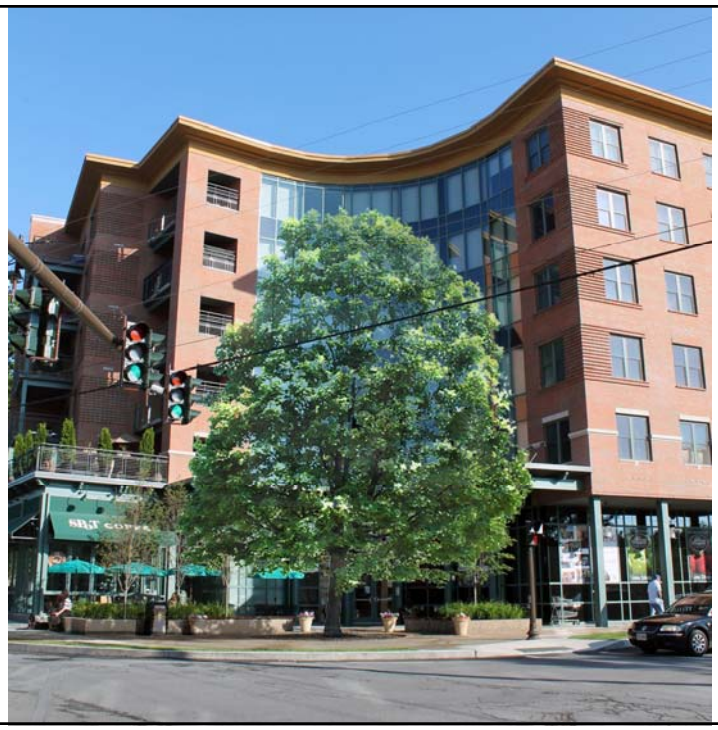
EXPAND

the urban forest



Caroline St. at Putnam/Maple

Caroline St. at Putnam/Maple



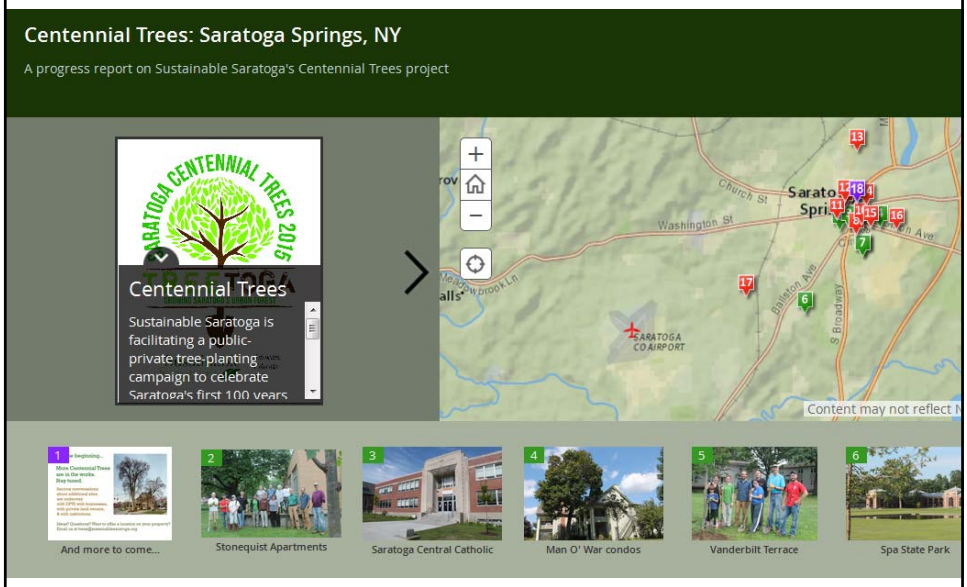
BMPs for Stormwater Mgt - "preserve & utilize natural systems"

SOIL & POROUS SURFACES

- Maximize size of tree lawn (avoid tiny tree wells)
- Reduce impervious surface areas. Use porous materials.
- Minimize soil compaction & large-scale grading during construction
- Clustered design to minimize site disturbance

