BCAP Project Area 10: New York Willow

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ReEnergy Holdings

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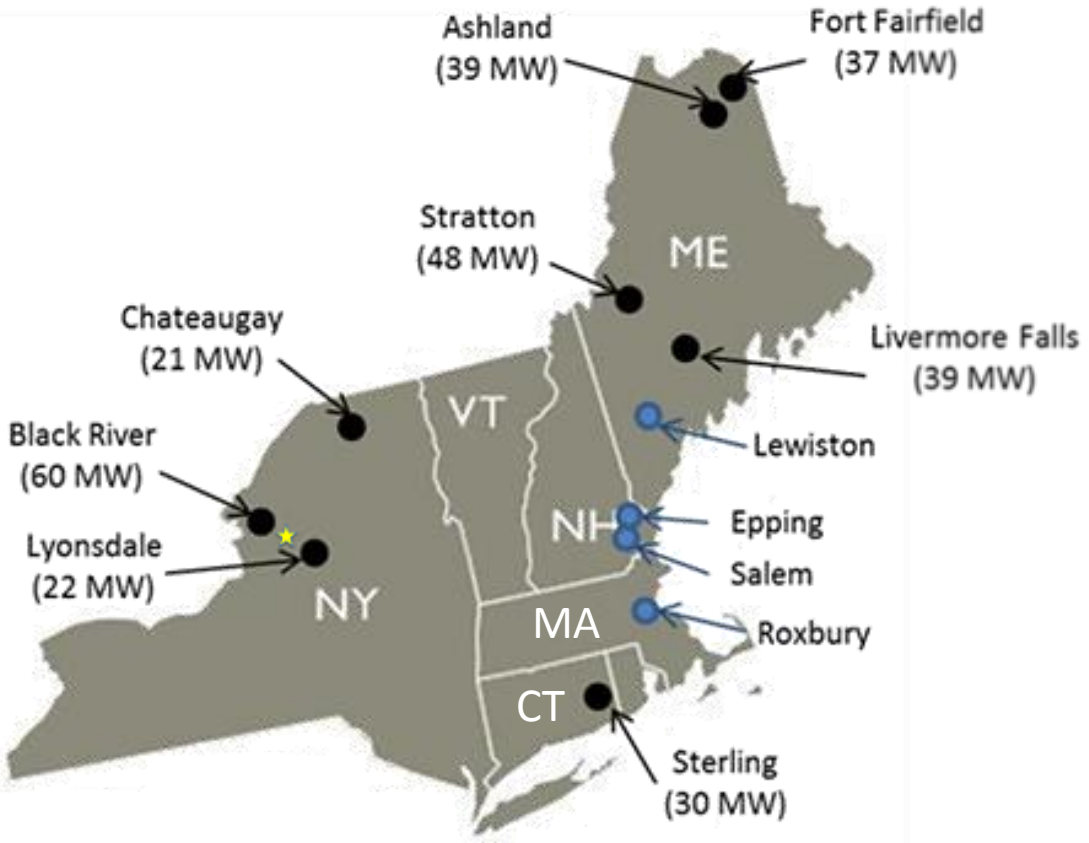
Fast Facts: ReEnergy Holdings

- ~300 MWs of renewable energy generation
- ~ 300 employees; 5 states



- Renewable Energy Facility
- Recycling Facility
- Headquartered in Latham, NY

ReEnergy Holdings in New York

- 80 employees
- 103 MW of installed capacity, or 738,000 MWh – enough to serve 96,000 homes
- $24 million in annual fuel purchases
- Support more than 300 indirect jobs, most in the forest

ReEnergy Facilities in NYS

- ReEnergy Black River: 60 MW
- ReEnergy Lyonsdale: 22 MW
- ReEnergy Chateaugay: 21 MW

ReEnergy Biopower

- Large demand for woody feedstocks
- Primarily forest residues
- Recent contract with Fort Drum Army post; 100% renewable electricity for next 20 years

Fuel Supply Program

- **End-market for BCAP Shrub Willow**

- **Equipment Leasing Program**
  - ReEnergy launched a program allowing loggers to gain access to state-of-the-art equipment and secure long-term agreements to provide fuel to ReEnergy

