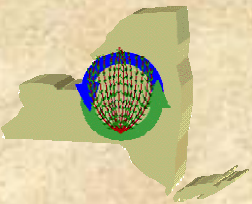


Capturing the Snow with Fast Growing Willow Living Snowfences



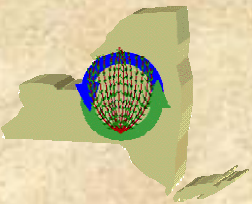
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**State University of New York College of Environmental Science and Forestry
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Outline

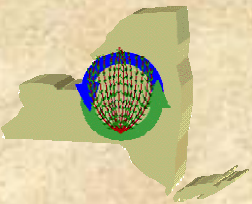
- ◆ Challenges with blowing snow
- ◆ Structural and living snowfences
benefits and limitations
- ◆ Willow characteristics for snowfences
- ◆ Design, installation and maintenance
of willow snowfences
- ◆ Future Development



The Challenge



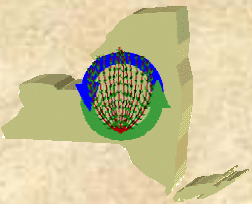
- ◆ Snow and ice removal and control costs over \$2 billion annually in the US
- ◆ Blowing and drifting snow causes:
 - Reduced visibility
 - Impaired road conditions
 - Reduced road width
 - More frequent road closures
 - Increased number of accidents and injuries
 - Increased need for plowing and deicing materials



The Challenge



- ◆ Mechanical snow removal costs up to 100 times more than trapping snow with snowfences (SHRP 1991)
- ◆ Options
 - Wood or plastic structural snowfences
 - Living snowfences

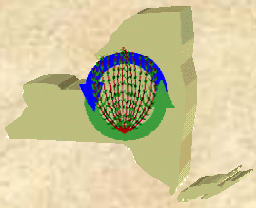


Structural Snowfences



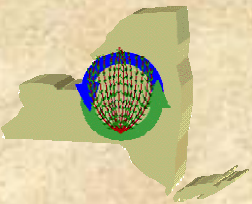
- ◆ Less costly than snow removal
 - Snow removal costs about \$3/ton
 - A 4 ft high snowfence can trap up to 12 tons of snow per linear yard
- ◆ More costly than living snowfences
 - Annual installation and maintenance
 - Short lifespan and associated replacement costs
 - Ineffective in years with heavy snowfall due to limited height
- ◆ Visually unappealing