VEGETATION (incl. TREES)

- Design ample tree cover into all streetscapes, parking lots, and development
- Protect and conserve existing forests/trees and riparian areas
- Re-vegetate and re-forest disturbed areas using native species

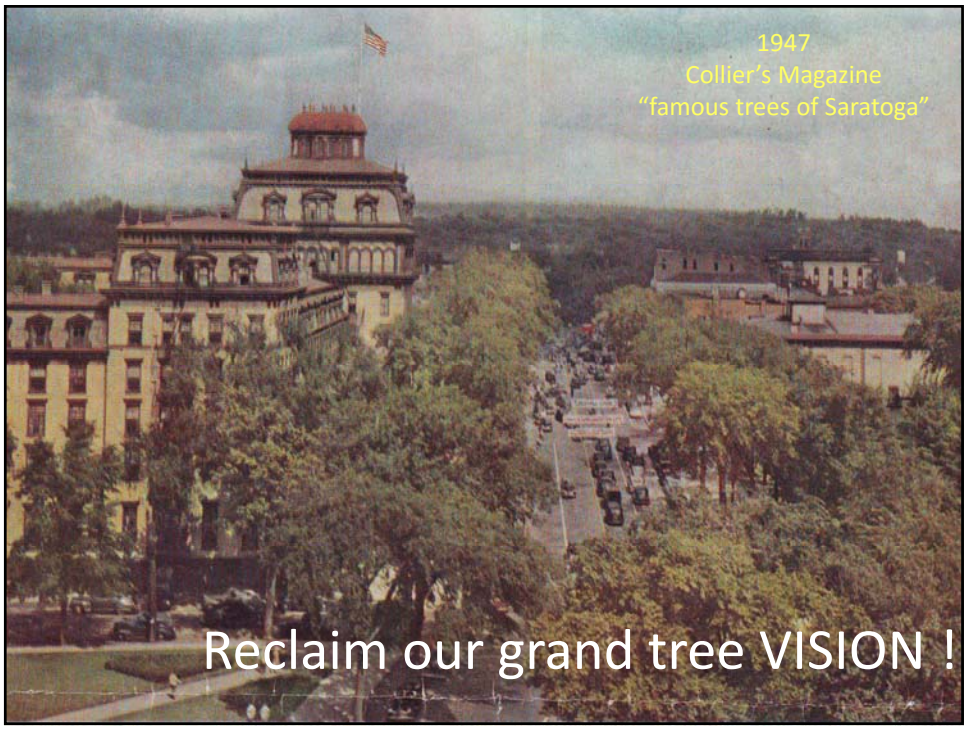


Trees Pay Us Back !

Large Trees Pay Us Back <u>Even More</u> !

