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Notice

This quarterly report was prepared by Penn State University and NEWBio research, extension and education partners from Cornell University, Delaware State University, Drexel University, Ohio State University, Rutgers University, SUNY College of Environmental Science and Forestry, University of Maine, University of Vermont, West Virginia University, USDA Eastern Regional Research Center, US DOE Idaho National Laboratory and US DOE Oak Ridge National Laboratory. This work was supported by Agriculture and Food Research Initiative Competitive Grant No. 2012-68005-19703 from the United States Department of Agriculture National Institute of Food and Agriculture (“USDA-NIFA”).
NEWBio Objectives

I. Understand the values, legacies, and motivations that drive perceptions and decisions about land management and business development for biomass energy systems to overcome barriers to development of perennial feedstocks.

II. Generate price-supply curves, facility siting and forward contracting tools to provide entrepreneur and investor confidence in biomass feedstock supply.

III. Develop and deploy as industry standards sustainable production practices for perennial grasses and short rotation woody crops to improve yield 25% and reduce costs by 20%.

IV. Commercialize the current pipeline of improved willow (*Salix spp*) and switchgrass varieties and develop genomic tools to accelerate breeding for marginal land.

V. Develop harvest, transport, storage and preprocessing systems that increase feedstock value as biomass moves through the supply chain toward advanced biofuel refineries.

VI. Create a culture of safety in the biomass production, transport and preprocessing sectors that addresses machinery hazards and environmental risks to protect workers.

VII. Transform standards of practice for biomass value chains to greatly improve carbon paybacks, net energy yields, soil and water quality, and other ecosystem services.

VIII. Deploy safe, efficient and integrated supply chains in four demonstration regions, each providing 500 to 1000 tons/day of high-quality low-cost sustainable biomass.

IX. Create learning communities of farmers, entrepreneurs, employees and investors informed about the best practices and emerging technologies in their bioenergy interest areas.

X. Provide business support services to generate at least 100 supply contracts and support over 50 new supply chain businesses to harvest, transport and preprocess biomass from short rotation woody crops and warm-season grasses.

XI. Educate students, citizens, landowners and policymakers to increase public understanding of biomass alternatives, including the social, economic, and environmental impacts of sustainable bioenergy systems in the Northeast.

XII. Create a culture of opportunity to support corporate commitments for two commercial-scale advanced biofuels facilities and encourage many more such commitments in the Northeast.
Project Administration

Project Organization and Governance Accomplishments

Project Director Tom Richard continues to lead the overall NEWBio effort, assisted by Associate Director Timothy Volk and Executive Committee members Larry Smart and Jingxin Wang. The committee is supported by Project Manager Barbara Kinne, who coordinates the day-to-day administrative operations.

- **Project Progress**
  Each thrust continues to show satisfactory progress in meeting task objectives and schedules.

- **Advisory Board**
  An Advisory Board meeting was held via teleconference on May 30, 2014. Four board members, four members of NEWBio’s Executive Committee and the project’s two evaluators were on the call. Board Chair Ann Swanson reviewed board recommendations from the 2013 NEWBio Annual Meeting, and Tom Richard discussed project actions taken in response to those recommendations. Board members were provided a copy of the project’s Y3 funding reapplication narrative of accomplishments and plans for the next year. Noted during the call:
  - The NEWBio priority to establish feedstocks on reclaimed mine land is proving to be very challenging. High mortality rates meant new site preparation approaches were needed during Y2. This will be a major issue to tackle.
  - Results will be available shortly on the model developed for large willow plantings’ harvesting, preprocessing and logistics.
  - Safety and Health is investigating a few incidents at biomass facilities that will inform the development of NEWBio’s Biomass Safety Handbook.
  - NEWBio is working now to understand various near-term alternate markets that will continue to build up feedstocks to a scale that could move into acreage needed to supply longer-term refinery markets.

- **Communication and Collaboration**
  A monthly e-NEWS email keeps the project team and external stakeholders informed of research news and publications, field demonstrations, and upcoming biomass educational opportunities, conferences and workshops. The project has also dramatically increased its use of a shared cloud-based drive for articles-in-progress, thrust reports, field work images, and presentation slide decks. The Data Management working group completed work on the handbook, and a sample soils dataset has been uploaded to test the system.
final review of the proposed data use and sharing agreement is expected to be completed in time for the annual meeting.

Feedback was elicited from the project team to build the agenda for our 2014 annual meeting. Goals for the meeting included opportunities for collaborative interactions, especially for graduate students with senior team members, and for the team with industry and advisory board stakeholders. NEWBio’s third year is expected to be a data-rich year, and the team will discuss data management implementation protocols.

- **Financial Matters/Year Three Funding Reapplication**

  NEWBio submitted its Y3 reapplication on May 30 to grants.gov. Our annual progress report was submitted via the REEport portal on June 23. Jillian Worthen (USDA-NIFA) acknowledged receipt on June 24, and forwarded the proposal to the Awards Management Division for processing. Darlene Brown, USDA NIFA Grants Management Specialist, notified Niki Page, Penn State SIRO, of questions that arose from the review process on July 21. Penn State responded to Ms. Brown on July 25.

- **Seed Grants**

  Project Director Tom Richard discussed options with William Goldner, USDA-NIFA Program Manager, for distributing the $20,000 in sponsored funds earmarked for seed grants. The proposal submission and approval process has proven to be somewhat time-consuming relative to the amount of funding. It was agreed that no seed grant proposals would be submitted for Y3. Y3 funds were rolled into existing thrust budgets where needed. For Y4 and Y5, seed grant proposals will become a part of the overall funding reapplication each spring.

**Plans for Next Quarter**

- NEWBio will hold its annual meeting at the Cornell-NY State Ag Experiment Station in Geneva on July 31-August 1, 2014. The agenda includes several opportunities for thrust interactions (field tours, a stakeholder panel discussion, cross-thrust meetings, and a competitive poster session), two workshops (‘Packing the Publications Pipeline’ and ‘Making the Most of Your NEWBio Team: Collaborative Strategies’), and an Advisory Board meeting. We’ll also have a project-wide ‘huddle’ on the second day that includes two brief presentations by invited guests, and group discussions on aspects of the Safety and Health thrust’s research, and implementation of our data management plan.

- We will submit an annual progress report in September that will cover the entire period of performance for Y2.

- NEWBio will inaugurate its Twitter feed in July: Austine Decker, a social-media-savvy rising junior at Penn State will join the project team and assist all thrusts, but primarily
NEWBio Quarterly Report for April through June 2014

Extension, in increasing NEWBio’s visibility with feature articles for the newsletter, twitter feeds, and targeted press releases.
Publications and Products

Peer-Reviewed Journal Articles


Scientific, Technical, Professional Journals
None to report this quarter.

Books/Book Chapters
Conference Presentations


Other Publications/Presentations

Patents or Licensures

Applications for Plant Variety Protection
None to report this quarter.
Educational Aids or Curricula


Proposals Submitted
Tooker, J.F., A. Kemanian, L.B. Smart. Polycultures: Using biodiversity to increase crop productivity and resiliency while reducing the agrochemical footprint of agricultural systems. USDA-NIFA Foundation Program, $500,000 requested, 10/1/14-9/30/17


Fact Sheets
None to report this quarter.

Workshops, Webinars, Field Days, Demonstrations, Symposia, Trainings
Callaghan, Meaghan. 2014. Differing Perspectives of Biomass Energy in New York State: Comparing Newspaper and Website Biomass Communications. SUNY ESF Department of Environmental Studies Senior’s Showcase, SUNY ESF Spotlight on Research. Syracuse, NY.

Cornell University, Field trip and 1-hour presentation for BEE 6940, Grasses for Bioenergy. Students viewed switchgrass germination and establishment in greenhouse. Seven students attended. April 30, 2014.


Heavey, J. Willow BCAP. Presentation at the North Country Clean Energy Conference, Lake Placid, NY. June 4-6, 2014.


Marrison, D. Miscanthus Production. Presentation to the Rock Creek Travelers Group, Rock Creek, OH. May 20, 2014.


NEWBio Bioenergy Short Course: New Markets for Bioenergy Crops. May 21, 2014. Presentations:
- Richard, T. L. Biomass Resource Overview in the Northeast U.S.

- Crawford, R. Research on switchgrass seeding rates, seeding time, and seed treatments with insecticides and fungicides;
- Songsomboon, K.: New research on breeding for resistance to disease on switchgrass caused by Bipolaris species;
- Volcko, J.: Breeding switchgrass for production on acid soils.


