

# Commercial Production & Harvesting of Shrub Willow Crops in NY State

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# Shrub Willow

- **Research at SUNY ESF since 1986**
  - Breeding
  - Cultural Practices
  - Harvesting and Logistics
  - Economics
- **40,000 commercial acres in Europe**
- **Commercial production now accelerating in the United States**
- **Supported by USDA BCAP**



Shrub willow shortly after planting

# Shrub Willow

- Can be grown on marginal land
- 1 million acres in New York State (poorly drained soils)
- Goal: target underutilized/abandoned farm land
- Not compete with food crops



# Barriers to Commercial Willow

- High start up costs - \$1,000/acre
- Intermittent cash flows
- Long payback periods
- Uncertain markets
- Status quo bias
- Specialized machinery



# USDA Biomass Crop Assistance Program (BCAP)

“Improve domestic energy security, reduce carbon pollution, and spur rural economic development”

“...provide assistance to land owners to establish, produce and deliver biomass feedstocks.”



# Biomass Crop Assistance Program

Catalyze commercial adoption and innovation...

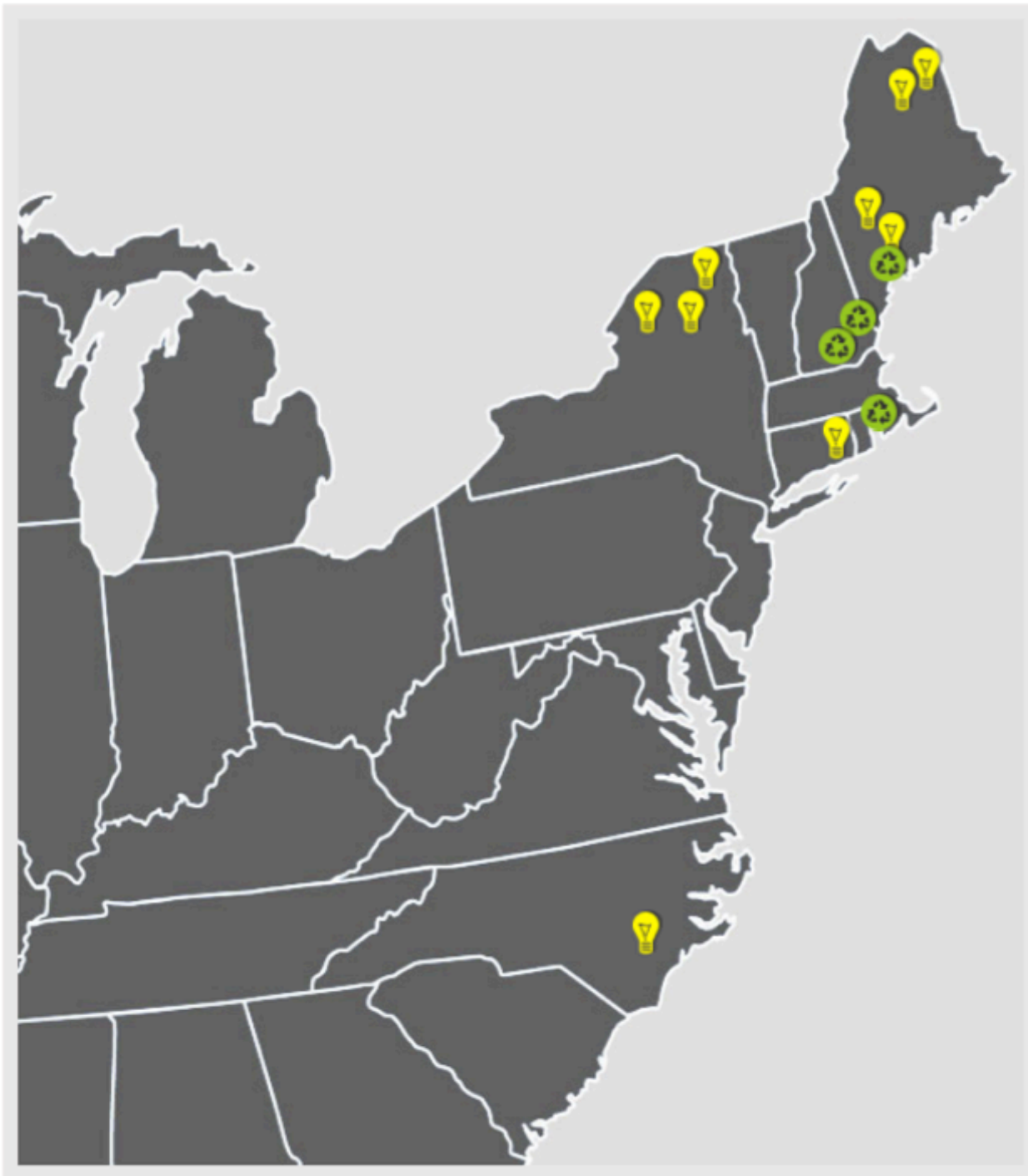
- **Partial establishment grants**
  - Offset high start up costs
- **Land rental payments**
  - Non harvest years
- **Purchasing contracts**
  - With biomass end user