Large Trees=Cost-Effective Infrastructure

Public-
Private
Planting
Campaign



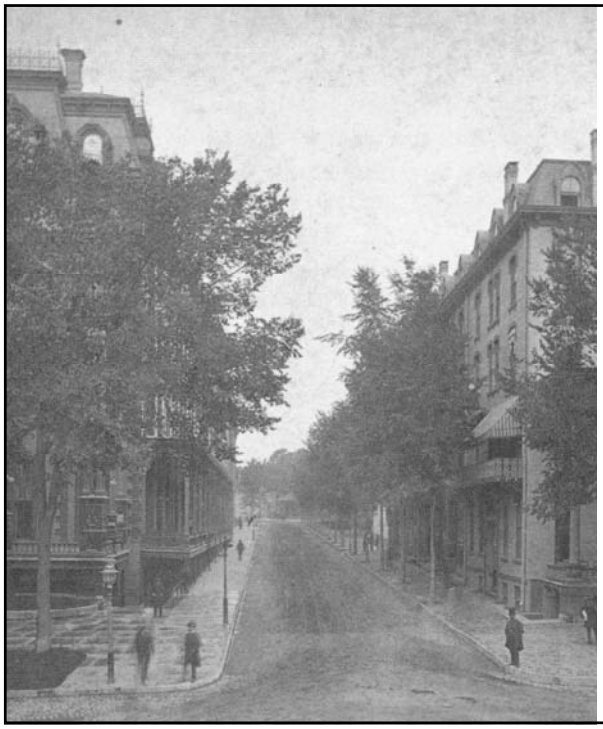
VISION in Saratoga – 2 brief histories

1. Large Building Era (1st)
c1820 to c1955

2. Small Building Era
("Red Barn era")
c1955 to c1990

3. Large Building Era (2nd)
c1990 forwards

LARGE BUILDING ERA #1

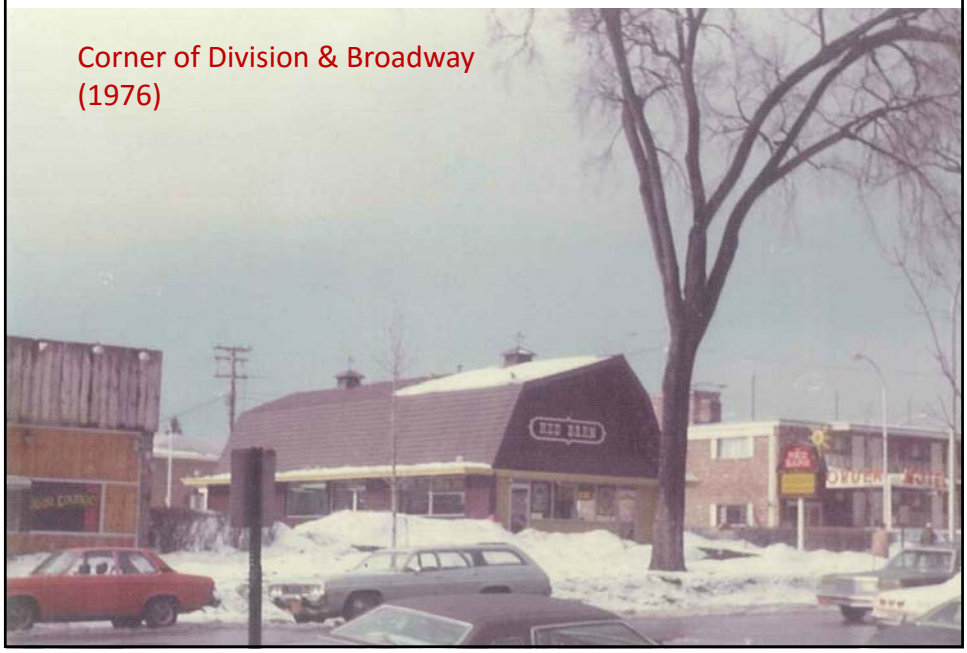


ERA 1:
the
LARGE BUILDING
VISION

Corner of Division
& Broadway,
looking west on
Division

On left,
United States Hotel

ERA 2: SMALL BUILDING VISION (Red Barn era)



ERA 3: regained the LARGE BUILDING VISION

Around 1990, Saratoga reclaimed its "large building vision"

Around 1990, Saratoga reclaimed its "large building vision"