- **SFI Certification**
  - First company solely devoted to electricity production to be certified by SFI
  - Commitment to use best management practices and protect forest health

Commercial Willow Production

- More than 3,100 tons of willow delivered to Lyonsdale and Black River facilities over first two harvest seasons, 2013 and 2014. YTD 2015: 1,200 tons.
- Willow found to be suitable fuel in terms of moisture and ash content, now incorporated directly with other feedstocks upon delivery.
- Current willow plantings are planned to be harvested about 350-400 acres per year.
- This will produce roughly 8,000-9,000 green tons of feedstock annually

Woody Biomass in Society

World Energy Use

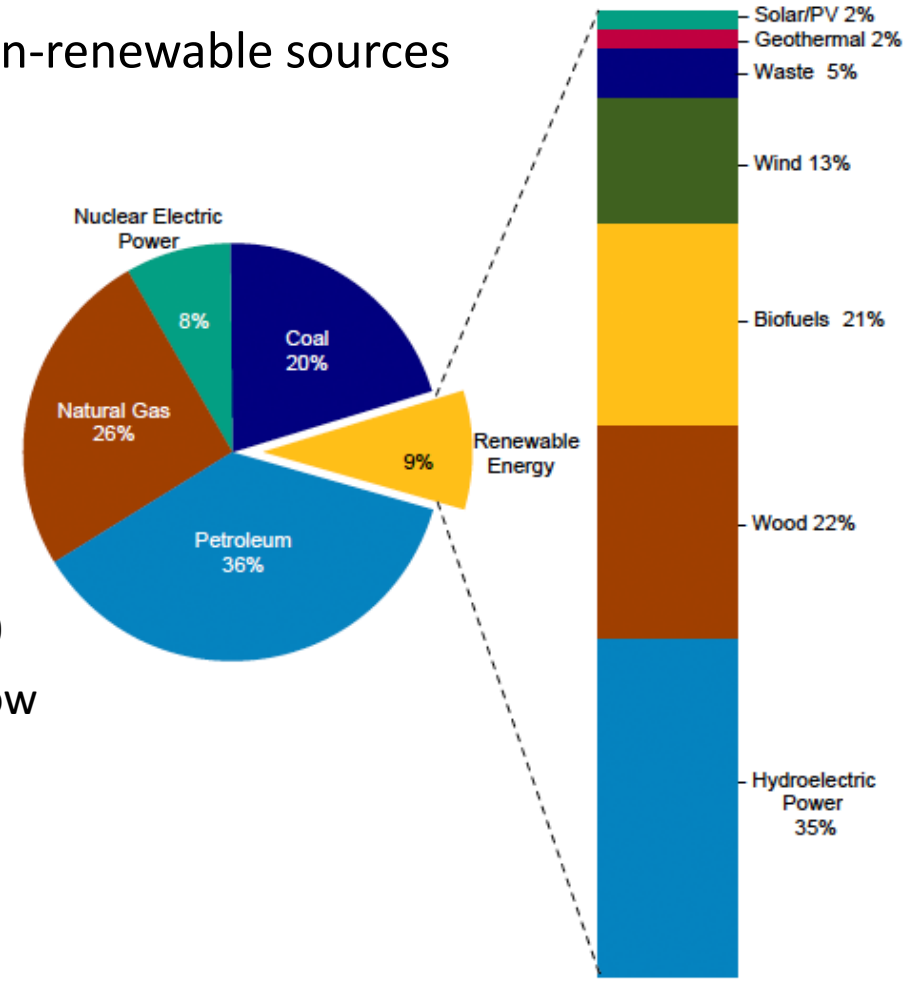
- Increasing exponentially, mostly non-renewable sources

Biomass Energy

- 43% of all renewables world in US

Projected Supply

- 1,500 million dry tons per year by 2030
- 600 million from energy crops like willow



Willow Genus (*Salix* spp.)

Shrub willow

Salix purpurea, Salix miyabeana, Salix sachlinensis, Salix viminalis, Salix eriocephala, Salix caprea…

…and many cultivars of these species

Not tree willows!