Other
Jacobson, M. Blog post: Supreme Court says EPA can regulate greenhouse gases; biogenic emissions unclear. June 30, 2014.
Thrust 1: Human Systems in the Northeast Regional Bioeconomy

Human Systems focuses on understanding the values, legacies, and motivations that drive perceptions and decisions about land management and business development for biomass energy systems. During the project’s first year, the team began to acquire and synthesize socio-economic data and develop a media library on the social acceptability of biomass. During year two, the team will a) project the economic availability of biomass feedstocks in the Northeast with an emphasis on dedicated feedstocks from mined lands and other economically marginal lands, b) complete the media analysis to identify key issues in proximate communities related to the biomass energy industry and state policy analysis related to bioenergy for NY and PA, and c) start interviews with biomass growers and potential growers in NY and PA, and initiate the scoping of communities near demonstration sites to identify key issues and key informants.

Task 1.1: Understanding social and economic constraints
Task 1.1.1: Economic availability

1. Planned Activities
   - Continue to work on POLYSYS to evaluate feedstock supply and price;
   - Incorporate modeled yield data from within NEWBio and NE Sun Grant Initiative feedstock partnership.

2. Accomplishments
   ✓ Graduate student Wei Jiang completed a review of the literature on marginal lands for bioenergy production and is now working on a manuscript looking at economically marginal lands for bioenergy production
   ✓ Wei Jiang also presented a paper at the 1st Symposium of the International Society of Forest Resource Economics (see sidebar).

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

Conceptual Discussion of Economically Marginal Lands for Planting Energy Crops
Presentation by Wei Jiang, PhD Student at Penn State, at the International Society of Forest Resource Economics, March 17-18, 2014, St. Louis, MO.

Abstract:
A major critique of large scale biomass production is competition for land between food and energy crops. A commonly suggested solution is to limit energy crops production to marginal lands. Physical marginality (soil quality, slope and location) is often used when discussing marginal lands. However, as important is the economic marginality. This paper will first identify economically marginal lands by comparing break-even prices for energy crops and food crops and then turn to assess farmers’ willingness to plant energy crops on economically marginal lands by using discrete choice model. By combining economical margin with biophysical margin, we can provide a comprehensive map of marginal lands for food crops, and in so doing identify lands targeted for energy crops.
4. Plans for Next Quarter

- Continue working with Cycles Data for estimating energy crops;
- Compare the Cycle’s Yield Data with PRISM Yield Data (Oak Ridge National Lab);
- Continue working with POLYSIS model output by extending Year to 2022.
- Begin to calculate break-even cost for energy and food crops.

Task 1.1.2: Social Acceptability

1. Planned Activities

- Hire a post-doctoral research associate;
- Work on publication on media analysis;
- Develop key informant interview questions and interviewee list for New York;
- Work on literature review (landowner and community perspectives on bioenergy/biofuels; Energy transitions; hydraulic fracturing in New York);
- Construct database of federal, regional, and state level policies that influence bioenergy production in New York;
- Review results of media analysis and interviews to develop procurement supplier analysis.

2. Accomplishments

- Morey Burnham hired as post-doctoral research associate.
- Continued working on media analysis publication;
- Parker, Selfa, and Burnham were invited to submit a paper to a special issue of the journal *Energies* discussing the coupling potential of carbon capture and storage technologies with biofuels;
- Refined questions for the interviews that will be conducted by the Human Systems group for the purpose of interviewing key informants in New York;
- Identified key actors in New York bioenergy development for key informant interviews;
- Burnham working on policy database;
- Completed coding and analysis of Lancaster Farming bioenergy corpus;
- Completed transcription of Crawford County interviews;
Parker presented a paper at the Annual Association for Environmental Studies and Sciences Conference in New York, June 1-14, 2014 (see sidebar);

Undergraduate student Meaghan Callaghan presented a poster at SUNY ESF Department of Environmental Studies Senior’s Showcase, SUNY ESF Spotlight on Research: Differing Perspectives of Biomass Energy in New York State: Comparing Newspaper and Website Biomass Communications

3. Explanation of Variance
Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
• Finish media analysis publication;
• Begin key informant interviews in New York;
• Finish policy database;
• Finish literature review;
• Identify New York landowners for interviews;
• Supply Chain Management group will work with Human Systems group;
• Review results of media analysis and interviews to develop procurement supplier analysis;
• Review and code of March Crawford County interview transcript;
• Completed transcription of Crawford County interviews.

Powering the Anthropocene: News Media’s Take on the Future of Energy
Presentation by Andrea Feldpausch-Parker, PhD Student at SUNY-ESF, at the Annual Association for Environmental Studies and Science Conference, June 11-14, New York, NY.

Abstract:
For the majority of the public, news media serves as a conduit for information on scientific and technological innovation, understanding and opinion. Incidentally, it also serves as a space for public discourse, impacting and being impacted by interpretations of scientific and technological events. In this paper, I presented a meta-analysis of state-level newspaper representations of controversial energy technologies that are linked in one way or another with climate change mitigation and/or adaptation. The meta-analysis is comprised of studies that include states directly or indirectly impacted by the particular technology. Using the Socio-Political Evaluation of Energy Deployment (SPEED) framework, I compared the economic, social, and cultural contexts of various energy technologies in their infancy. These technologies include carbon capture and storage, wind energy, high volume hydraulic fracturing and woody biomass. These fossil fuel-related and renewable energy technologies come with tradeoffs often portrayed in the media as risks and benefits to society and the environment. Comparisons between these technologies show an overly positive presentation of renewable energy sources (wind and biomass) and technologies mitigating CO2 production from fossil fuel use (carbon capture and storage). Reporting on these three energy technologies tend to focus on the economic, political/legal and technical aspects, whereas coverage of hydraulic fracturing as a fossil fuel energy source is presented in a predominantly negative light, with a focus on political/legal, environmental and technical aspects.
Thrust 2: Feedstock Improvement for Perennial Energy Crops

Feedstock Improvement will optimize low input perennial feedstock crops (shrub willow and perennial grasses) that research has shown to be the best suited for Northeast climates and marginal soils. Feedstock Improvement’s goal is to deliver plant cultivars with improved performance across the wide range of marginal land types found throughout the Northeast. During the first year of the project, the willow team conducted more than 60 crosses, 27 of which were successful and produced over 4,600 seedling progeny. Switchgrass and willow yield trials and demonstration sites were established in NY, OH, PA and WV. During year two, the team will collect measurements of first season growth in yield trials of new willow cultivars that will indicate their yield potential relative to existing commercial cultivars. We will also continue to generate novel hybrid willow progeny and establish new trials for trait mapping in willow. Evaluations of a new switchgrass trial will inform us about the impact of disease on yield and ongoing surveys of switchgrass breeding nurseries will lead us toward new cultivar selections.

Task 2.1: Breeding of non-invasive triploid hybrids of willow displaying hybrid vigor

1. Planned Activities
   - Plant 2014 Tetraploid-Diploid Crossing Block willow trial;
   - Cut back all remaining stems in the willow nursery beds prior to bud break in spring;
   - Plant 2014 Triploid QTL mapping willow trial;
   - Conduct growth, phenology, and pest measurements in the 2012 Salix purpurea Association Trials;
   - Plant seedlings from 2014 willow crosses in nursery beds;
   - Plant clonal willow material obtained from collaborators in nursery beds.

2. Accomplishments
   ✓ Willow cuttings for the 2014 Crossing Block Trial have been planted in three blocks all with tetraploid females surrounded by either tetraploid or diploid males. The three blocks include: unimproved tetraploid females and tetraploid males (FOUNDATION); unimproved tetraploid females with diverse, unimproved diploid males (UNIMPROVED), and improved tetraploid females with improved diploid males (IMPROVED). The improved block contains 12 males and females, unimproved and foundation blocks include eight males and females, each represented in single plant plots and replicated four times. Pre-emergence herbicide was applied for weed control.
   ✓ The 2014 QTL Mapping Trial was planted, containing 1079 progeny from eight families plus the parents of those crosses and commercial check clones. Each entry is planted in
three plant plots and replicated four times in Geneva. Pre-emergence herbicide (SureGuard, a.i. Flumioxazin) was applied for weed control.

☑ Stem segments from the 2012 Geneva, NY, Morgantown, WV and Portland, NY Association Trials have been measured for specific gravity and are being milled for composition analysis by HR-TGA.

☑ GBS genotyping of the genotypes in the Salix purpurea Association Trials has been completed and the marker data are being analyzed.