VISION in Saratoga – 2 brief histories

1. Large Building Era (1st)
c1820 to c1955

2. Small Building Era
aka "Red Barn era"
c1955 to c1990

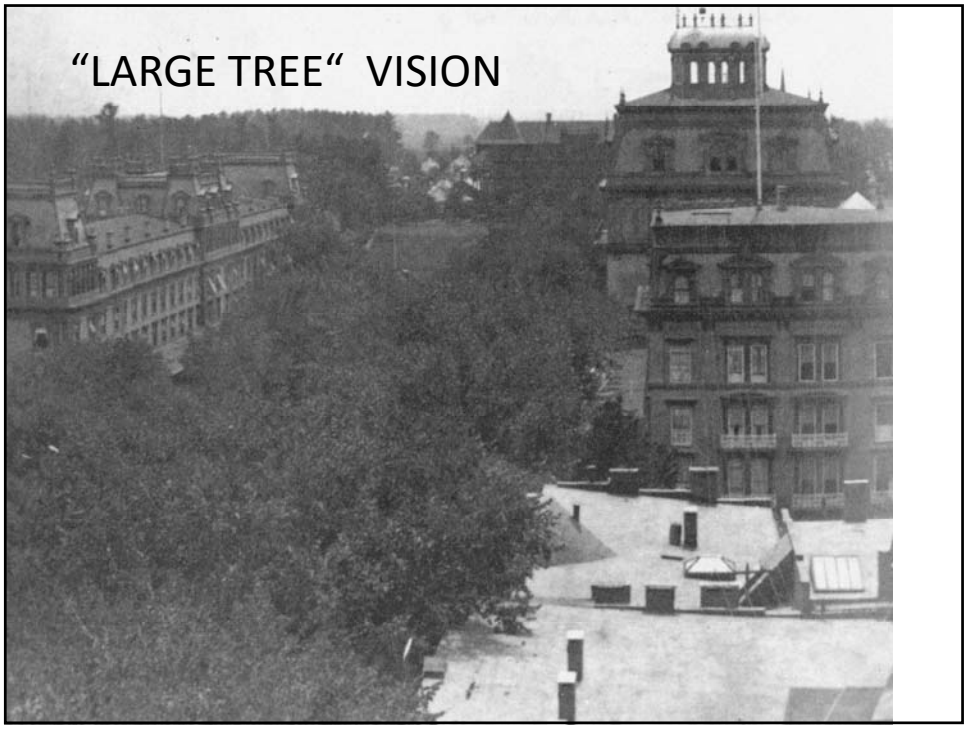
3. Large Building Era (2nd)
c1990 forwards

VISION in Saratoga – 2 brief histories

1. Large Tree Vision (1st Era)
1828 to c1980

2. "Small Tree" or
"No Tree" Vision
aka "Callery Pear era"
c1980 to 2013

3. Large Tree Vision (regained)
2013 into the FUTURE?
(UFMP)


“LARGE TREE“ VISION

“SMALL TREE”
VISION
(1995)

"SMALL TREE"or "NO TREE" VISION – c2000

"NO TREE"
VISION

(2012)