# ReEnergy LLC

- BCAP “project sponsor” for NY Willow
- Biopower company - facilities throughout the northeast
- 11 year purchasing contracts
- Mixing willow with forest residue chips
- Renewable electricity





## Owned and Operated by ReEnergy

### ReEnergy Ashland

39 MW facility in Ashland, ME

### ReEnergy Black River

60 MW facility in Fort Drum, NY

### ReEnergy Chateaugay

21 MW facility in Chateaugay, NY

### ReEnergy Fort Fairfield

37 MW facility in Fort Fairfield, ME

### ReEnergy Livermore Falls

39 MW facility in Livermore Falls, ME

### ReEnergy Lyonsdale

22 MW facility in Lyons Falls, NY

### ReEnergy Sterling

30 MW facility in Sterling, CT

### ReEnergy Stratton

48 MW facility in Stratton, ME

## Operated by ReEnergy

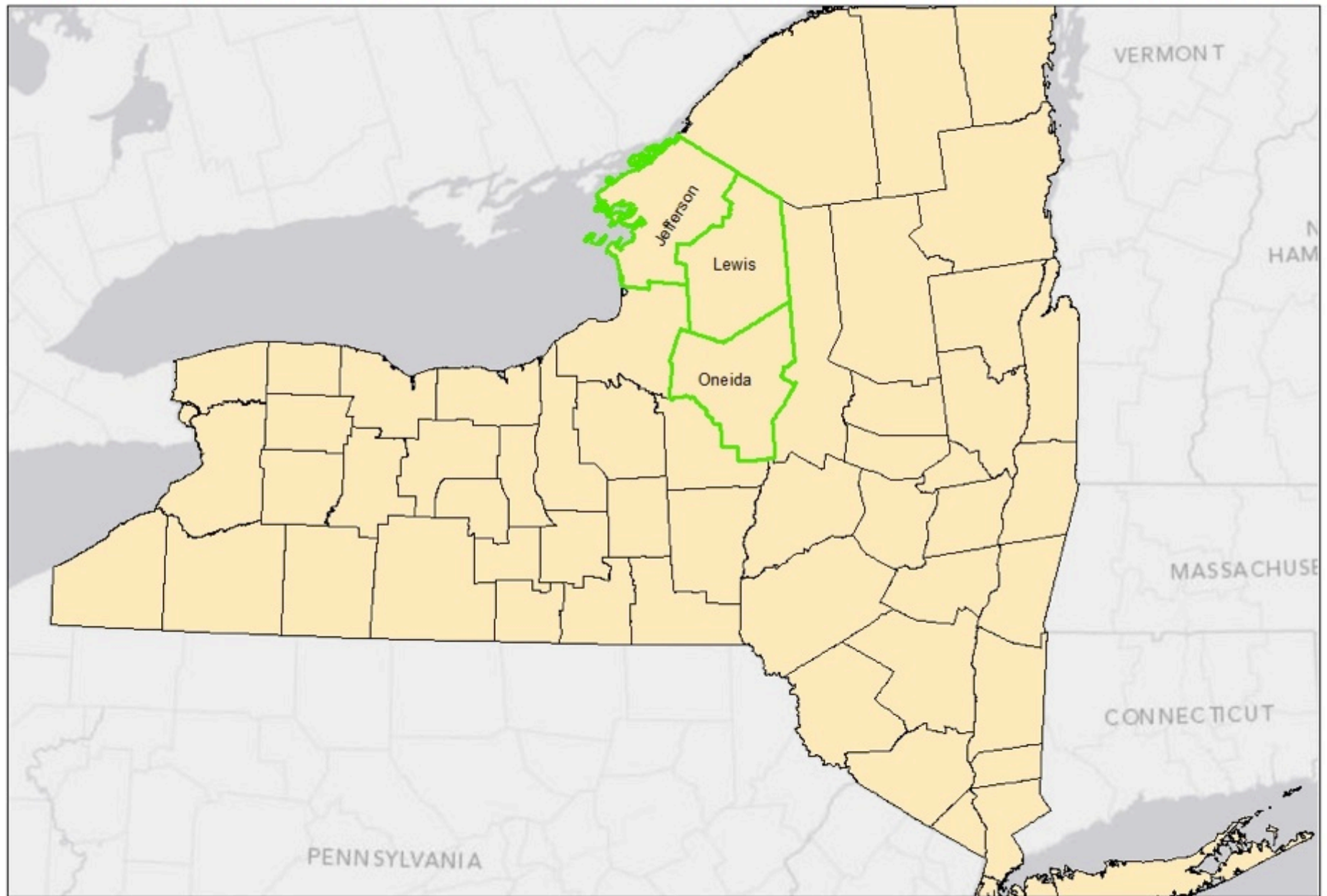
### Coastal Carolina Clean Power

30 MW facility in Kenansville, NC

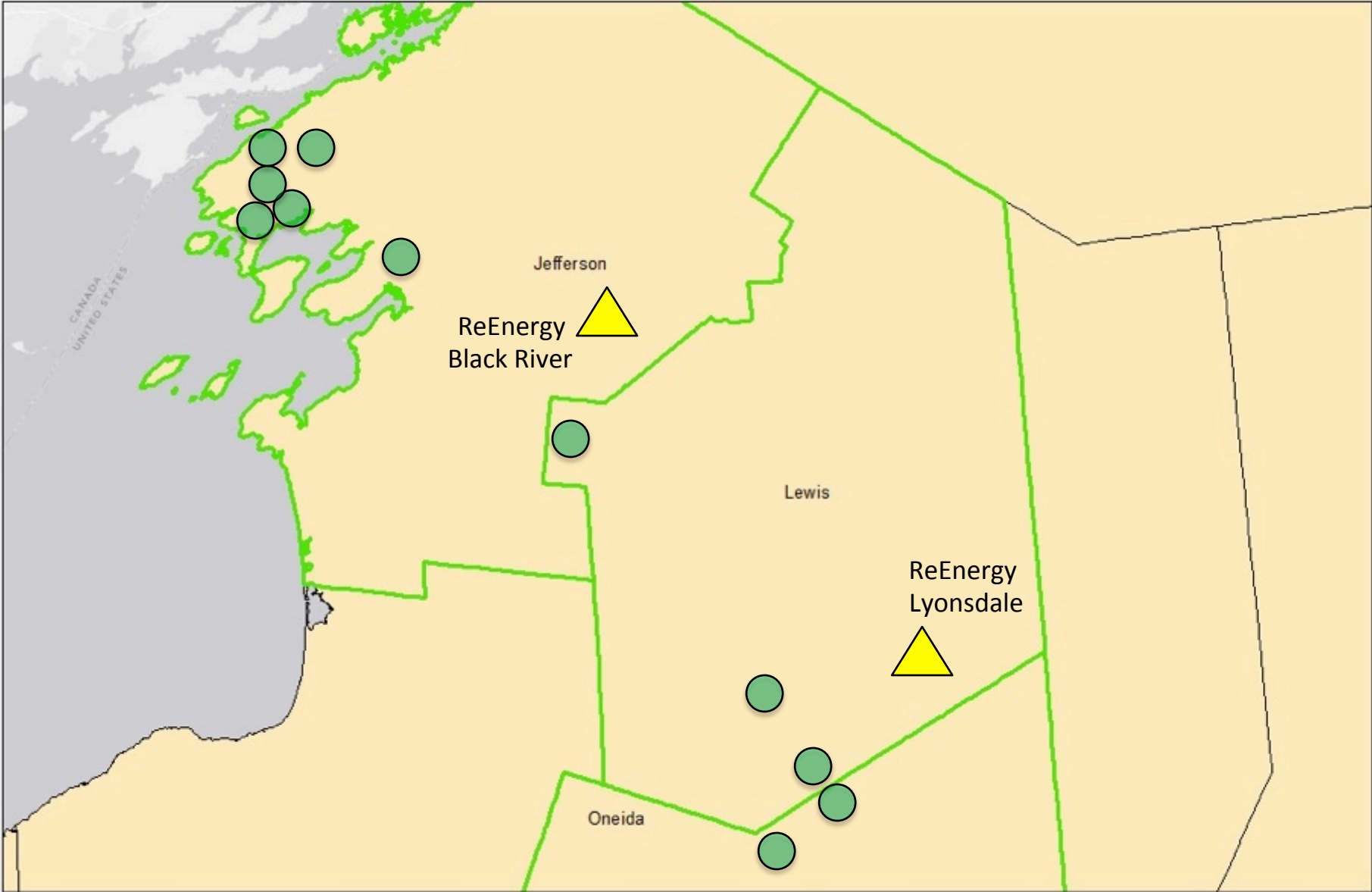
## Recycling Facilities



# New York State Counties with Commercial Willow Production



# New York State Counties with Commercial Willow Production



0 16 Miles



Willow Production Area



Biopower Facility

# Commercial Plantings - 2013

- 850 acres in northern New York State
- Mostly marginal soils or fallow
- Willow step planter



# Commercial Plantings - 2013

- Planting speed = 1.5 acres per hour
- Planting stock quality (sorting)
- Wet spring delayed planting
- Fall site prep for large acreage
- Weed pressure and controls vary field to field