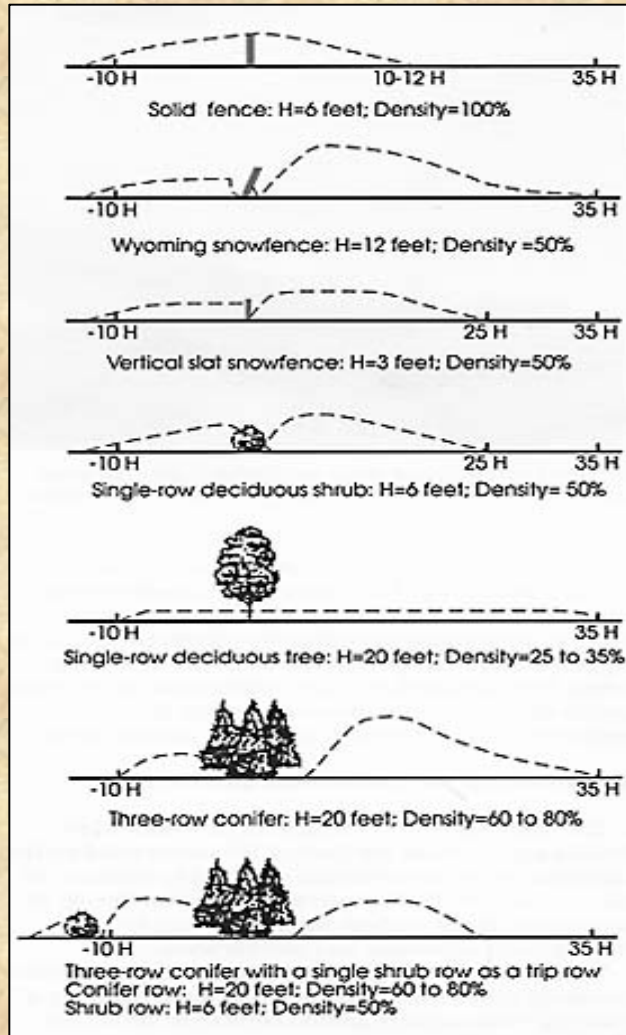


A Solution - Living Snowfences

- ◆ Designed plantings of trees and/or shrubs that create a vegetative barrier that traps and controls blowing and drifting snow
- ◆ Key characteristics for suitable species
 - High density that extends to the ground
 - Rapid growth
 - Suited to local soil and climate conditions
 - Easy to establish and maintain



Living Snowfences



- ◆ Effectiveness is determined by
 - Optical density
 - Height
- ◆ Both characteristics can be manipulated by selecting species, spacing and adjusting management practices



Living Snowfences - Benefits



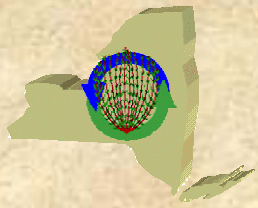
- ◆ Cheaper than plastic or wood snowfences
- ◆ More effective in years with heavy snowfall
- ◆ Potential to provide wildlife habitat
- ◆ Potential for income generation for landowner
- ◆ Opportunities for carbon sequestration



Living Snowfences - Limitations



- ◆ Traditional living snowfences require 6 – 20 years to become effective (Taber 1994)
- ◆ Require more space than manufactured snowfences because they often require more than one row of plants



Potential Solution – Willow Snowfences



Mature single row willow
snowfence in central NY

- ◆ Usually a single row of densely planted shrub willows
- ◆ Mix with other species if desired
- ◆ Shrub willow research at SUNY ESF since 1986
- ◆ Excellent knowledge base of willow growth, development and management
- ◆ Over 1,200 varieties of shrub willow



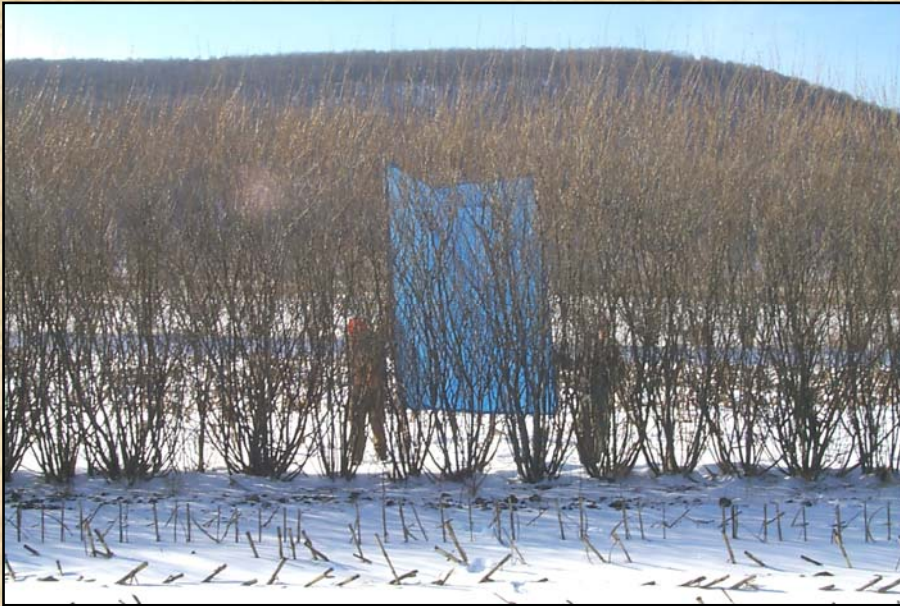
Beneficial Willow Characteristics



- ◆ Easy to establish with unrooted cuttings
 - Easier to handle
 - More tolerant of delays in the field
 - Cheaper than rooted stock
- ◆ Tolerates planting at high density (1.5 – 2 ft spacing)



Beneficial Willow Characteristics



Measuring optical density on a living willow snowfence in Cortland County, NY

- ◆ Rapid height growth
 - Can reach >20 ft in 3-years
- ◆ Larger planting stock can be used to accelerate establishment
- ◆ Effective in as little as two to three years