(Salix babylonica)

SUNY-ESF Willow Project

Research on shrub willow since 1986

- Cropping methods
- Breeding
- Yield
- Economics
- Best practices
- Environmental sustainability
- **Commercialization**

Why Shrub Willow?

- ✓ Unique plant characteristics
- ✓ Ease of establishment
- ✓ Regrows after each harvest
- ✓ 4-5 dry tons/acre/year
- ✓ Limited pests and diseases

Willow in Central and Northern NY

-About 1,150 acres in the ground

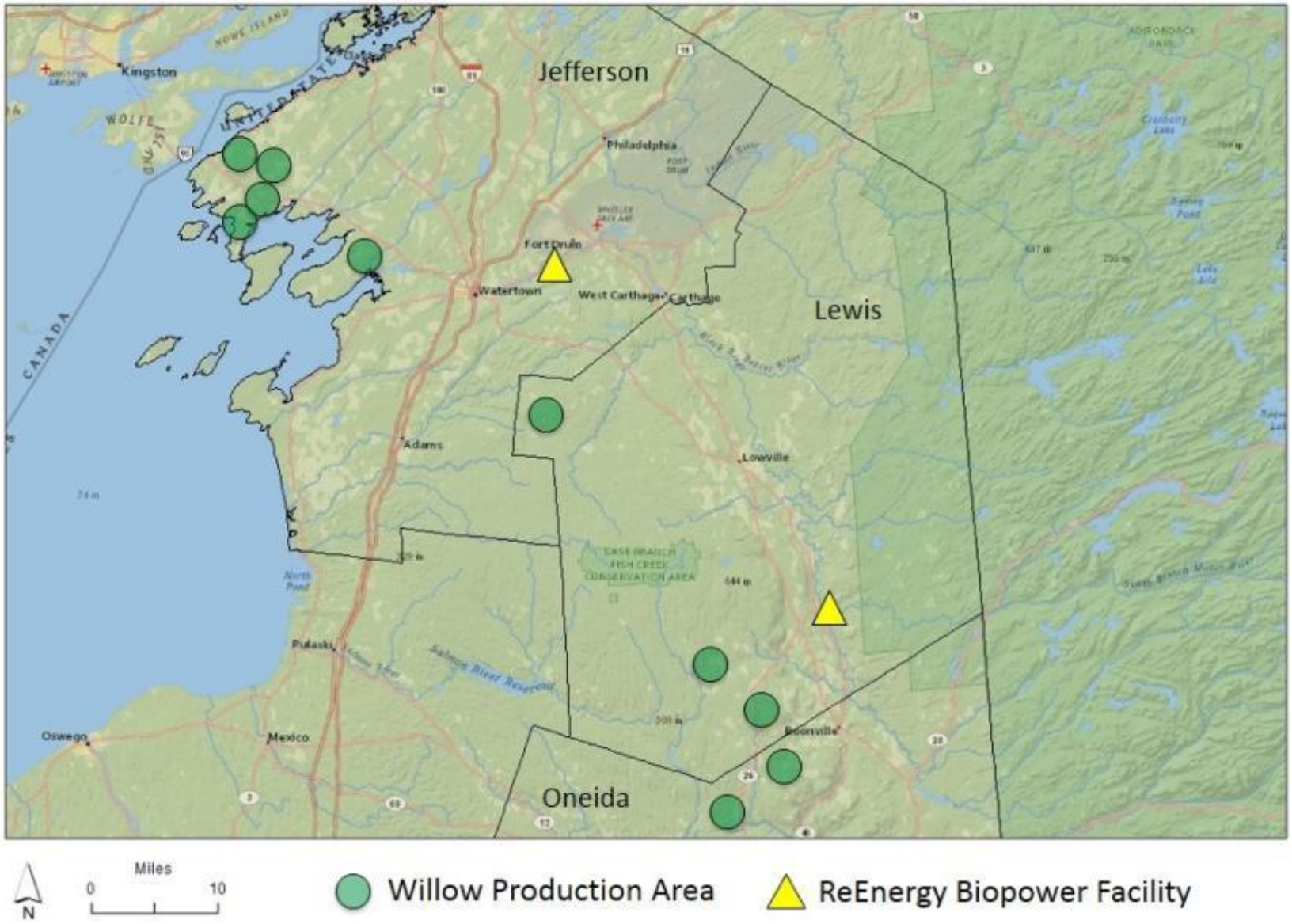
-Harvesting about 350-400 acres per year