# Commercial Plantings - 2013

- Coppiced over winter 2013/2014
- Majority well established
- 50 of 850 acres to be replanted
  - Late establishment
  - Hot & Dry
  - 2014 Site Prep
  - 2015 replant
- Weed control ongoing some areas



**May 2014**



# May 2014



# June 2014



06.23.2014



# June 2014



# Commercial Harvesting

- 300 acres previously established crops in USDA BCAP
- No establishment grants
- Land payment & contracts
- 100 acres harvested 2013
- 200 acres next 1-2 years
- **1200 commercial acres - harvest every year**



# Harvesting Platform

- New Holland self propelled forage harvester - 130FB header
- Developed by New Holland Agriculture from 2008 - 2012
- Tested in commercial-scale trials by SUNY ESF 2012
- Efficient harvesting platform – now commercially available



# Chip Collection System

- Matching harvester throughput
- Up to 70 -100 tons/hour (wet)
- Keeping harvester moving
- Limit collection vehicles
- Maintain efficiencies
- High-dump sugar cane wagons
  - Dump directly into transport vehicles
  - Large 12 ton capacity
  - Narrow wheel base



# Biopower 2013

- 2,500 tons of chips harvested from BCAP fields
- ReEnergy Lyonsdale - mixed with forest residue chips
- 1400 Mwh of renewable electricity from willow (5% gen)



# Second Rotation Coppice Regrowth



# Second Rotation Coppice Regrowth



# Commercial Willow Chip Quality

- Low variability feedstock that meets end user specs
- Mixing with forest residue chip for biopower
- 2013 harvest samples taken at plant gate





# Moisture Content

	<u>2013</u> Commercial Harvest	<u>2012</u> Commercial Trials	Previous Research Trials
Average	43%	45%	44%
Stan Dev	± 2%	± 2%	-
Range	35% – 55%	37% - 52%	-

# Ash Content

	<u>2013</u> Commercial Harvest	<u>2012</u> Commercial Trials	Forest Residue Chips
Average	3.0%	2.6%	~2%
Stan Dev	± 0.7%	± 0.6%	-
Range	2% - 4%	1% - 3%	-

# Energy Density

	2013 Commercial Harvest	2012 Commercial Trials	Forest Residue Chips
btu/lb (dry)	8,240	8,200	8,200 - 8,600

- Overall chip quality similar to forest residues chips
- Meets end user specs
- Suitable for mixing feedstocks



# Willow Extension Services

## Training and education for BCAP willow...

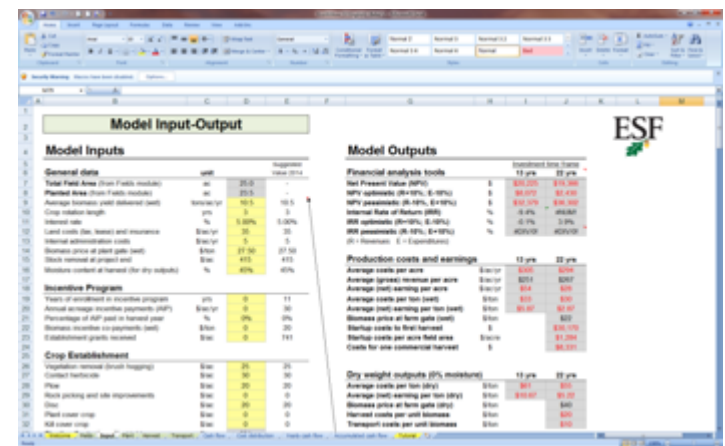
- Technical assistance
- Outreach programs
- Crop monitoring
- Equipment access
- Analytical tools and research summaries



# EcoWillow 2.0

## Lifecycle Economic Model

- Establishment, harvest, transport
- SUNY ESF (2007) - Updated 2014
- Current data, logistics and best practices from commercial willow
- More user friendly design based on grower feedback
- Currently beta testing



# National BioEnergy 2013



# Future Crop Outlook

- Commercial production just beginning in NYS
- Seeing innovation and system improvements by growers
- Ongoing breeding programs and experimental trials...
  - SUNY ESF, Cornell University and others
- Numerous commercial and collaborative partnerships...



# Future BCAP Incentives

Included in approved 2014 Farm Bill

-pending allocation of funds...

- Establishment grants
- Land rental payments
- Purchasing contracts
- Possible biomass co-payments



# Summary

- Commercial willow production happening in the US
- Starting with 1200 acres in New York State
- BCAP incentives, contracts, and extensions services
- Catalyzing adoption and innovation
- Chip quality meets end user specs for mixing
- Continued opportunities & improvements expected!



# Thank You For Your Time!

More Info...

[www.esf.edu/willow/](http://www.esf.edu/willow/)

Contact...

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