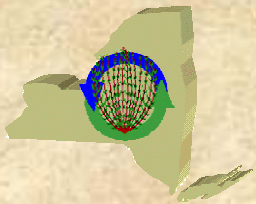


Beneficial Willow Characteristics



Willow (*S. purpurea*) living snowfence five months after coppicing

- ◆ Coppicing ability creates good density from the ground to top of the crown
 - Mature willow snowfence has a measured density of 60-70%
- ◆ Once established maintenance is minimal
- ◆ Height and density can be modified by selecting willow varieties and changing spacing and/or management

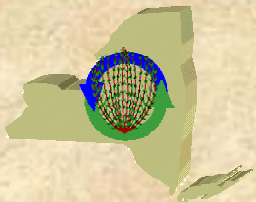


Keys for Success

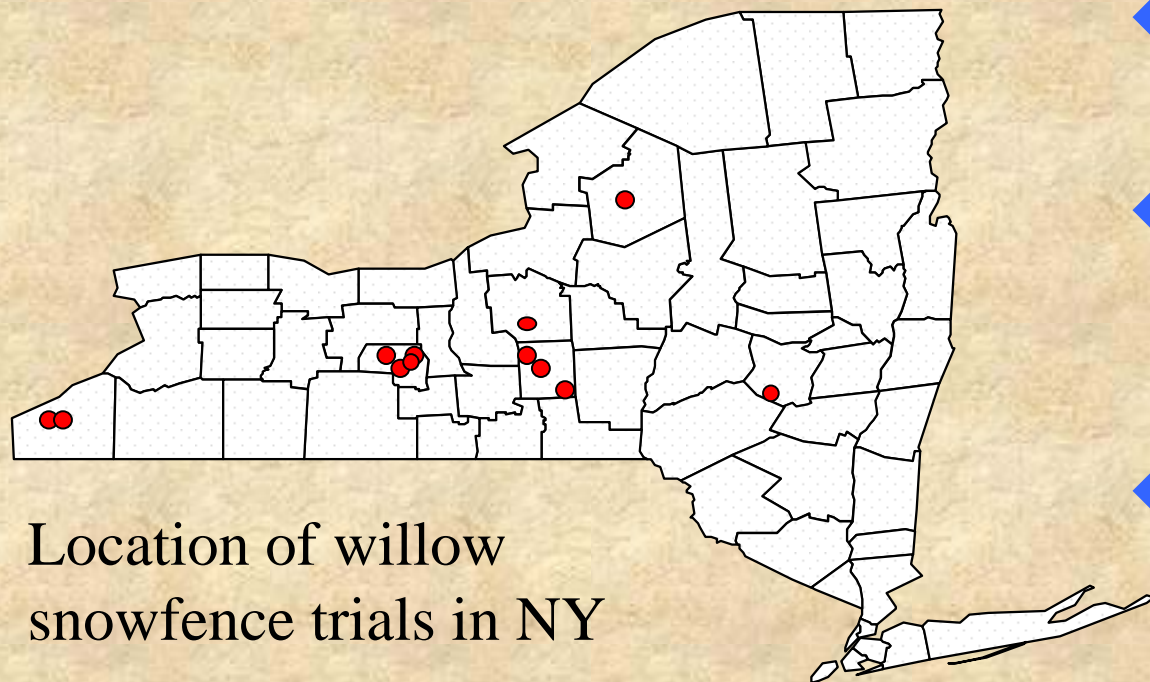


Willow snowfence one-year after coppicing

- ◆ Collaboration with multiple agencies
- ◆ Planning and design in advance
- ◆ Proper site preparation
- ◆ Careful planting and maintenance

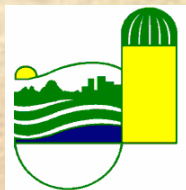
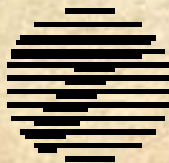


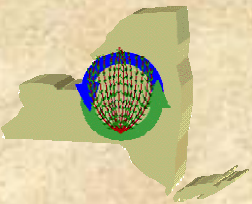
Collaboration



Location of willow
snowfence trials in NY

- ◆ 12 willow snow-fence demonstrations in NY
- ◆ Collaboration with NYSDOT, SWCD, and NRCS
- ◆ Most successful where collaboration is the strongest



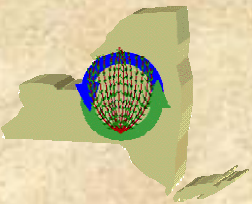


Planning & Design



Establishing a living snowfence in Yates County in the spring of 2004.