-Delivered to ReEnergy biopower facilities

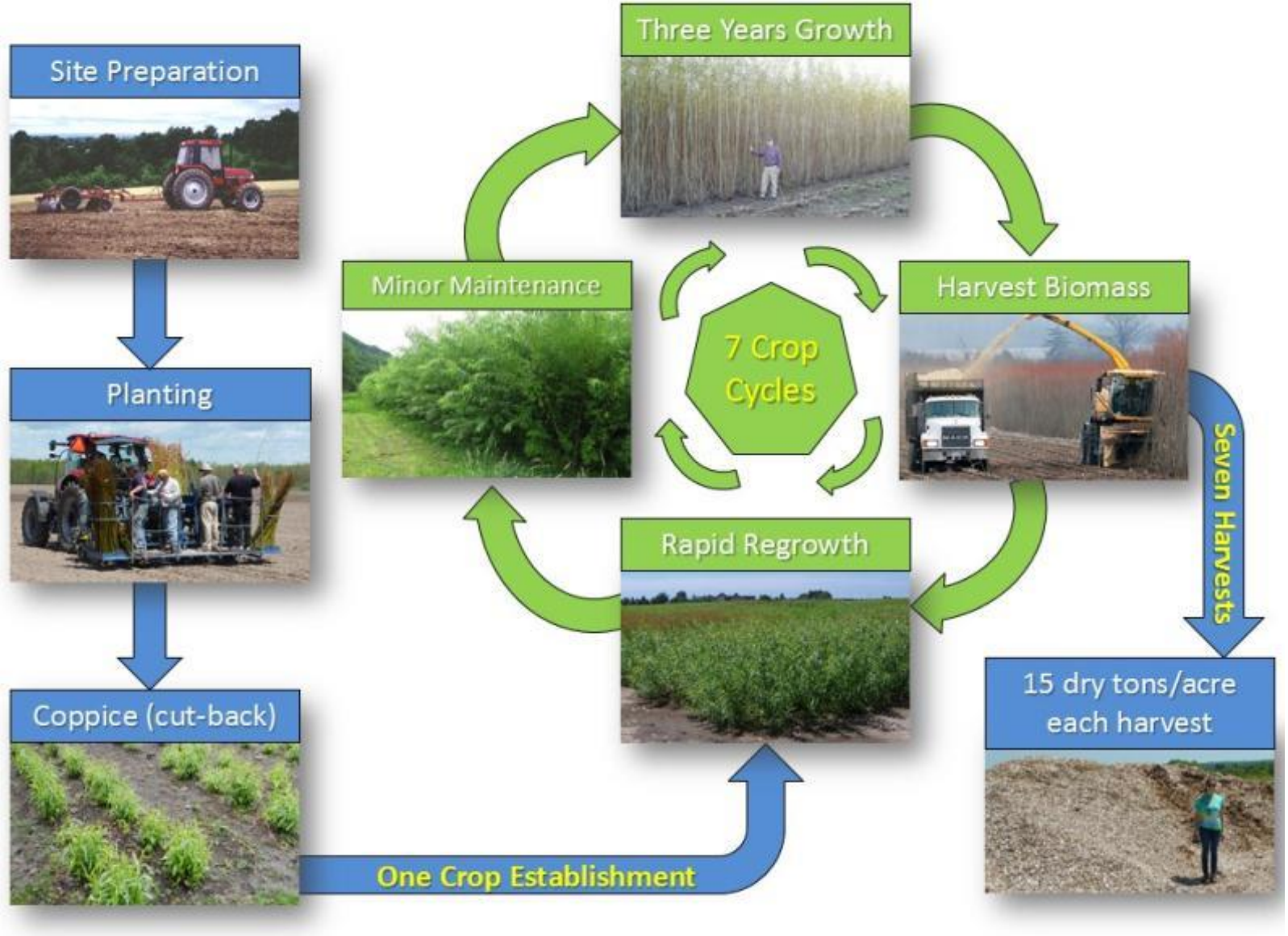
-Mixed with forest residues

-Renewable electricity

Willow in Central and Northern NY