☑ Crosses aimed at recurrent improvement of diploids and the production of novel triploid hybrids were completed, with 53 crosses attempted and seedlings of 15 families produced. Growth data from the S. purpurea association trials was used to identify superior female clones, and open-pollinated seed, as well as seed from the triploid female ‘Preble’ was collected from these improved S. purpurea females. These seed were sown in the greenhouse and seedlings are nearly big enough to plant out in nursery beds.

☑ Surveys of bud break, early pest incidence, and early height growth have been completed at the WVU, Geneva, and Portland Association trials.

☑ SUNY ESF’s New Holland FX45 forage harvester with CRL willow header was used to cut back Geneva willow nursery beds.

☑ New germplasm (20 genotypes) was obtained from Vermont Willow Nursery, Arnold Arboretum, and Morton Arboretum and was planted out in nursery beds.

3. **Explanation of Variance**

   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**

   - Continue the 2012 Association Trials for growth and physiological traits and pest and disease incidence;
   - Conduct weed management for 2014 Crossing Block and QTL Mapping Trials in Geneva;
   - Maintain all nursery beds with breeding progeny and archival clone collections;
   - Begin analyzing stem segment samples from the 2012 Association Trials for biomass composition.

**Task 2.2: Genetic basis for pest and disease resistance in willow and perennial grasses**

1. **Planned Activities**

   - Continue to analyze leaf images for rust prevalence;
   - Begin controlled feeding assays for potato leafhopper and willow leaf beetle;
• Conduct willow pest survey in the 2013 Family Selection Trial;
• Apply fungicide in switchgrass anthracnose fungicide trial for 2014;
• Collect growth assessments for switchgrass germplasm trials in NJ and NY.

2. Accomplishments
✓ Leaf image rust analysis continued with a high school student employee to complete the analysis over summer.
✓ First-year post-coppice growth in the 2013 Family Selection Trial was surveyed for pest damage we believe was caused by pale green weevil (*Polydrusus impressifrons*).
✓ Early season pest/disease surveys were completed at the 2012 Yield Trials at Rock Springs, PA.
✓ Willow cuttings of resistant and susceptible parents and three of their progeny were planted in pots for feeding assays using potato leafhopper and willow leaf beetle. New insect cages were purchased and assembled. Feeding studies will be conducted in the next quarter.
✓ The first fungicide application for the switchgrass anthracnose fungicide trial was applied in May 2014 and the second was applied in June of 2014.
✓ Vigor was assessed in all switchgrass germplasm trials in Freehold and New Brunswick, NJ.
✓ Data for manuscript on switchgrass anthracnose resistance has been analyzed and draft manuscript is in preparation.

3. Explanation of Variance
Most activities and accomplishments are on schedule.

4. Plans for Next Quarter
• Continue to analyze leaf images for rust presence;
• Complete greenhouse trials for beetle and potato leaf hopper feeding;
• Isolate RNA from leaf samples collected from insect feeding studies and begin library construction for RNA-Seq analysis;
• Continue pest/disease surveys in all three 2012 Association Trials;
• Continue pest/disease surveys in 2012 Yield Trials in Geneva, NY and Rock Springs, PA;
• Continue pest/disease surveys in 2013 trial in Fredonia, NY;
• Continue pest/disease surveys in 2013 Family Selection Trial in Geneva, NY;
• Conduct pest surveys in late June/early July in 2013 switchgrass trials in Ithaca, NY, Philipsburg, PA and Freehold, NJ;
• Conduct pest surveys in late June/early July in 2013 switchgrass anthracnose trial in Freehold, NJ;
• Manage switchgrass trials to reduce weeds.

Task 2.3: Breeding and selection of willow and switchgrass cultivars adapted for Northeast conditions

1. Planned Activities
   • Analyze wood properties of samples from the 2012 Willow Yield Trials established under the NE Sun Grant project;
   • Assess survival and cut back willow in the 2013 Fredonia and Willsboro, NY Yield Trials established under the NE Sun Grant project;
   • Apply fertilizer and lime amendments to the amended portion of the 2013 Fredonia Yield Trial;
   • Begin to document disease and insect reaction in switchgrass nurseries over the three locations;
   • Start seed and transplant new switchgrass breeding nurseries. Five populations will be replicated in a poorly drained, marginal field in Ithaca;
   • Assess winter survival of switchgrass in Ithaca;
   • Take soil samples from 2014 Ithaca switchgrass field;
   • Conduct soil metagenomics analysis and soil health (chemistry) analysis of soil samples from willow and switchgrass yield trial sites.

2. Accomplishments
   ✔ Stem segment samples from the 2012 Yield Trials have been milled and are being analyzed for biomass composition analysis by HR-TGA.
   ✔ The 2013 Fredonia, NY Amendment Trial was cut back and fertilizer and lime were added to the amended treatment half of the trial. Pre-emergence herbicide was applied followed by some hand weeding. Survival was assessed after bud break.
   ✔ Survival was assessed in the 2013 Willsboro, NY Yield Trial and was determined to be very low. The major cause of mortality seemed to be rodent herbivory coupled with flooding and winter damage. Remaining survival was too low to continue the trial.
   ✔ In spring of 2013 a project was initiated to characterize the soil microbial communities and soil chemistry in the willow trials to assess below ground effects on above ground productivity. Replicate soil samples were collected at the willow trials planted at Philipsburg, Rockview and Rock Springs, PA, the WVU agronomy farm, Clements and Squires' Creek, and Willsboro and Fredonia, NY sites. Approximately eight soil samples
were collected from each trial. Half of each samples was sent to the Cornell soil health lab for chemical analyses and half to the Carlson lab for metagenomic analysis. Total DNA was prepared from each soil sample followed by quality checks. In the first 2 quarters of 2014, individually barcoded libraries were prepared and sequenced for each of the high quality soil DNA samples. On average, 4 million DNA sequences totaling 400 million bases of sequence were obtained for each of the sequenced DNA libraries. Assembly and analysis of the data commenced. Soil health chemistry analyses were also completed for all samples.

- A phone call between Rutgers and Cornell took place on May 2nd. We discussed what data to collect on the switchgrass nurseries.
- For the Ithaca nursery planted in 2013, the plants were assessed for winter survival and early spring vigor on May 27th. Height notes and a second rating for vigor were also taken on June 20-23. A summary of these results will be presented at the NewBIO annual meeting.
- For the new Ithaca nursery to be planted in 2014, seedlings had been started in the greenhouse of five new populations. The seedlings continued to grow well during this quarter and were moved to cold frames at the end of June. The field was prepared for planting during this quarter.
- For the Freehold, NJ nursery planted in 2013, the plants were assessed for winter survival and vigor. Manual weed control was done twice to remove annual grassy and broadleaf weeds and switchgrass volunteer seedlings.
- Plans for taking additional soil samples for soil health analyses and for metagenomics to send to John Carlson were made.
- Samples were organized, summarized and sent to Michelle Serapiglia and Akwesi Boateng for pyrolysis analysis. Michelle gave Lindsey Hoffman and our NEWBio Scholar (Christopher Mann) a tour of the pyrolysis laboratory. Approximately 90 samples were sent for analysis. This corresponds to replicated switchgrass clones grown in three different locations for which lignin, cellulose and hemicellulose is known. Additionally 20 kg of Timber switchgrass biomass was ground and also shipped to the pyrolysis lab for analysis.

3. **Explanation of Variance**

Due to very low survival in the 2013 Willsboro, NY Yield Trial and no continued funding to support this trial from the Northern NY Ag Development Program, it has been decided to abandon this trial site and return the land to long-term cover.
4. Plans for Next Quarter
   • Monitor willow and switchgrass trials for weed pressure, apply mechanical and/or chemical treatments where necessary;
   • Collect additional soil samples to continue the analysis of soil chemistry and DNA sequences for the remaining willow (2014 Mylan Park Yield Trial) and for new switchgrass trials (Cornell-Ithaca and Rutgers). Libraries will be produced and sequenced for the new samples as well as for the remaining soil samples collected in 2013. Large scale metagenomic analyses of the soil DNA sequence data will also continue, with preliminary results to be ready for this year’s annual report.
   • Collect performance, insect, disease data on switchgrass trials planted in 2013;
   • Plant the 2014 switchgrass nursery;
   • Develop posters for the International Poplar Symposium, Short-Rotation Woody Crops Meeting, and NEWBio Annual Meeting in July.

Task 2.4: Breeding and selection of willow and switchgrass yields on reclaimed mine land

1. Planned Activities
   • Assess survival in the 2013 Philipsburg willow yield trial;
   • Plant Mylan Park mine land site with new willow yield trial, replant as needed;
   • Solidify spring management plan for switchgrass mine land trial and make plans for data collection for 2014 on all switchgrass plantings;
   • Replant check cultivars in PA reclaimed mine site in spring 2014;
   • Review soil sample chemical analysis results from reclaimed mine site and develop plan for adding fertility at the reclaimed mine site in spring.

