

2006 Project Award Summaries  
Maryland Center for Agro-Ecology, Inc.

Funding for the projects was made possible by the Agroecology grant and the Chesapeake Bay Agroecology grant from the USDA Cooperative State Research, Education, and Extension Service (CSREES). A total of \$665,428 was awarded to the seven project teams, matched by \$386,217 from in-kind and other sources.

**1. José Costa – Univ. of MD, College Park; *Management and Selection of Hulless Barley Cultivars in Maryland*; Funding: \$58,550; Match \$58,550; Duration: 36 months**

To investigate the potential of barley as a feedstock for fuel ethanol production, advanced lines and varieties of hulled and hulless barleys will be tested in Maryland for grain yield, test weight, heading date, plant height, resistance to lodging, grain protein content, grain starch content. Hulless barleys are a potentially superior raw material for the production of ethanol because they have a higher starch content than hulled barleys. An additional advantage of hulless barley is that it does not have the abrasive hulls of hulled barley that damages grain handling and grinding equipment. The current drawback for growers of hulless varieties is that grain yields are significantly lower than those of hulled varieties. Continued research on hulless barley for the mid-Atlantic will likely close this gap in productivity in the near future. Improved varieties of hulless barley are only one of the keys to successful production of hulless barley. Sound, profitable nitrogen management will also be an important production factor. The second objective of this proposal is to determine nitrogen rates and timing of nitrogen applications for hulless barley. Agronomically and environmentally sound nitrogen management is important for hulless barley production. Additionally, optimum planting dates and seeding rates will be determined for recommendation as best management practices for hulless barley production. Based in part on this research, an ethanol plant may be built in Maryland using mostly barley grain.

This research has three objectives:

1. To screen hulless barley cultivars for grain yield, test weight, disease reaction, heading date, height, starch, and protein content.
2. To determine nitrogen rates and timing of nitrogen applications that have agronomic feasibility, are considered environmentally acceptable, and are economical for farmers.
3. To determine optimum planting dates and seeding rates that will become best management recommendations for hulless barley production.

**2. Anne Hairston-Strang – MD Department of Natural Resources; *Assessing Forest Buffer Functions after Five Years*; Funding: \$82,179; Match \$81,417; Duration: 12 months**

This proposal will quantify riparian forest buffer functions on buffers about five to six years old, primarily on private land in the Monocacy, Antietam, and Catoctin watersheds,

and estimate values for future wood products, nutrient reduction, and air quality improvement. It builds on two datasets, one with very detailed vegetation and stream benthic macroinvertebrate data, collected in 2000 and 2001, and one with less detailed herbaceous and benthic data that were collected annually from 2001-2005 through the Potomac Watershed Partnership. The testable hypotheses ( $H_A$ ) are that:

1. Significant differences will occur for vegetation/habitat, shade, and benthic macroinvertebrate communities between time of planting and 5 years later; and
2. Benefits of forest buffers will exceed costs of public investment if nonmarket values are included.

The objectives to be able to test these hypotheses are to:

1. Quantify current buffer and stream conditions on 23 sites, including:
  - shade/water temperature,
  - bank stability at cross-sections,
  - stream water quality, and
  - vegetation for aquatic and wildlife habitat, including invasive species occurrence.
2. Compare conditions to baseline data to determine trends in functions five to six years after planting, usually about half-way to crown closure, and
3. Estimate values for sampled buffers for market and nonmarket benefits, including future timber products using current harvesting restrictions, water quality improvement through reduced nitrate and phosphate, and air quality improvement through reduced nitrous oxides, sulfur oxides, particulates, and carbon monoxide.

**3. Jeffrey Horan – MD Department of Natural Resources; *Maryland Comprehensive State Forest Assessment*; Funding: \$177,000; Match \$177,000; Duration: 24 months**

The goal of this project proposal is to collect, compile, analyze, classify and manage the data necessary for the sustainable management of 200,000 acres of public forestland. The data collected, analyzed and classified, and the data management system created, will be used to seek and retain forest certification of Maryland's four State Forests and Chesapeake Forest to create a model for the sustainable management of other forestlands in Maryland.