Willow Crop Production Cycle



Mechanized Planting

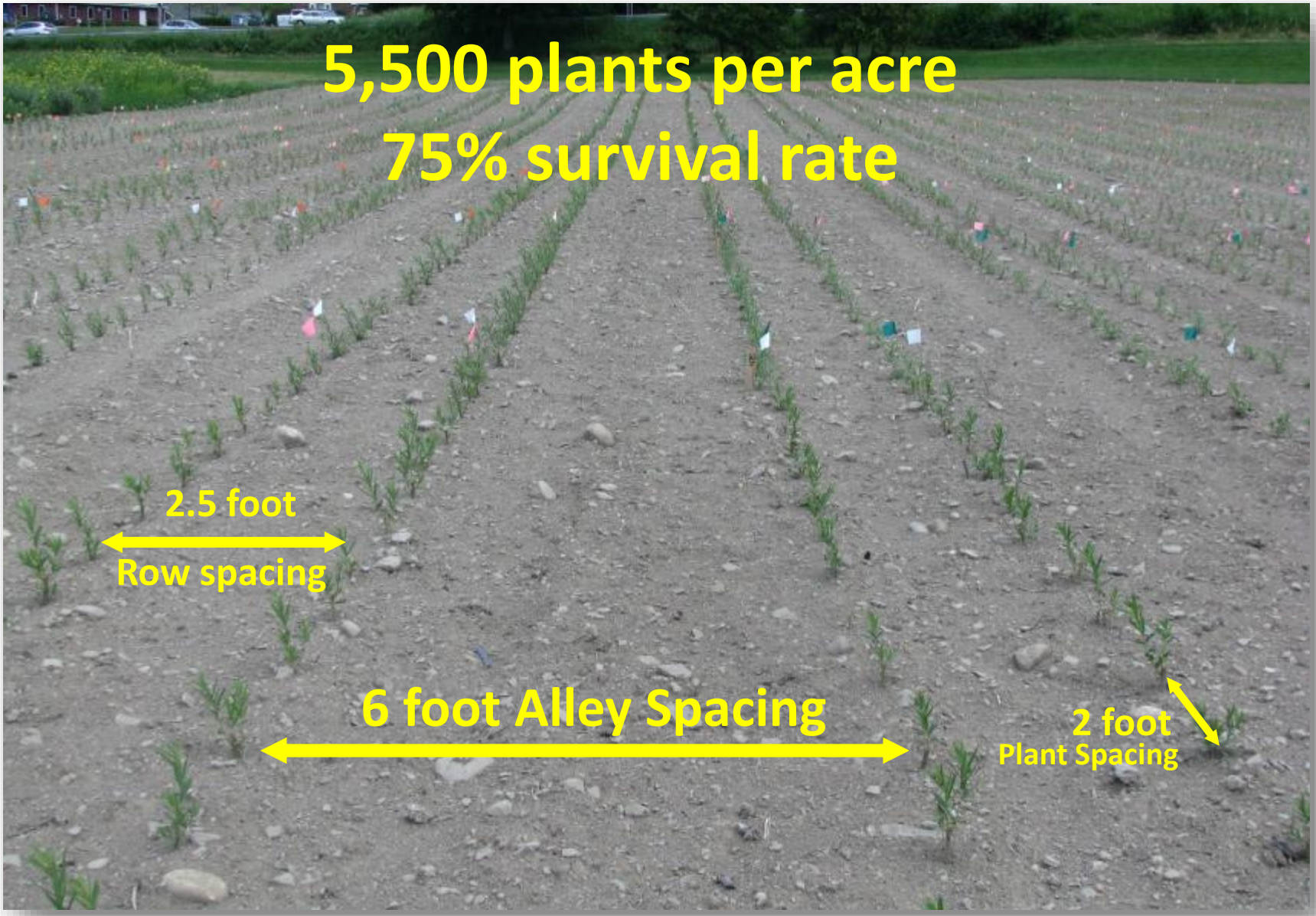
-Specialized planter cuts large willow stems (“whips”) to about 10 inch “cuttings” and plants in one pass