2. Accomplishments
   ✓ Survival in the 2013 Philipsburg, PA willow Yield Trial was surveyed and determined to be very low due to frost heaving and winter damage. Due to high mortality, it was decided that this planting would be abandoned and plans made to prepare the site for planting again in 2015.
   ✓ The Mylan Park, WV site was replanted with willow on May 6 and 7 to establish the 2014 Mylan Park Yield Trial containing 10 genotypes selected based on survival and growth data from the previous 2012 trial planted at that site. Pre-emergence herbicide (SureGuard, a.i. flumioxaxin) was applied for weed control, which was followed up with hand weeding (see accompanying image). Survival was assessed and is over 96% on average. The few cuttings that did not grow were replanted.
The switchgrass trial at Philipsburg, PA was fertilized. Ryan Crawford and Joseph Volcko (2014 NEWBio scholar) traveled to Philipsburg on June 16, 2014 and took notes on the New York germplasm planted. They noted plant survival, plant vigor, and plant height. In the New York switchgrass nursery, plants were replanted a few weeks after the initial establishment of the nursery in 2013. These replanted plants are clearly much smaller than the plants originally established. Thus any yield ratings or topgrowth harvested will need to be clearly identified as to the plants initial establishment date. For this year, yields from the entire nursery all pooled together will not be useful data. The check rows were also replanted by the Rutgers group in spring 2014 and thus will not be well established until next year. Stacy Bonos and Lindsey Hoffman (NEWBio post doc) traveled to Philipsburg on June 10, 2014. In the NJ switchgrass nursery plants were noted for survival and vigor. Check rows in both NJ and NY nurseries were replanted. However, as noted above these plants were extremely smaller than established plants that survived from 2013.

A Miscanthus trial with 5,000 rhizomes was planted on the Philipsburg, PA reclaimed mineland site after 26 tons of spent mushroom compost were added as a soil amendment.

3. Explanation of Variance
Due to very low willow survival in the 2013 Philipsburg Yield Trial, we have abandoned this planting and will make plans for better site preparation based on experience in Morgantown, WV. We will plan to replant this site in 2015.

4. Plans for Next Quarter
- Monitor 2014 Mylan Park trials for weed pressure;
- Conduct data collection for 2014 on switchgrass plantings to assess disease and insect pressure and plant maturity;
• We will travel to Phillipsburg in July and August to continue to monitor vigor and growth of switchgrass nurseries;
• Plan for site preparation and replanting of willow trial at Philipsburg, PA;
• Plans for harvesting or rating for yield will be developed in consultation with Lindsey Hoffman, Stacy Bonos and Marvin Hall.

*Rutgers Post-Doc Lindsey Hoffman records data on switchgrass vigor at the Philipsburg, PA, reclaimed mine land site in June.* Image credit: Stacy Bonos
Thrust 3: Harvest, Preprocessing, and Logistics of Integrated Biomass Supply Chains

For perennial crop systems like willow, miscanthus and switchgrass, harvesting and transportation can account for 40 to 60 percent of the delivered cost of biomass. Preprocessing of biomass through drying, size reduction, storage and compaction can increase transportation efficiency, reduce delivered costs, and improve conversion efficiency. During the first year of the project, the team designed willow and switchgrass harvesting protocols and collected time-motion data for various pieces of harvesting equipment, and developed base case models for these feedstock supply chains and models for optimizing biomass harvest and logistics scenarios. Year two efforts will include biomass harvest production and cost data analysis, further refinement of the supply chain optimization model, and biomass storage and dry biomass loss testing and analysis. Further tests will also be conducted on torrefaction, pelletization and pyrolysis. Techno-economic and life cycle analyses will be improved through more robust process modeling and data acquisition.

Task 3.1: Significantly reduce the harvesting cost per ton of biomass feedstocks from willow and perennial grasses

Task 3.1.1: Optimize the operation of the forage harvester

1. Planned Activities
   - Continue to process time motion data from large scale harvests.

2. Accomplishments
   - Collected time-motion data on large-scale harvest;
   - Organized data to prepare for data processing in the next quarter;
   - Examining alternative data analysis methods, to improve work flow.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   - Process time motion data from large-scale harvests.
Task 3.1.2: Detailed time and motion data collection and fuel use analysis

1. Planned Activities
   • Collect forage harvester data.

2. Accomplishments
   ✓ Collected Data on Spring harvests of Willow
   ✓ Processing Collected Data to prepare for Data Analysis

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   Analyze forage harvester data.

Task 3.1.3: Cost effective technologies for harvesting perennial grasses

1. Planned Activities
   • Continue data collection.

2. Accomplishments
   ✓ Collected data on the harvest of several thousand pounds of miscanthus from sites in West Virginia.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   • Process collected data.

Task 3.1.4: Optimize the operation of the perennial grass harvester

1. Planned Activities
   • Continue data collection.
2. **Accomplishments**
   - Continued data collection on the operation of the grass harvester.

3. **Explanation of Variance**
   Data collection is behind schedule due to severe weather conditions limiting equipment operation earlier in the year.

4. **Plans for Next Quarter**
   - Process collected data.

**Task 3.1.5: Feedstock Logistics, supply chain and modeling optimization**

1. **Planned Activities**
   - Validate and optimize forage harvest models, including data inputs.

2. **Accomplishments**
   - Completed models for woody biomass harvest that include the forage harvester.
   - Optimized the model to incorporate forest biomass and SRWC.
   - Manuscript preparation underway.

3. **Explanation of Variance**
   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**
   - Revise models based on new research.

**Task 3.2: Quantify the role of preprocessing for densification and storage on transportation efficacy and downstream fuel conversion**

**Task 3.2.1: Quantitative metrics of preprocessing parameters of biomass densification**

1. **Planned Activities**
   No activities were planned for this quarter.

2. **Accomplishments**
   None to report this quarter.
3. **Explanation of Variance**
   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**
   - Conclude torrefaction tests and analysis of feedstocks.

**Task 3.2.2: Effects of preprocessing transportation and downstream fuel conversion**

1. **Planned Activities**
   No activities were planned for this quarter.

2. **Accomplishments**
   None to report this quarter.

3. **Explanation of Variance**
   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**
   - Conclude measurements of energy and fuel yield from torrefied biomass.

**Task 3.2.3 Biomass densification**

1. **Planned Activities**
   - Continue densification studies for switchgrass, Miscanthus, and willow; analyze impacts.

2. **Accomplishments**
   ✓ Preparing a manuscript on non-catalytic and catalytic pyrolysis.

3. **Explanation of Variance**
   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**
   - Continue densification studies for switchgrass, miscanthus, and willow.
   - Analyze densification impacts.
Task 3.3: Assess the storage requirements and effects of long term storage on the quality of willow and perennial grasses

Task 3.3.1: Storage system development and assessments for perennial grasses

1. Planned Activities
   - Continue long-term storage studies for switchgrass and miscanthus harvests.
   - Analyze storage impacts.

2. Accomplishments
   ✔ Monitoring of ongoing studies continues, while investigating additional opportunities to expand research.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   - Continue long-term storage studies for switchgrass and Miscanthus harvests and analysis of storage impacts.

Task 3.3.2: Storage system development and assessments for willow

5. Planned Activities
   - No activities were planned for this quarter.

6. Accomplishments
   None to report this quarter.

7. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

8. Plans for Next Quarter
   - No activities are planned for next quarter.
Task 3.4: Techno-economic analysis, cost engineering, and life cycle analysis of densification, storage preprocessing and biorefinery integration

Task 3.4.1: Develop an integrated supply chain model

1. Planned Activities
   • Validate and optimize models for alternative integrated supply chains.

2. Accomplishments
   ✓ The models have been validated against the currently available technology.
   ✓ The models have been input into optimization solvers and preliminary solutions have been developed.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   • Generate equipment performance parameters, biomass material format characteristics and ranges for each alternative supply scenario.