Project Objectives:

1. Identify forest types and stratify the forest into distinct forest stands on Potomac Garrett, Savage River and Green Ridge State Forests.
  - a. Conduct a comprehensive analysis of the existing Continuous Forest Inventory data to begin the process of forest stand level stratification and to identify current data gaps.

- b. Develop classification methodologies for using existing remote sensed data and aerial photography (20 meter RESOURCESAT-1, 30 meter derived National Land Cover Data Set-NLCD, and the MD GAP Analysis Project Land Cover Classification completed in July 2000, and Digital Ortho Quarter Quads - DOQQs) to further stratify forest stands and enhance existing forest data sets. Develop methodologies and analysis techniques to determine forest stand characteristics using three sets of remote sensed imagery products.
- c. Overlay existing historic timber sale data to assist with forest stand level classification and to further refine recently digitized data. Remote imagery analysis will be used to enhance the accuracy of stand descriptions and stand boundary locations on the ground.
- d. Use field inventory procedures to further enhance the accuracy of stand descriptions and stand boundary locations on the ground.

2. Develop a spatial data base (GIS) management system that contains information on every discreet forest stand or management unit, its typology, description, and spatial location, to aid in sustainable management and monitoring, and to develop models for sustainable management of key forest components over time.

3. Collect original and supplemental forest inventory data from forest plots to compile and analyze information on forest type, past management history, age, volume, economic potential, forest structure, plant and animal diversity, and water resources that can be used in support of third party forest certification and sustainable forest management.

4. Use this forest stand analysis to create and run a pilot growth and yield model to guide sustainable forest management on one of the four Maryland State Forests.

5. Complete an accuracy assessment of stand level characterization using these techniques. Determine applicability of these techniques for use on other forestlands throughout Maryland.

**4. James McElfish - Environmental Law Institute; *Supporting Sustainable Land Use through Tax Policy*; Funding: \$42,000; Match \$20,000; Duration: 12 months**

Land use changes are profoundly affected by economic factors including the signals sent by state and local tax policy. Maryland's ability to sustain its vision of smart growth and the retention of viable farms and forests in the face of rising population cannot rely solely on regulatory means (such as planning and zoning and building codes), state expenditure policies (such as priority funding areas), nor conservation easement and land acquisition policies (such as Program Open Space, Rural Legacy, or Greenprint). While these are important in shaping development and conservation decisions, the impacts of state and local decisions on what to tax and how to tax it reinforce or countervail these policy

tools. The Environmental Law Institute will examine the directions in which Maryland tax policies tend to influence development and conservation decisions, and will identify 2-4 targeted, specific changes that can (without occasioning significant changes in state revenue or subsidy) support the land use objectives of sustainable land use and growth management.

**5. Michael Panich - New West Technologies; *Private/Public Financial and Organizational Mechanisms to Initiate the Creation of New Markets and Expansion of Existing Markets for the Products Made From Wood Residues, By-Products and Waste*; Funding: \$37,395; Match \$9,500; Duration: 12 months**

Wood residues, by-products, and wastes are ubiquitous across much of the State of Maryland. These materials may be found variously in urban, suburban, and rural settings; they can be the product of public activities and private enterprise, the latter including both commercial and industrial entities. Maryland's forestry and wood-products industry is composed of three distinct sectors, timber management and harvesting, primary wood manufacturing, and secondary wood manufacturing. Taken together, the three sectors in 1996 employed nearly 14,000 people and generated products valued at about two billion dollars. This represented about three-quarters of a billion dollars in value-added economic activity. There are a number of programs available through State and Federal governments and the private sector in Maryland that may be sources of assistance for creating new markets and expanding existing markets for the products made from wood residues, by-products and wastes.

Better economic and environmental use of these various residues, by-products, and wastes will require knowledge (a) of how much of each of the various materials there are and where they are found and (b) what products are or can be made from these materials. Given this knowledge, one can then reasonably consider what opportunities might exist either for creating new markets or for expanding existing markets for the products made from wood residues, by-products, and wastes. Based on what thus might be possible, one can then suggest what of the several financial and organizational mechanisms might already exist or else be deployed in Maryland to initiate the creation of new markets and the expansion of existing markets. This is the goal of this project proposed to the Maryland Center for Agro-Ecology, Inc.