-Equipment and planting services are available from Celtic Energy and Double A Willow

-Improved willow varieties available from Double A Willow

-Orders for spring planting must be placed several months in advance

Double-Row Planting Pattern



Three Years After Coppice

Willow Harvesting

New Holland forage harvester and 130FB header

- ✓ Developed by Case New Holland and SUNY-ESF from 2008 - 2012
- ✓ Reduced harvesting costs by 35% (Eisenbies et al. 2014)
- ✓ Now available for purchase or rental

EcoWillow Model

- Cash flow model
- Willow biomass crops
- All phases of production
- User-friendly & customizable
- Recently updated using..
  - Commercial operations
  - Latest research studies
  - Example production scenarios

Download at:
www.esf.edu/willow

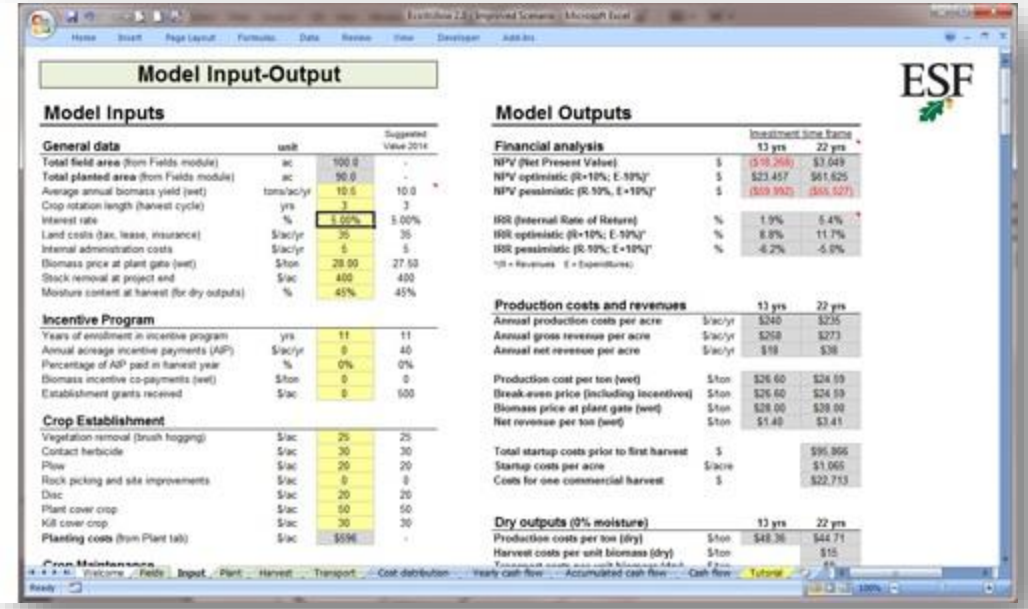
Economics of Production

Base Case Scenario 2014

- Conservative estimates of profitability
- 22-year life cycle of the planting including tear-out
- Does not include best BCAP incentives or best practice targets