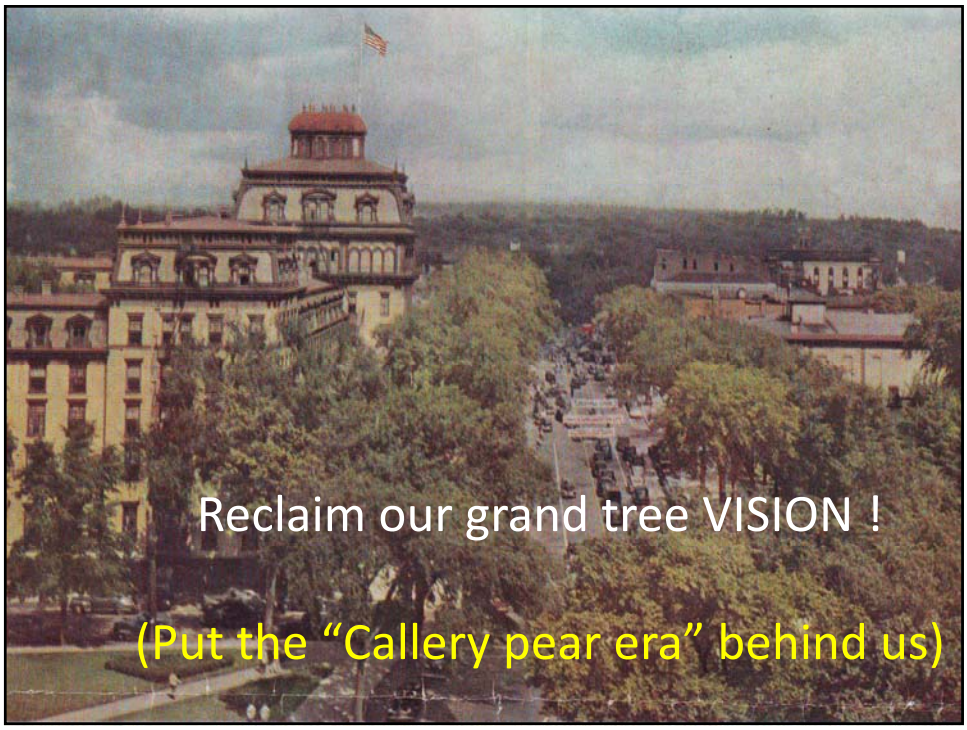
LARGE
TREE
VISION

"SMALL TREE"
or
"NO TREE"
VISION

"LARGE TREE" VISION

NOW – NO TREE vision

THEN – LARGE TREE vision



SARATOGA CENTENNIAL TREES 2015

TREETOGA

GROWING SARATOGA'S URBAN FOREST

Sustainable Saratoga | Advocate. Educate. Act.

MORE INFORMATION at:

www.sustainablesaratoga.org/centennialtrees/

SEND US YOUR IDEAS at:

trees@sustainablesaratoga.org

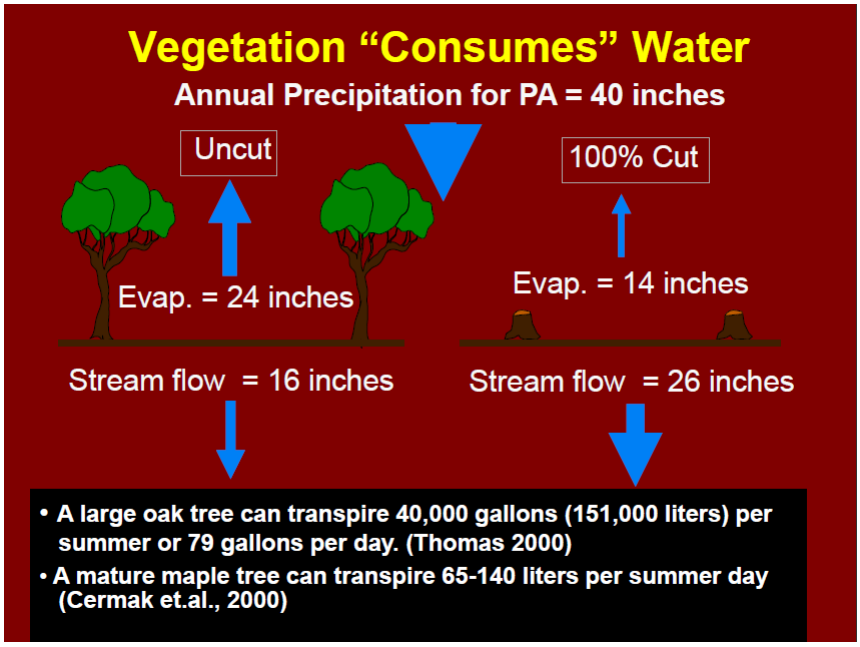
Sustainable Saratoga

Advocate.
Educate.
Act.

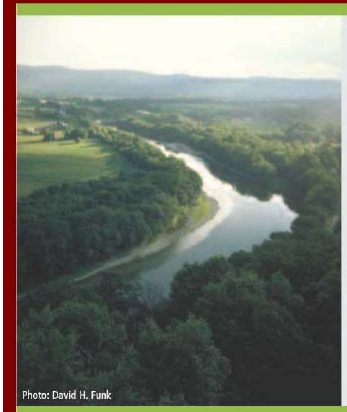
www.sustainablesaratoga.org

Tom Denny

tomdenny2010@gmail.com


Vegetation "Consumes" Water
Annual Precipitation for PA = 40 inches
Uncut
100% Cut
Evap. = 24 inches
Evap. = 14 inches
Stream flow = 16 inches
Stream flow = 26 inches
• A large oak tree can transpire 40,000 gallons (151,000 liters) per summer or 79 gallons per day. (Thomas 2000)
• A mature maple tree can transpire 65-140 liters per summer day (Cermak et.al., 2000)

A 10% increase in forest cover in a drinking source area results in a 20% decrease in treatment and chemical costs!