- ◆ Site selection
- ◆ Agreements with landowner
- ◆ Set back from road is determined by (Taber 1994):
 - snow fall
 - fetch distance
 - wind direction
 - topography
 - snowfence height and density
- ◆ Typically 100 – 300 ft set back from road center
- ◆ Shorten set back by increasing density

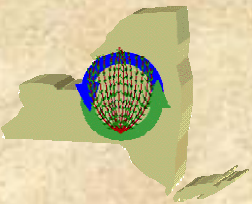


Planning & Design



This variety of willow (*S. purpurea*) had prostrate growth when planted in a single row living snowfence

- ◆ Assessment of soil conditions
- ◆ Selection of correct varieties is important
 - Upright form
 - Rapid growth
 - Suited to soil conditions
 - Insect and pest resistant
- ◆ Design site preparation and weed control plan based on site history and current conditions

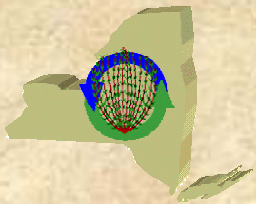


Establishment



Planting of unrooted hardwood cuttings is easy and relatively quick

- ◆ Mix of techniques
 - Mechanical and/or chemical weed control
 - Possibly sub soiling
 - Rototill 3 to 5 ft. width to depth of 6 to 8 in.
- ◆ Install and anchor landscape fabric
- ◆ Plant 10 to 20 in. long cuttings between late April and early June
- ◆ Use high quality, unrooted planting stock



Planting & Maintenance



Proper mulching of landscape fabric is important for success.

- ◆ Cover with 2 to 4 in. mulch or wood chips after planting
- ◆ Mowing along weed mat up once or twice during the first year depending on conditions

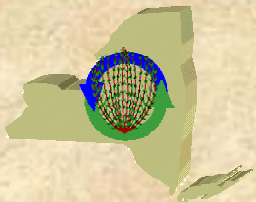


Maintenance



Coppiced willow produces multiple stems on each plant

- ◆ Coppice after first growing season to encourage development of multiple stems
- ◆ Potentially fertilize at the beginning of the second growing season
- ◆ Potentially mow weeds once at the beginning of the second growing season



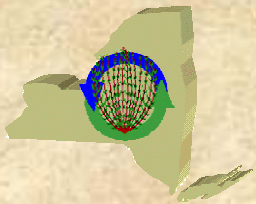
Successful Installations



Willow snowfence three months after planting.



First year of growth after coppicing



Successful Installations



First year of growth after coppicing



Mature and effective willow snowfence

Cutting corners does not pay!



Using plant material that is locally available and /or untested can result in failure

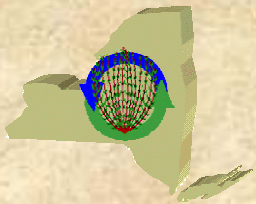


Poor weed control usually results in poor survival, limited growth and costly restoration efforts

Cutting corners does not pay!



Lack of mulch on the landscape fabric and poor site preparation resulted in scalding on the cutting, poor survival and limited growth.

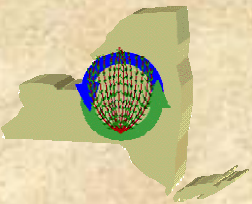


Future Development



◆ Areas for improvement

- Optimize site preparation and establishment
- Measure the effect of different willow varieties and planting densities
- Determine the effect of different sizes of planting stock
- Test mixed plantings of different willow or other species
- Assess methods to accelerate branching of willow and increase density



Future Development



- ◆ Develop specific guidelines for design and planning steps based on experience to date and applied research
- ◆ Use new willow snowfence installations as training sessions for regional staff
- ◆ Determine cost:benefit ratios
 - Record equipment, personnel and supplies
 - Measure amount of snow trapped by willow snowfences
 - Record changes in time spent plowing

Questions and Discussion

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