Task 3.4.2: Cost engineering models for satellite preprocessing and storage

1. Planned Activities
   • Refine estimates of preprocessing facilities

2. Accomplishments
   ✓ Refinement of the cost estimates are ongoing and progressing.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   • Continue to refine estimates of preprocessing facilities.
Task 3.4.3: Life Cycle analysis, techno-economic analysis, and model integration

1. Planned Activities
   - Construct the SimaPro model.

2. Accomplishments
   ✓ Base SimaPro model has been developed.
   ✓ A WVU graduate intern was co-located with Idaho National Lab for a month to work on the development of the model.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   - Continue to refine and update the SimaPro model.
Thrust 4: System Performance and Sustainability Metrics

Sustainability will assess the overall system performance and sustainability of biomass to biofuel systems through a combination of detailed measurements at willow and perennial grass experimental sites, regional simulations using benchmark scenarios, and integration of the techno-economic analysis. During year one, the team defined benchmark locations for assessment monitoring and modeling, established cover crop experiments, and formed a data management working sub-group with representatives across NEWBio thrusts to coordinate data and metadata collection. Year two activities will focus on implementation of a data management plan for NEWBio that cross-cuts all thrusts.

Task 4.1: Site- and crop-specific knowledge gaps
Task 4.1.1: Biomass production

1. Planned Activities
   - Complete the second eddy covariance tower installation;
   - Continue simulations for BCAP areas;
   - Finalize the data use agreement for yield trials.

2. Accomplishments
   ✔ All eddy covariance towers installed and functioning in paired maize/willow fields.
   ✔ Started hand-sampling whole willow plants at Rockview (at roughly six-to-eight-week intervals) to complement the eddy covariance tower carbon balance.
   ✔ BCAP simulations continue, with preliminary results presented to the NEWBio team.
   ✔ Yield trial data from several locations collected for willow database using non-parametric methods (see Feedstock Improvement, Task 2.3).
   ✔ Simulations nearly completed to estimate biomass production by winter rye within annual ag systems.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   - Start processing eddy covariance data and continue maintenance of towers.
   - Continue simulations for BCAP areas.
   - Finalize rye biomass simulations and manuscript preparation.
Task 4.1.2: Nitrogen demand and alternative supply

1. Planned Activities
   - Complete the prototype model for perennial crop N remobilization.
   - Continue routine monitoring experiments.
   - Establish twin willow 15N experiment at Geneva, in collaboration with Feedstock Improvement.
   - Conduct a needs and literature review for a 15N experiment in miscanthus.

2. Accomplishments
   - 15N trial installed at Geneva, NY in collaboration with Feedstock Improvement thrust.
   - Soil sampled at both 15N trials (PA, NY).

3. Explanation of Variance
   Installation of 15N trial in miscanthus halted due to winter kill in target plots. Reporting of nitrogen translocation model delayed as plant sampling, BCAP area and winter rye required more attention. All other activities and accomplishments are on schedule.

4. Plans for Next Quarter
   - Continue with prototype model for perennial crop N remobilization.
   - Continue routine monitoring experiments.
   - Sample whole (aboveground) willow plants from 15N trials.

Task 4.1.3: Nitrous oxide emissions

1. Planned Activities
   - Continue systematic sampling of soil N.
   - Implement continuous storage of soil data.
   - Begin discussions on testing the nitrous oxide emission model using NY data.

2. Accomplishments
   - Continued soil sampling of NO$_3$.
   - Continued model development and testing for N2O in parallel with a sister project.
   - Soils database development and implementation nearly complete, with some data population underway and manual data retrieval available.
3. **Explanation of Variance**

Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**

- Continue systematic sampling of soil N.
- Implement continuous storage of soil data.
- Continue discussion and start testing the model for nitrous oxide emissions in switchgrass plots at Ithaca, NY.

**Task 4.1.4: Carbon storage**

1. **Planned Activities**

- Maintain two eddy covariance systems.
- Obtain and process soil samples (PA, NY, mineland site at WV).
- Obtain soil samples from NY locations for long-term storage (Fredonia, Mapping Trial).
- Decide whether to add Meadville, PA site to long-term monitoring of soil C via archiving of soils samples.
- Plan for root sampling with SUNY ESF (Volk).

2. **Accomplishments**

- See Task 4.1.1 for eddy covariance tower accomplishments.
- Intact soil cores were taken from Geneva, NY for freezer storage.
- Meadville, PA site not added to long-term monitoring to avoid weakening the current monitoring routine.
- Root sampling planning underway.
3. **Explanation of Variance**
   Soil sampling at Fredonia and WV mineland site has not occurred yet. All other activities and accomplishments are on schedule.

4. **Plans for Next Quarter**
   - Maintain two eddy covariance systems.
   - Obtain soil samples from Fredonia NY and mineland site at WV.
   - Conduct root sampling with SUNY ESF.
   - Prepare posters for the NEWBio annual meeting (Cangiano, Ramcharan).

**Task 4.2: Benchmark scenarios**

1. **Planned Activities**
   - Continue simulations for both annual and perennial crops.
   - Resolve issue of N economy in perennials as this relates to the prototype model.

2. **Accomplishments**
   - First rounds of scenario simulations completed for western PA and northeastern Ohio BCAP area; these include annual crops (corn based rotations) and miscanthus, switchgrass and willow.
   - N economy resolved in practical terms for the simulations. As first analysis requires biomass yield, simulations are run with “automatic nitrogen”, which means that no N stress is simulated.
   - Translating SSURGO database into soils that truly represent “marginal” soil conditions has proven to be a challenge.

3. **Explanation of Variance**
   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**
   - Continue simulations for both annual and perennial crops.
   - Resolve issue of marginal vs non-marginal soils so that modeling activities reflect so-called marginal biophysical conditions.
   - Add impact of stand age in the analysis of the yield results based on recent published data for grasses.
Task 4.3: Regional feedstock supply and environmental assessment

1. Planned Activities
   - Complete an initial internal draft review of the extent to which bioenergy feedstock production may increase emission of biogenic volatile organic carbon compounds, and how these compounds may reduce air quality.
   - Continue with plans from the previous quarter, noting that air quality impacts have been established.
   - Continue efforts on integrating, conceptually, biomass production modeling with landscape characterization.
   - Continue promoting data model development for each NEWBio thrust.

2. Accomplishments
   ✓ Using the BCAP area, progress was made on an integrated economic assessment.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   - In general, continue with activities from previous quarters for the course of the project.
   - Continue efforts on integrating, conceptually, biomass production modeling with landscape characterization.
   - Continue promoting data model development for each NEWBio thrust.

Task 4.4: Biomass to biofuel life cycle analysis and multi-criteria sustainability

1. Planned Activities
   - Continue data collection to compile techo-economic analysis (TEA) models.
   - Continue work on developing a sustainability matrix for a specific example, possibly the BCAP area in Ohio and Northwestern PA.

2. Accomplishments
   ✓ Continued TEA model data collection.
   ✓ Development of sustainability matrix continues.
3. **Explanation of Variance**  
Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**  
   • Continue data collection to compile techo-economic analysis (TEA) models.
   • Continue developing a sustainability matrix for a specific example, possibly the BCAP area in Ohio and Northwestern PA.
   • During the project’s annual meeting, finalize the coordination and implementation of integrated analyses with the Harvest, Preprocessing and Logistics thrust.

**Task 4.5: NEWBio Data Management Plan (new task this quarter)**

1. **Planned Activities**  
   • Revise data management plan (DMP) to incorporate researcher comments.
   • Engage with Leadership team to finalize critical policies: data use and sharing agreements.
   • Continue education on and implementation of the data management plan with thrust representatives.

2. **Accomplishments**  
   ✓ Engaged with Leadership to finalize critical policies on data sharing, access, and use.
   ✓ Created a soils sample data set to be shared.
   ✓ Formalized the data sharing agreement to be used by NEWBio researchers and project collaborators.
   ✓ Worked with Leadership to finalize and incorporate access/sharing and archive/preservation policies for the Data Management Plan.

3. **Explanation of Variance**  
Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**  
   • Finalize the DMP for access and sharing and archive and preservation policies.
   • Specify hardware and software equipment specifications for searching data within the NEWBio library.
   • Create a data tag library generated from researcher metadata.
   • Explore linking NEWBio data to outside sources.
• Establish a goal-based plan for data management implementation for the future project years:
  o Y3 will focus on metadata;
  o Y4 will determine the final library user interface;
  o Y4 will transfer data to the archival server.
**Thrust 5: Safety and Health in Biomass Feedstock Production and Processing Operations**

Safety and health aspects of the biomass product supply chain will be addressed from a holistic, systems perspective. During the project’s first year, the team conducted a literature search to review hazard and risk exposure and identified a framework for describing injury prevention opportunities and risk evaluations. Year Two will focus on developing journal and extension publications and presentations that more precisely identify hazards, best safety practices, and opportunities for safety and health management plans.

**Task 5.1: Biomass safety program development**

1. **Planned Activities**
   - Combine the respiratory and fire hazard information collected into a comprehensive document for eventual publication.