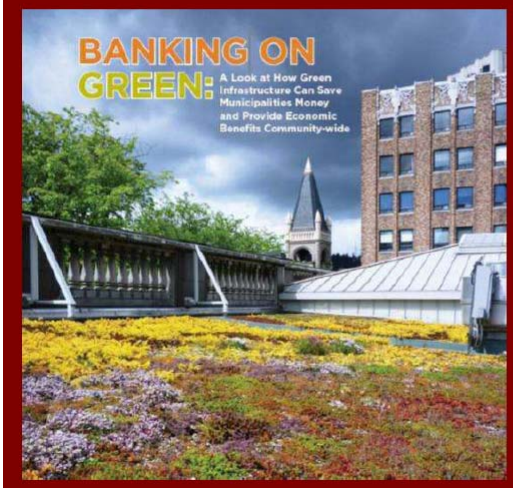
Green Stormwater Infrastructure

- A range of soil-water-plant systems that ***intercept*** stormwater, ***infiltrate*** a portion of it into the ground, ***evaporate*** a portion of it into the air, and in some cases ***slowly release*** a portion of it back into the sewer system.

Centre County Visitor Center across from Beaver Stadium

Acknowledges the symbiotic relationship between land use and water resources

Green Infrastructure Save$



U.S. Communities are facing a total of $106 Billion in stormwater and combined sewer upgrades. (EPA)

25% of the $1 billion in annual damages caused by flooding are linked to stormwater (FEMA)

Green Infrastructure in Chicago diverted over 70 million gallons of strormwater in 2009 from the CSO system.

Increase Urban Tree Canopy

Urban Tree Interception rates exceeded 40% for small storm events, but were less than 4% for large storm events (Wang, Nowak, Endreny 2006).

Increasing canopy cover over impervious surface had the greatest effect on reducing runoff.

UFORE Hydro Study Dead Run, Baltimore, MD

Thanks for listening !

BMPs for Stormwater Mgt in PA
"preserve & utilize natural systems"

Trees and Forests: a New BMP for Stormwater Management in Pennsylvania

Up until recently, stormwater management strategies have been focused on detaining large volumes of water in basins that had little to no effect on removing the pollutants in the stormwater. In December 2006, DEP unveiled the new Stormwater Management- Best Management Practices (BMP) Manual that works to protect water quality and to put stormwater back into the ground where it fell. One of the ten principles for new stormwater management is "preserve and utilize natural systems (soil, vegetation, etc)".

Several of the Non-Structural BMPs include protecting/conserving existing forests and riparian areas, cluster or concentrate new construction to minimize site disturbance, use conservation subdivision design and low impact development techniques, minimize soil compaction and grading entire areas, re-vegetate and re-forest disturbed area using native species, and reduce impervious cover such as streets and parking lots.

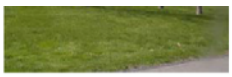
Albany – Aug 6, 2014

Trees Consume Stormwater

Trees and forests absorb and use tremendous amounts of water for growth, thereby consuming storm water. A single mature oak tree can consume (transpire) over 40,000 gallons of water in a year. In Pennsylvania forests, an average of 24 inches of the annual 40 inches of rainfall is taken up by trees through evapotranspiration (movement of water from the ground through the tree and leaves, evaporating back into the environment). That evapo-transpiration also serves to cool and modify surrounding summer temperatures. If the forest is removed or harvested, evaporation drops to 14 inches and stream flow increases to receive 26 inches of the annual 40 inches of precipitation. So, just the removal of forests can have an impact on streams in the watershed.

Pollutant Removal and Phytoremediation

Plants, especially woody plants, are very good at removing nutrients (nitrates and phosphates) and contaminates (such as metals, pesticides, solvents, oils and hydrocarbons) from soil and water. These pollutants are either used for growth (nutrients) or are stored in wood. In one study, a single sugar maple growing roadside removed 60mg of cadmium, 140mg of chromium, 820mg of nickel, and 5200mg of lead in a single growing season (Coder, 1996). Studies in Maryland showed reductions of up to 88% of nitrate and 76% of phosphorus after agricultural runoff passed through a forest buffer.



in our streams, rivers, lakes and the Chesapeake Bay.