Model Outputs

- Break-even scenario
- Payback is entire life cycle of project



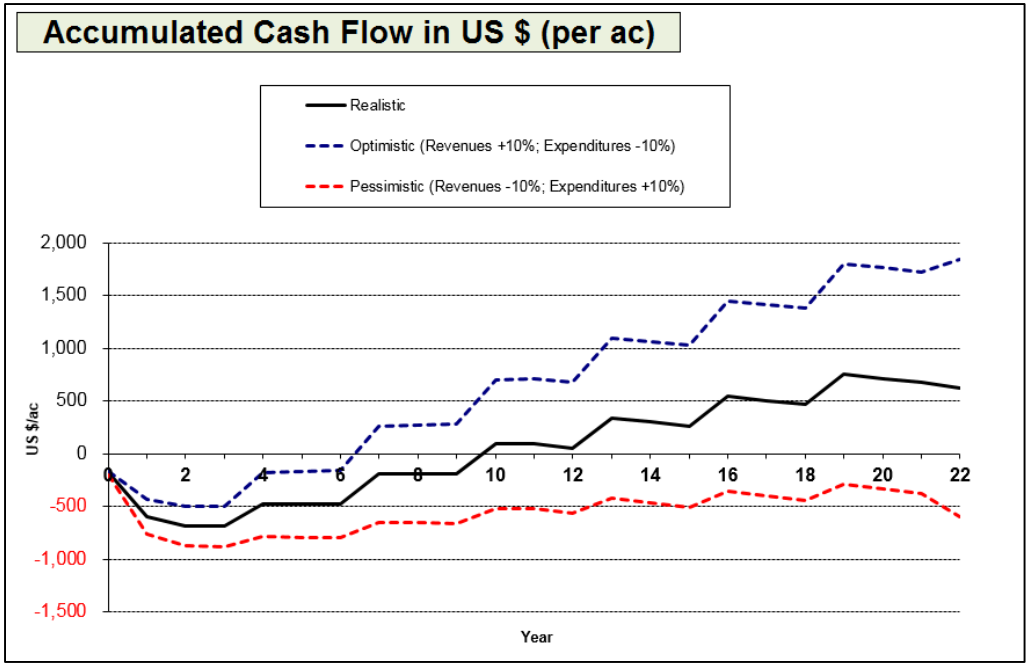
Economics of Production

Base Case Scenario + BCAP Incentives

- 2014 base case assumptions and 2015 BCAP funding

Model Outputs

- Positive NPV
- IRR 10%
- Payback…
  - 10 years after planting
  - Third Harvest
- All-in costs about $25/ton



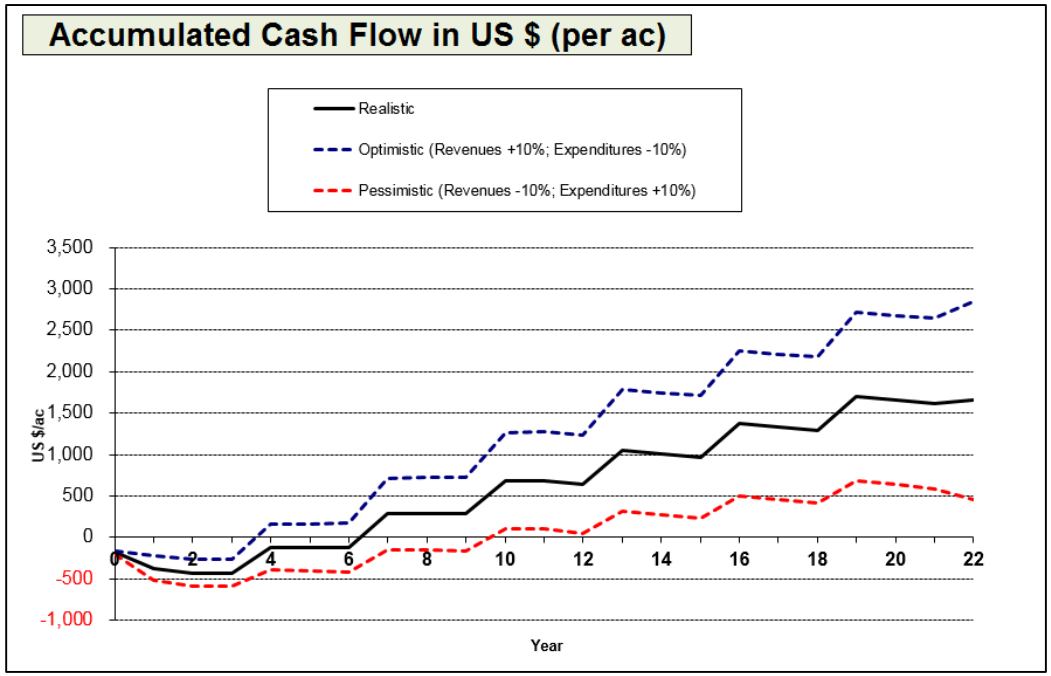
Economics of Production

Improved Base Case + BCAP Incentives

- Adds current BCAP incentives and best practice targets to base case

Model Outputs

- Positive NPV
- IRR 20%
- Payback
  - 7 years after planting
  - Second harvest
- All-in costs about $20/ton