2. **Accomplishments**
   - Respiratory and fire hazard information put into a form as a part of a presentation at the NEWBio Annual Meeting. This will be used to gather thrust direction from the entire group of NEWBio project participants.
   - A webinar highlighting the processing of oilseed crops into alternate fuels of straight vegetable oil and biodiesel occurred Apr. 8, 2014. This webinar was listed on NEWBio and the University of Vermont oilseed crop websites. Presenters were Doug Schaufler (Penn State) and Chris Callahan (University of Vermont Cooperative Extension).

3. **Explanation of Variance**
   Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**
   - Develop respiratory and fire information into a fact sheet for Extension and safety use.
Task 5.2: Safety and health hazard inventory

1. Planned Activities
   ✓ Continue and expand site visits to outlying cropping areas.
   ✓ Site visits will include crop planting during this quarter.

2. Accomplishments
   ✓ Visited a switchgrass production and storage site during spring harvest.
   ✓ Arranged to visit willow nursery and production sites in areas outside Pennsylvania.
   ✓ Arranged to visit a miscanthus production site.

3. Explanation of Variance
   While some site visits have occurred, others have not because of weather issues that delayed biomass crop harvest and planting. Even into late June planting conditions were too wet on the marginal ground being used for miscanthus and willow plantings.

4. Plans for Next Quarter
   - Continue to expand site visits to other operations.
   - Collect copies of operational manuals of biomass harvest equipment.

Task 5.3: Develop, conduct and evaluate a comprehensive safety and health management program

1. Planned Activities
   ✓ Continue collecting photographs of biomass equipment so that current farm safety management publication can be adapted to serve the emerging biomass production/processing industry.

2. Accomplishments
   ✓ Learned the safety perceptions of switchgrass field work from the supervisor of a major switchgrass producer. This included planting, harvest, storage and transport of ~4,000 acres of switchgrass to a central processing facility. We were allowed to photograph any portion of the operation or equipment for safety management publications.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.
4. Plans for Next Quarter

✓ Continue collecting photographs of biomass equipment so that current farm safety management publication can be adapted to serve the emerging biomass production/processing industry.
Thrust 6  Extension

Extension will transfer NEWBio project knowledge and skills developed to support rapid deployment of willow- and warm-season grass-based bioenergy systems for economic, social and environmental benefits. During year one, the team identified potential field demonstration sites, forward-positioned a step planter with a corporate partner, held workshops and webinars, and developed fact sheets and various NEWBio display materials. In year two, the Extension team will consolidate activities at demonstration sites, fully develop the equipment leasing program, and create extension and eXtension materials on business models and other key issues facing the bioenergy sector.

Task 6.1:  Integrated demonstration sites

1. Planned Activities
   - Participate in cooperation with Aloterra on field harvest trial
   - Complete necessary planting, replanting, maintenance activities at demonstration fields
     - Re-plant and further develop WV replicated sites, plant Mylan park site (WV)
   - Continue developing outreach opportunities via field days, tours, and demonstrations
   - Continue monitoring new BCAP funding opportunities for additional willow acreage
   - Provide reports of crop monitoring data analysis to willow growers in Northern New York and assist with upcoming crop monitoring and field activities
     - Begin planning activities for natural gas and willow short courses in fall 2014 and other upcoming outreach events.

2. Accomplishments
   - New York demonstration site:
     - Assistance continues to NY growers regarding crop monitoring/maintenance
     - BCAP outreach remains strong—completed video, research summary in progress (see tasks 6.4 and 6.5)
     - Majority of 850 acres were coppiced over winter and are re-growing nicely. A few areas will need to be replanted due to low establishment from late planting due to wet field conditions in 2013. ESF and growers are seeking re-establishment grants through NRCS.
     - Updates continue to suite of willow outreach materials
     - Email established to field willow inquiries from the general public: willow@esf.edu
     - Local presentations on NEWBio work relevant to demonstration site completed (see publications section)
     - Planning proceeds for willow short course (November) in Syracuse
✓ NW PA/NE Ohio demonstration site:
  o Local presentations on NEWBio work relevant to demonstration site completed (see publications section)
  o Set up miscanthus teaching station at Ashtabula County Ag. Day (May 9)—distributed 1,100 information sheets to students.
  o Working with Aloterra to promote new position (Plant Manager, Andover facility)
  o Coordinated with presenter at a PASA biochar workshop (Brookville, PA, June 28) to experiment with charring a switchgrass bale—was incorporated into program.

✓ WV Demonstration site:
  o Replanting and maintenance (herbicide, weeding, etc.) performed on WV sites as necessary
  o Added 1 complete additional replicate of the biochar/willow demo at each of the 4 WV sites.
  o NEWBio represented at Renewable Energy in West Virginia conference, showcased switchgrass, miscanthus, and willow samples. About 80 attendees.
  o Planning proceeds for natural gas short course (October) in Morgantown

3. Explanation of Variance
   Miscanthus field harvest trial postponed due to poor weather, potential cancellation of this trial as logistic challenges continue/increase due to weather and time constraints.

4. Plans for Next Quarter
   • NEWBio will be represented at several large regional agricultural expos and summer farm shows:
     o Big Flats Perennial Grass
     o Empire Farm Days
     o Ag Progress Days
   • Host a Farm Energy Day in Montgomery County, PA.
   • Complete necessary planting, replanting, maintenance activities at demonstration fields.
   • Continue developing outreach opportunities via field days, tours, and demonstrations.
   • Continue monitoring new BCAP funding opportunities for additional willow acreage.
   • Provide reports of crop monitoring data analysis to willow growers in Northern New York and assist with upcoming crop monitoring and field activities.
   • Finalize planning for natural gas and willow short courses in fall 2014 and other upcoming outreach events.
Task 6.2: Biomass equipment access program

1. Planned Activities
   - Gather and review rental contracts drafted by equipment owners and make available to potential users
   - Monitor and schedule equipment use
   - Begin documenting scheduled equipment sharing using Google calendar.
   - Safety—Become more familiar with equipment program and where equipment is housed. If equipment is scheduled for use nearby, safety team will visit the equipment when available for investigation.

2. Accomplishments
   ✓ Scheduling system in place for reserving machine(s)
   ✓ Safety procedures regarding machinery, logistics continue to be monitored based on existing systems (field visits to current biomass operations)

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   • Continue managing scheduling and distribution of equipment.
   • Continue investigating safety procedures and updating knowledge on this subject.

Task 6.3: Small business and economic development

1. Planned Activities
   • Update marketing opportunities paper for a final version for publication and distribution at May short course on alternate markets
   • Continue work on biomass business models
   • Continue working on media analysis and publication

2. Accomplishments
   ✓ Marketing opportunities white paper completed (refer to publications section).

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.
4. Plans for Next Quarter
   - Continue work on biomass business models.
   - Continue working on media analysis and publications.

Task 6.4: Expand eXtension.org for willow and warm-season grasses

1. Planned Activities
   - Develop in parallel eXtension.org and NEWBio website publication indexes, and examine in general better website integration; this will include making NEWBio publications and resources available on eXtension.org and vice versa;
     o Develop the “Ask an Expert” section;
     o Populate both websites with team members’ expertise and bios;
   - Publish at least one research summary
   - Publish two fact sheets that address top priority topics.

2. Accomplishments
   ✓ NEWBio index of resources created on eXtension website to better integrate across sites and resource locations.
   ✓ Populated NEWBio eXtension index with NEWBio publications and resources.
   ✓ Developed NEWBio “Ask an Expert” section on the eXtension site, with a "widget" that can be embedded onto any NEWBio and partner websites. Specialists are ready to answer Northeast bioenergy questions.
   ✓ Published one expert bio (Smart) on eXtension to serve as a model for other NEWBio collaborators.
   ✓ Published one research summary (see publication section)
   ✓ Additional research summaries in progress.
   ✓ NEWBio webinars posted to eXtension.
   ✓ Facebook and Twitter used to broadcast NEWBio events and resources.
   ✓ Organized Cross-CAP calls to discuss outreach techniques within other bioenergy CAPs, marketing strategies/industry interactions; June meeting focused on evaluation efforts.

3. Explanation of Variance
   Several fact sheet and research summary publications are in the peer review process, with publication pushed to next quarter.

4. Plans for Next Quarter
   - Maintain and update NEWBio index of resources on eXtension website.
• Manage NEWBio Ask an Expert section on the eXtension site.
• Promote NEWBio Ask an Expert “widget” for embedding onto NEWBio partner website.
• Publish four expert bios for NEWBio extension collaborators on eXtension.
• Publish three research summaries (two are in progress).
• Publish two fact sheets (one in progress).
• Continue posting NEWBio webinars to www.learn.extenstion.org.
• Utilize social media to broadcast NEWBio events and resources.
• Coordinate web conference with other CAPs-Extension and use the network to improve outreach efforts.