Parking lots, one of the fastest growing land uses, have become a major cause of water quality and stream degradation. Non-Point Source pollutants such as petroleum hydrocarbons, nitrates, and heavy metals (cadmium, copper, lead, and zinc) from brakes and rusting automobiles all wash into our water ways. Even a small rain storm (less than .5 inches) will cause 'first flush' – washing these pollutants into streams.

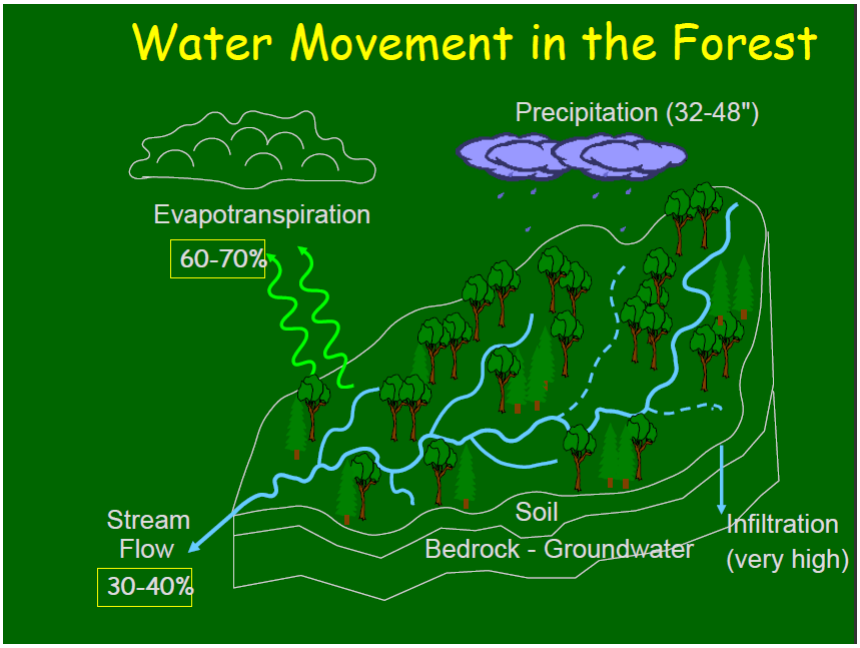
The runoff from one acre of paved parking generates the same amount of annual runoff as: 36 acres of forest; 20 acres of grassland; a 14 acre subdivision (2 acre lots); or a 10 acre subdivision (0.5 acre lots). One inch of rainfall on an acre of parking produces 27,000 gallons of stormwater. Large increases in stormwater volume reaching streams has caused major streambank erosion problems, down stream flooding, increased nutrient/sediment loads, and degraded aquatic habitat. The planting of trees in parking lots, especially in bio-retention areas where stormwater flows, can have a positive impact on water quality and work to reduce flooding and stream impairment.

One generation plants the trees.

The next enjoys the shade.

Chinese proverb

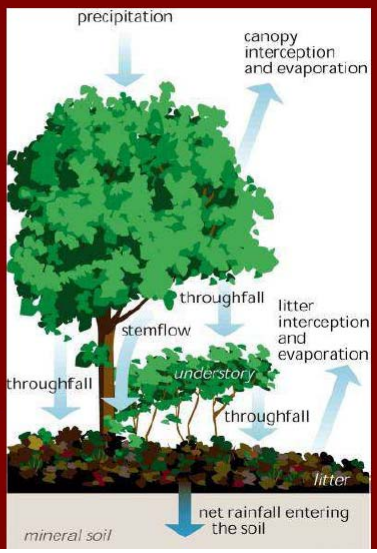
The Role of Trees and Forests
in Managing Stormwater
Vincent Cotrone
Extension Urban Forester
Penn State University
Penn State Extension


Water Movement in the Forest
Precipitation (32-48")
Evapotranspiration
60-70%
Stream
Flow
30-40%
Soil
Bedrock - Groundwater
Infiltration
(very high)

Trees Reduce Stormwater

- Interception in the Canopy
- Infiltration into Soils
- Consumption by Vegetation
- Pollutant Removal & Phytoremediation
- Soil Stabilization
- Streamside Buffers