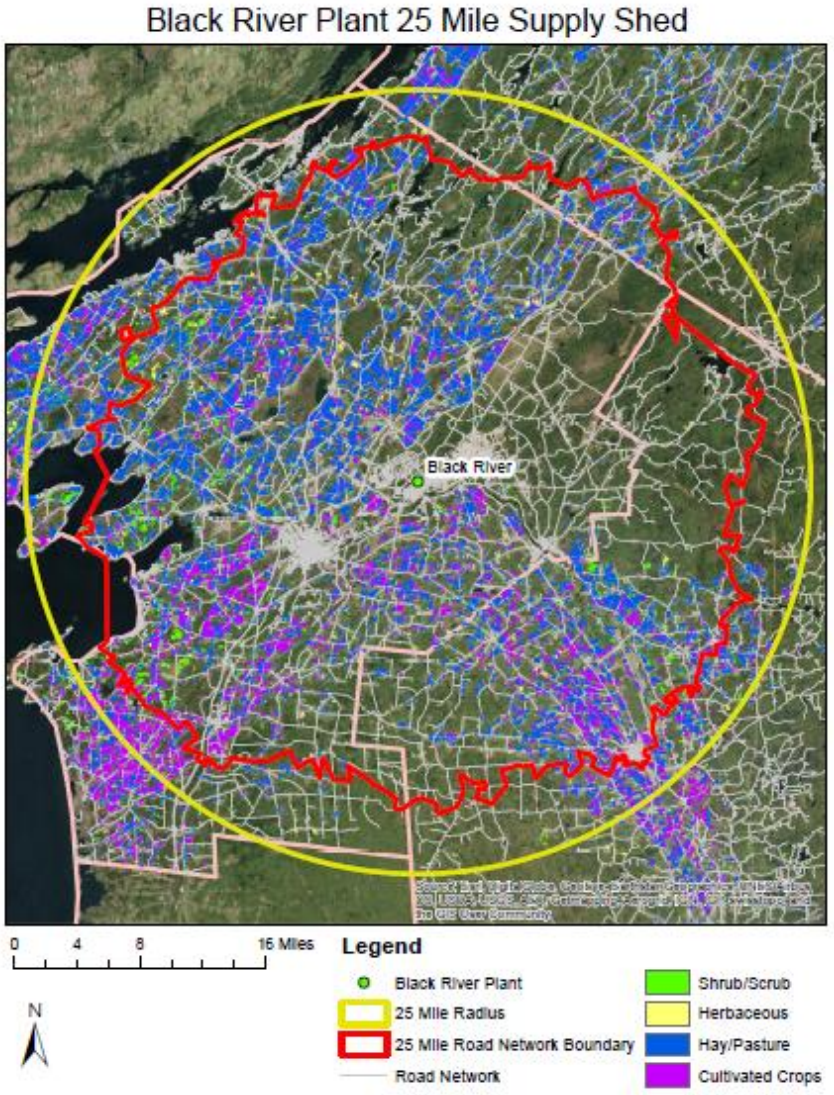


Willow Environmental Benefits

- Carbon neutral lifecycle does not contribute to climate change
- Low lifecycle herbicide/pesticide/fertilizer requirements
- Perennial crop limits soil erosion and nutrient runoff
- Revitalize idle or marginal lands
- Wildlife habitat for birds and mammals
- Creates jobs and rural development

Potentially Available Land

- Recent GIS analysis
- 25-mile road network
- ReEnergy Black River
- 170,000 suitable acres
  - Hay/Pasture: 110,000 acres
  - Row Crops: 40,000 acres
  - Herbaceous/Scrub: 20,000 acres
- Can be grown on marginal lands
- Revitalize underutilized land base



Willow Extension Services

Training and education for BCAP willow…

- Technical assistance
- Outreach programs
- Crop monitoring
- Equipment access
- Analytical tools & research summaries
- Land assessments & consulting services

Willow Summary

- ✓ Promising source woody of biomass
- ✓ Years of research at SUNY-ESF
- ✓ Positive economic returns with BCAP
- ✓ 1,150 acres already established
- ✓ Secure market in ReEnergy
- ✓ Environmental benefits
- ✓ Extension services available
- ✓ **BCAP incentives for a limited time**

Thank You!

Please contact us at…

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