Task 6.5: Interactive and innovative learning-lessons tools

1. Planned Activities
   • Complete updates to EcoWillow 2.0 (metric to English unit conversions, supporting material revisions, update model scenario examples) and gather and incorporate feedback from stakeholders and experts at the NY demonstration site.
   • Begin creating Willow Producers’ Handbook Fact Sheet series.
   • Continue developing outreach materials (blog posts, webinars, website updates, presentations, and fact sheets).
   • Host short course on alternate markets in May.
   • Begin planning activities for willow short course in fall 2014 and other upcoming outreach events.
   • Present overview of NEWBio and preliminary data on willow growth and mortality at Marshall University’s June Bioenergy Conference in WV.

2. Accomplishments
   ✓ Hosted a short course on alternate markets on May 21 in State College, PA.
   ✓ Continued planning for fall short courses in October and November.
   ✓ Represented NEWBio at WV Bioenergy Conference in June.
   ✓ Updated various outreach products, including EcoWillow 2.0 and other willow products.
   ✓ Completed a video on USDA BCAP willow project area and planting.
   ✓ See the Publications and Products section for details on webinars and outreach presentations delivered.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.
4. Plans for Next Quarter

- Complete planning for upcoming short courses in October/November.
- Present NEWBio’s extension model at Extension Summit Conference in September.
- Continue robust schedule of presentations at field days, workshops, summer ag expos, delivery of bioenergy webinars, and publication of fact sheets.
- Maintain the NEWBio website and blog, continue monthly delivery of eNEWS, and establish a NEWBio Twitter feed.
Thrust 7  Education

The NEWBio education program will develop critical human capital by preparing learners to understand, contribute to, and lead the Northeast US bioenergy industry via three coordinated, complimentary programs that inform, engage, and enable students at secondary, undergraduate, and graduate levels. The education team operationalized all three programs during year one, placing eight bioenergy scholars with mentors at NEWBio partnering institutions, conducting two secondary educator week-long workshops, and inaugurating the graduate distance education program with an online course on biomass energy systems. Year two will continue these efforts.

1. Planned Activities
   • Continue organizing training.
   • Continue planning workshops with site directors.

2. Accomplishments
   • 14 applications have been accepted to date.
   • Organizational meetings have been held to set the agenda for the workshops.
   • Plans have been laid for a unique regional educational event in 2015 (project year #3)

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   • Set up, deliver, and evaluate workshops.
   • Evaluate program annually.

Task 7.2:  Regional Bioenergy Scholars

1. Planned Activities
   • Market program.
   • Review applications, select candidates.
   • Provide training.

2. Accomplishments
   • Eight Bioenergy scholars underwent one week of training and evaluation at Delaware State University.
   • Scholars reported to their host institutions and began their summer mentorship.
   • Program website updated.
3. **Explanation of Variance**  
Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**  
- Continue to provide training for bioenergy scholars.
- Scholars will present results of their summer research to the project team via webinar.
- Scholars to participate in NEWBio annual meeting in Geneva NY on July 31-Aug 01, including poster session.

**Task 7.3: Graduate distance education in bioenergy**

1. **Planned Activities**  
- Marketing of program, and  
- Delivery of courses.

2. **Accomplishments**  
- Program marketed via website and email. Application deadline for Fall 2014 scholarships is July 10.
- Two courses currently being taught:  
  - ABE 884 – Bioenergy Systems  
  - ABE 886 – Bioenergy Harvest and Logistics

3. **Explanation of Variance**  
Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**  
- Market Program.  
- Delivery of courses.  
- Award scholarships for Fall Semester 2014.
Thrust 8  Leadership, Stakeholder Involvement, Knowledge-to-Action (K2A) and Program Evaluation

The primary focus here is to link stakeholder involvement to all NEWBio activities through demonstrated transdisciplinary collaborations, research that is closely aligned with stakeholder needs, and effective and efficient dissemination of scientific knowledge to support the expansion of perennial energy crops in the Northeast U.S.

Task 8.1:  Executive and thrust conference calls

1. Planned Activities
   - Continue monthly teleconferences for Executive Committee and Leadership teams.

2. Accomplishments
   ✓ Held Executive Committee teleconferences on April 3, May 1, and June 5.
   ✓ Held Leadership teleconferences on April 10, May 8, and June 12.
   ✓ Held a total of 15 thrust and working group teleconferences to address such subjects as the Year 3 funding reapplication, data management, feedstock budgets, publications planning, the equipment access program, and annual meeting planning.

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   - Continue monthly scheduling for Executive Committee and Leadership team meetings.

Task 8.2:  All Hands teleseminars and meetings

1. Planned Activities
   - Continue monthly teleseminar schedule to deliver project updates and share thrust progress toward goals and objectives.
   - Engage thrusts, and especially graduate students, in the planning and organization of our monthly teleseminars and the August annual meeting.

2. Accomplishments
   ✓ Held All Hands teleseminars on April 17, May 15 and June 26. Featured seminar topics and speakers are listed in the Publications and Products section.
✓ Assigned the organization of seminar topics and speakers for Fall 2014 All Hands meetings as follows:
  ○ September 25 to Human Systems and Education.
  ○ October 23 to Safety and Health and Extension.
  ○ November 20 will feature an external industry/corporate speaker.
  ○ December 18 to the NEWBio evaluation team.
✓ Thrust leadership and graduate students were polled and asked for input on prioritizing subject matter and activities for future All Hands meetings and for the annual meeting this summer.
✓ Set the agenda for the July 31-August 1 Annual Meeting in Geneva (Cornell/NYS Ag Experiment Station).

3. Explanation of Variance
   Activities and accomplishments are on schedule. No variance to report.

4. Plans for Next Quarter
   • Hold our annual meeting.
   • Complete our Y2 Annual Progress Report (in September).
   • Continue monthly teleseminars.

Task 8.3: External Advisory Board meetings and strategic planning

1. Planned Activities
   • Invite Advisory Board members to participate in NEWBio All Hands teleseminars.
   • Solicit new board member involved in economic and community development.
   • Solicit board member involvement in future All Hands meetings as presenters/co-presenters.

2. Accomplishments
   ✓ Advisory Board members are routinely invited to monthly All Hands teleseminars.
   ✓ An Advisory Board meeting was held via teleconference on May 30, 2014. Participating in the call: Dante Bonaquist (Praxair), Dennis Rak (Double A Willow), Kevin Smith (CNH), Ann Swanson (Chesapeake Bay Commission). Chair Ann Swanson offered remarks on the narrative NEWBio submitted to the USDA as part of its Y3 funding reapplication, and discussion followed a review of NEWBio accomplishments. (See Appendix B for a summary of the meeting.)
3. **Explanation of Variance**  
Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**  
   - An Advisory Board meeting is scheduled for 5 p.m. on July 30, during NEWBio’s annual meeting.

**Task 8.4: Task and project evaluation**

1. **Planned Activities**  
   - Participate in Management and All Team teleconferences.  
   - Observe team interactions.  
   - Develop Y2 evaluation schedule and identify external stakeholders as potential participants.  
   - Seek input from the project team on specific questions to include in the evaluation protocols for Y2.

2. **Accomplishments**  
   - ✓ Established a schedule for the Y2 evaluation’s Advisory Board interviews, and survey of the internal NEWBio project team.  
   - ✓ Created the interview protocol, with questions reviewed by a subset of the Executive Committee.  
   - ✓ Began to schedule interviews with Advisory Board members.

3. **Explanation of Variance**  
Activities and accomplishments are on schedule. No variance to report.