- Trees used in bio-rentention areas filter and consume stormwater that would otherwise carry pollutants to our streams



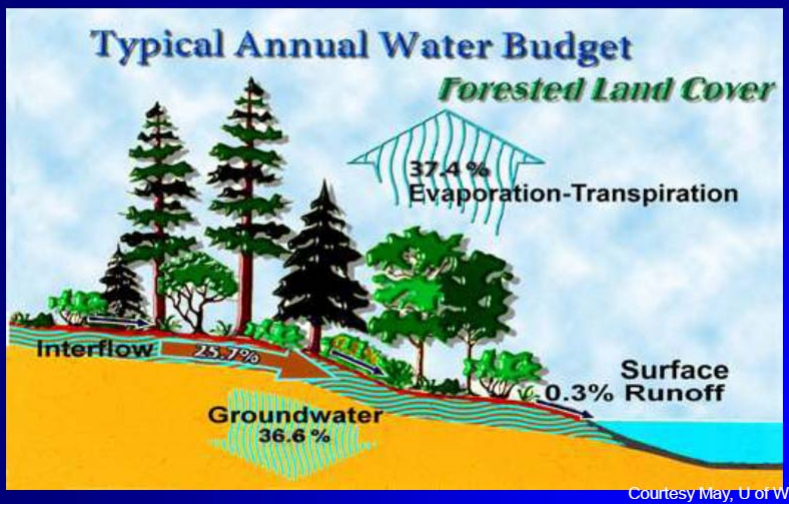
Rainfall Interception by Tree Canopies

- Average interception of rainfall by tree canopy cover ranges from 10-40% for forested settings.
- Interception:
  mature deciduous
  500 to 760 gallons per year

  mature evergreen
  4,000 gallons per year.
- In one study, existing canopy in Dayton, Ohio reduced runoff by 7% and could be increased to 12% by planting more trees.

1 inch of rainfall per acre is equal to 27,000 gallons of stormwater

Hydrology Under Natural Conditions



Courtesy May, U of W

Developed Conditions

Courtesy May, U of W

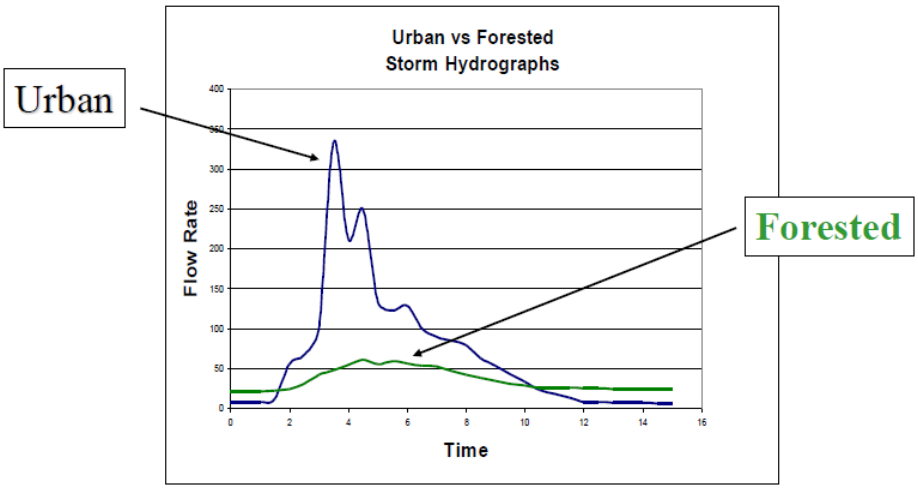
Green Stormwater Infrastructure

A range of soil-water-plant systems that **intercept** stormwater, **infiltrate** a portion of it into the ground, **evaporate** a portion of it into the air, and in some cases **slowly release** a portion of it back into the sewer system.

Green stormwater infrastructure "acknowledges the symbiotic relationship between land use and water resources."

The Urban Storm Hydrograph

Greater Peaks & Volume



intercept
absorb
consume
filter
evaporate
disperse