



# SHRUB WILLOW

Fact Sheet  
Series



Renewable Energy • Rural Development • Environmental Benefits

## Willow Biomass Crop Production Cycle

This flow chart and series of diagrams represents the basic production cycle for shrub willow biomass energy crops from site preparation through multiple harvests. The flow chart on the first page summarizes the entire process and subsequent pages provide a larger image and more information on each of the eight steps illustrated in the flow chart. This is a simplified overview of the multiyear cropping cycle that can be started from just one planting. For more detailed information on this process and other aspects of willow biomass production, other uses of shrub willow and environmental benefits of these systems, please contact us or visit us on the web.

### The Willow Project at SUNY-ESF

[www.esf.edu/willow](http://www.esf.edu/willow) (315)470-6775 [willow@esf.edu](mailto:willow@esf.edu)

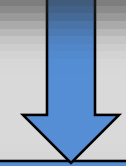
### The Northeast Woody/Warm-Season Biomass Consortium

[www.newbio.psu.edu](http://www.newbio.psu.edu)

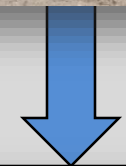
Justin P. Heavey and Timothy A. Volk. © 2015 The Research Foundation for the State University of New York College of Environmental Science and Forestry.

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Site Preparation



Planting



Coppice (cut-back)



1 Crop Establishment

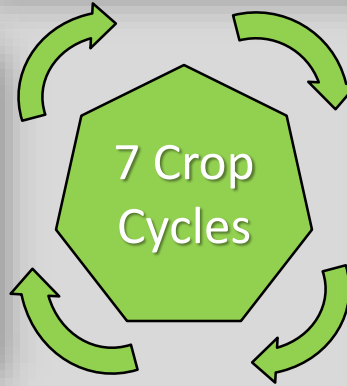
Three Years Growth



Minor Maintenance



7 Crop Cycles



Harvest Biomass



7 Harvests

Rapid Regrowth



25 - 30 wet tons/acre/harvest





# Willow Site Preparation

Site preparation is completed once in fall or spring prior to planting. Typical site preparation includes mowing, herbicide, plow, disc and smooth. Thorough control of weeds is a critical step in site preparation process. This photo shows a properly prepared willow field prior to planting.





# Planting Willow

Planting is completed once in spring using a specialized willow planter. The willow planter cuts large dormant willow stems to length and plants in one pass. Willow planters are available through the NEWBio Equipment Access Program. This photo show a willow planter in operation planting two double rows at a time.





# Coppicing Willow Plants

Willow is coppiced (cut back) after the first growing season when plants are dormant. Coppicing encourages more vigorous growth and more stems per plant. Cut willow re-grows quickly from the remaining plant after coppice and each harvest. These photos show willow after first coppice, and a mature plant with multiple stems.





# Rapid Growth After Coppice and Harvest

Willow can grow up to ten feet in height in a single growing season.

A well established root system helps the plant grow back quickly from the cut stool.

The large plants and high planting density quickly shade out weed competition.

This photo shows re-growth of a willow field in early summer after the first harvest.





# Willow Growth and Harvest Cycle

Willow is grown on a 3 - 4 year cropping cycle, or one harvest every 3 - 4 years.

A mature willow crop is 15 - 25 feet tall with 1 - 2 inch diameter stems.

Each harvest yields about 25 - 30 wet tons per acre, or 4 - 5 dry tons per acre per year.

This photo shows the alley between two double rows of three-year-old willow.





# Willow Maintenance

Maintenance is highest in the first two seasons when weed & pest control are critical.

After the crop is established, maintenance is drastically reduced.

Crop monitoring and maintaining headlands between harvests is required.

These photos shows close-ups of shrub willow at various stages of development.





# Willow Harvesting Operations

New Holland has developed a woody crops header for its forage harvester series.

This system efficiently cuts and chips one double row of willow in one pass.

The willow chips are blown into collection vehicles such as trucks or dump wagons.

This photo shows a willow harvesting operation in progress.





# Multiple Harvests from a Single Planting

Once established, willow can be harvested every 3 - 4 years, up to seven times.

The current market for willow biomass in NY State is for renewable power and heat.

Other uses for willow include cogeneration, pellets, liquid biofuels and green products.

This photo shows forest residue chips mixed with willow at a ReEnergy facility in NY.