4. **Plans for Next Quarter**  
   - Conduct interviews with the Advisory Board, and release the online survey to the internal project team.  
   - Participate in Management and All Team teleconferences.  
   - Observe team interactions.
Appendix A

NEWBio Task List and Timeline
### NEWBIO TASK LIST AND TIMELINE

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<thead>
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<th>Thrust 1</th>
<th>Task 1.1 Understanding social and economic constraints</th>
<th>Task 1.2 Assess demonstration sites as they pursue scale up of biomass crop production and supply chain infrastructure</th>
<th>Task 2.1 Breeding of non-invasive triploid hybrids of willow displaying hybrid vigor</th>
<th>Task 2.2 Genetic basis for pest and disease resistance in willow and perennial grasses</th>
<th>Task 2.3 Breeding and selection of cultivars adapted for NE conditions</th>
<th>Task 2.4 Breeding and selection of willow and switchgrass yields on reclaimed mine lands</th>
<th>Task 3.1 Significantly reduce the harvesting cost per ton of biomass feedstocks from will and perennial grasses in the NE</th>
<th>Task 3.2 Quantify the role of preprocessing for densification and storage on transportation efficiency and downstream fuel</th>
<th>Task 3.3 Assess the storage requirements and effects of long term storage on the quality of willow and perennial grasses</th>
<th>Task 3.4 Techno-economic analysis, cost engineering, and LCA of densification, storage, preprocessing, biorefinery integration</th>
<th>Task 4.1 Site- and crop-specific knowledge gaps</th>
<th>Task 4.2 Benchmark Scenarios</th>
<th>Task 4.3 Regional feedstock supply and environmental assessment</th>
<th>Task 4.4 Biomass to biofuel LCA and multi-criteria assessments</th>
<th>Task 5.1 Biomass Safety Program Development</th>
<th>Task 5.2 Safety and Health Hazard Inventory</th>
<th>Task 5.3 Develop, conduct and evaluate a comprehensive safety and health management program</th>
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<td>Thrust 2</td>
<td>Feedstock Improvement for Perennial Energy Crops</td>
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<td>Thrust 3</td>
<td>Harvest, Preprocessing, and Logistics of Integrated Biomass Supply Chains</td>
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<td>Thrust 4</td>
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<td>Thrust 5</td>
<td>Safety and Health in Biomass Feedstock Production and Processing Operations</td>
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## NEWBIO TASK LIST AND TIMELINE

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<td>Task 6.2</td>
<td>Biomass equipment access program</td>
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<td>Task 6.3</td>
<td>Small business and economic development</td>
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<td>Task 6.4</td>
<td>Expand eXtension.org for willow and warm-season grasses</td>
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<td>Task 6.5</td>
<td>Interactive and innovative learning-lessons tools</td>
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<td>Regional Bioenergy Scholars</td>
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<td>Task 7.3</td>
<td>Graduate distance education in bioenergy</td>
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<th>Thrust 8</th>
<th>Leadership, Stakeholder Involvement, and Program Evaluation</th>
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<tr>
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<td>Task 8.3</td>
<td>External advisory board meetings and strategic planning</td>
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<td>Task 8.4</td>
<td>Task and project evaluation</td>
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<td>Task 8.5</td>
<td>Administrative program evaluation</td>
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<td>Task 8.6</td>
<td>Final evaluation and program report</td>
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### Key Deliverables
- **Project Milestones**: O
- **Fact Sheets, Reports, Articles, Videos**: X

### Activity Level
- Low Activity
- High Activity
Appendix B

NEWBio Advisory Board Meeting Summary

May 30, 2014
NEWBio Advisory Board Meeting Summary
May 30, 2014

Participating Advisory Board Members
Dante Bonaquist (Praxair), Dennis Rak (Double A Willow), Kevin Smith (CNH), Ann Swanson, Board Chair (Chesapeake Bay Commission)

NEWBio Project Team Members
Barbara Kinne (Project Manager), Jessica Leahy (External Evaluator-University of Maine), Laura Lindenfeld (External Evaluator-University of Maine), Tom Richard (Project Director-Penn State), Larry Smart (Executive Committee-Cornell University), Jingxin Wang (Executive Committee-West Virginia University)

Meeting Summary
Chair Ann Swanson welcomed everyone to the meeting and offered remarks on the narrative NEWBio submitted as part of its Year Three funding reapplication to the USDA. She commented on the extraordinary number of details in the application that described the breadth of work for the project’s 20 months of effort. She said she appreciated the realism with which the project includes current events (shale gas, for example) that affect project outcomes.

After introductions, Swanson and Richard provided an update on the board’s recommendations from the 2013 annual meeting and project actions taken:

- Policy component – NEWBio recruited Lara Fowler, an attorney with an extensive water background, to provide liaison with Penn State’s Law School. Fowler connected NEWBio with a law student to do a policy review. Richard noted that there is an Ag Law Center at PSU that runs a clinic to help people with issues related to contracts and policy analysis. Swanson said she could help with policy recommendations that come out of the review.
- Near-term markets – Since longer-term markets may not be available, NEWBio has to have an interim plan. To develop a more targeted outreach list, Richard said NEWBio pulled in ideas and materials from workshops, field days, and other meetings. NEWBio is working now to understand various alternate markets that will continue to build up feedstocks to a scale that could move into acreage needed to supply refineries. A recent NEWBio short course was devoted to alternate markets.
- Sustainability and Ecosystem Services – Richard said there are different ecosystem services that the whole biomass industry could provide, and that the difficulty lies in highlighting the sustainability opportunities. NEWBio has started interacting with conventional ag-related companies (groceries, CAFOs, dairy organizations) and are finding that these groups largely do not understand what biomass materials would be used for. We have standard metrics for GHG and nutrient flows, for example. Virginia Dale, a researcher at Oak Ridge National Laboratory, is developing common sustainability indicators for the biomass industry, and will be attending NEWBio’s annual meeting.
- Industry participation and diverse feedstocks – NEWBio seeks board guidance and strategies for greater industry involvement. We expanded our feedstock analysis when Board member
Mascoma asked NEWBio to look at switchgrass harvested in the summer (this raises questions for wildlife and nutrients as there is more nitrogen in green plants) and at winter rye. Delta Airlines is now the owner of a major refinery near Philadelphia, and is interested in biomass/cellulosic feedstocks and oil seeds. How do we bring enough feedstock to this refinery? ExxonMobil attended NEWBio’s biofuels conversion short course (November 2013) and will visit Penn State’s “Fields to Fuels” demonstration site this summer.

- Finance mechanisms, model contracts, workforce development and retention – Historically, this work has been hard for universities to do. NEWBio is funding an economic impact analysis study this year that will focus on a 5-10 county region in Pennsylvania. (NYSERDA funded a similar study in NY.) We do have the Ag Law Clinic to help develop some of the needed financial tools, but Richard commented that we do not have the tools, for example, to help a farmer amortize his investments over ten years. If the board sees these challenge issues occurring, we do have a law school with students looking for projects. NEWBio is using distance education for our workforce development; there is an online program for Master of Professional Studies in Renewable Energy and Sustainable Systems. There are also new BA, MS and PHD programs in biorenewable systems. Other universities working on this too. Smart said that Corinne Rutzke, a NEWBio investigator at Cornell, is the Director of the Bioenergy and Bioproducts Education Program. This program expanded to include Penn State and West Virginia as part of NEWBio. Wang commented that this is a secondary educator training program, with dedicated researchers at WVU and PSU. Richard also described the NEWBio Bioenergy Scholar program, where we place undergraduates at other universities for the summer to get a research experience. We would be interested in expanding this program to include our board members.

Swanson directed board members to review the Accomplishments summarized in the narrative. A brief discussion added these comments:

- Larry Smart said that it is a NEWBio priority to establish our feedstocks on reclaimed mine land. This is proving to be very challenging. There are very high mortality rates. Sites were replanted this year with a new site preparation approach, however, this will be a major issue to tackle.
- Jingxin Wang said the harvest/preprocessing/logistics model for woody biomass has been developed and is showing good progress in terms of large willow plantings. Results will be available soon on this research. His team will then move to grasses.
- Richard said that the Safety and Health thrust is investigating a few incidents at biomass facilities that will inform the development of their biomass safety handbook. They are particularly looking at fire and respiratory hazards. DuPont has a startup facility in Iowa that collected 80,000 tons of corn stover, and recently lost 10,000 tons to a fire.
- Richard noted that Delaware State University, a historically black school, is the lead for NEWBio’s Bioenergy Scholar Program. Richard also has an undergraduate African-American student who graduated this spring, and another starting in the fall.
- Evaluation – Leahy and Lindenfeld said they will be issuing a survey soon to the NEWBio project team and to the advisory Board. They will be contacting board members to conduct a short interview.

The floor was opened for general discussion on NEWBio’s Year Three plans. Tom suggested that board members email him if they have specific questions to ask. Swanson said that the activities in the
narrative appear to be quite comprehensive. She asked if we had any idea as to how far knowledge about the project is traveling. Richard said press releases would identify our accomplishments, and various venues can be considered. Smart asked the board if they used social media in their business settings (in general, no) and suggested BBI for releases.

The meeting ended with an inquiry as to board member attendance at the upcoming annual meeting. Swanson will be attending, and Smith said either he or John Posselius would be at the meeting.

The meeting adjourned at 11:00 a.m.
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NEWBio

NEWBio’s vision is to build robust, scalable and sustainable value chains for biomass energy in the Northeast United States.

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