**6. Andrew Ristvey, Univ. of MD, Wye Research and Education Center; *Investigating Alternative Niche Crop Requirements for Sustainable Production*; Funding: \$139,673, Match \$13,750; Duration: 30 months**

The objectives of this research are to investigate a select variety of native plant species for their requirements in more sustainable production systems, and their use as high-value niche crops for small farms and nurseries. Studies of natural systems have shown many native plants are biologically adapted to compete well in low nutrient, low moisture environments (Chapin, 1983). There is also a general consensus that native plant species can be utilized as low input ornamental plants, needing little fertilizer, water or pesticides after establishment in the landscape (United States Fish and Wildlife Service, no date). It

is feasible to assume that many native plants with aesthetic and marketable horticultural characteristics may be identified and utilized as alternative crops for highly sustainable, low input nurseries. While some varieties of native plant species are commonly grown by the nursery industry, little effort has been placed on studying their minimum cultural sustainability, including fertilizer and water use. We hypothesize that, in contrast to the majority of plant species presently grown by the nursery industry, several marketable native species can be grown using methods of fertility and irrigation more sustainable than those outlined in the Best Management Practices Guide for Producing Container-Grown Plants (Yeager et al., 1997). In particular, this select group of native species can be grown to marketable size using less nitrogen and phosphorus than presently labeled recommendations and irrigated with new moisture sensor technology for increased irrigation efficiency.

Small farms and nurseries would be the primary beneficiaries of this research in several ways. High-value alternative crops can generate greater profits per acre than that of conventional row crops and will give small farms and nurseries an edge to compete with larger scale nurseries. Additionally, this research will identify markets for these high-value alternative crops that can be grown with cultural practices of greater sustainability. The information gleaned from this research will be disseminated through an Alternative Crop Extension Program. The end result of this research may add to the integrity of our open spaces by keeping farms in operation by providing feasible incomes with sustainable levels of input.

**7. Lance Yonkos – Univ. of MD, Wye Research and Education Center; *Investigation of Nitrogen, Phosphorus and Sex Steroid Levels in Canada Goose Feces: Water Quality and Endocrine Effects on the Delmarva Peninsula*; Funding: \$128,631; Match \$26,000; Duration: 24 months**

Hypotheses: This project addresses two interrelated hypotheses: first, that resident and migratory Canada geese (*Branta canadensis* ssp.) contribute an appreciable amount to the total load of nutrients introduced from terrestrial sources to the Chesapeake Bay; and second, that steroidal contaminants in Canada goose feces are capable of inducing endocrine-active effects in aquatic resources.

Objectives: We propose to satisfy the following 6 objectives in an effort to resolve the above hypotheses:

1. We will measure nutrient and steroid levels in Canada goose feces over a 5 month interval (migrant arrival to departure) from areas providing variable diets (e.g., corn, grain, soybeans, grasses, etc.) and year-round from resident geese feeding primarily on grasses.
2. We will measure nutrient and steroid levels over a 5 months interval (migrant arrival to departure) in several broadly differing migrant Canada goose-impacted surface-waters (e.g., well and poorly flushed tidal estuaries, shallow field impoundments) and year-round in a surface-water persistently influenced by resident geese (e.g., golf course ponds).

3. We will develop a Canada Goose Nutrient Transport Model as a means of estimating the amount of terrestrial nutrients conveyed to surrounding surface waters by goose feeding activities.
4. We will expose representative fish and frog species to aqueous Canada goose feces in laboratory screening assays to investigate the existence of fecal estrogenicity.
5. We will perform definitive larval fish and embryo/larval frog assays to establish lower steroidal effects levels of Canada goose feces-associated steroidal contaminants.
6. We will examine fish and frogs collected from aquatic habitats exposed to steroidal contaminants primarily from Canada goose feces for evidence of compromises to normal endocrine function.