Dr. Jody Jellison
Professor of Biology
Director, Center for Agriculture Food and the Environment
Director, UMass Extension
Director, Massachusetts Agricultural Experiment Station
Assist. Vice Chancellor, Research and Engagement
University of Massachusetts

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Exploring Current Natural Resource Research Efforts and the Future of America's Land-Grant colleges and Universities

Qualifications/experience:

-A product of the Land Grant system, BS from UNH and MS and PhD in Plant Virology/Pathology with minors in biochem./biophysics and statistics from Oregon State
-Researcher and administrator with international experience (Japan, Sweden and Germany) and employment at four US research universities (Harvard, Univ. Maine, Virginia Tech and UMass Amherst)

Global trends and the Land Grant mission:

-Population is expanding, urbanization is accelerating
- "Global growth will likely increase the demand for food, water, and energy by 35, 40 and 50% respectively by 2030."(2014 US National Intelligence Council)
-Agriculture and natural resource management will be increasingly high tech but with concurrent growth of alternatives
-Be increasingly linked to national and global security
-Need to produce more with less
-Play a central role in maintaining human and ecosystem health
-Uncertainty has become a constant factor in natural resource management
-The need for science-based management and policy

Agriculture and natural resources in Massachusetts:

-Highly diversified, small scale, consumer based
-Average farm size is under 85 acres
-Coastal, heavily forested with and extensive urban/rural interface
-47th in the nation for commodity agricultural production
-Strong cultural importance placed on rural character
-A leader in energy efficiency
-Growing interest in food systems (a leader in farmers' markets direct sales)

Opportunities and challenges and the importance of the Land Grant mission and funding:

-Providing foundational support for sustained efforts and to leverage additional public- and private-sector funding.
-Addressing local, regional and national priorities, meeting federal and state regulatory burdens, providing educational access
-"…studies have shown that every dollar invested in agricultural research creates $20 in economic activity" (Vilsack, 2014)

A Federal/state partnership in Massachusetts for: (Appendix 1)

-Food and energy self sufficiency: *Spotlight on the Commonwealth's Research Orchard, Unearthing Secrets of Food*
-Environmental sustainability: *What motivates People to Conserve Water in Yards? Ecosystem services/watersheds: Fish are in Hot Water*
-Community viability: *Facilitating Responses to Extreme Weather Events*
-Nutrition, 4-H, food safety: *A Taste of Home, Fresh from the Farm*
-Specialty crops and the green industry: *World Class Research on a Small Red Berry*
-Workforce development and the next generation: *Young Energy for an Older City*

Working with communities to provide science-based conservation: (Appendix 2)

-Working with watersheds
-MassWoods: Will the Kids Keep the Forest? Informed decisions about generational transfers
-Are certain tree species headed northward?
-Knowledge makes Communities "River-Smart": ecologically supportive, community collaborative planning for flood events
-CAPS: a conservation assessment prioritization system: Decision support for prioritizing conservation efforts

High Impact:

Research and Extension on Agriculture, Food, and the Environment from the Flagship Campus of America's Education State

UMass Amherst Center for Agriculture, Food and the Environment

Mass. Agricultural Experiment Station • Mass. Water Resources Research Center • UMass Cranberry Station • UMass Extension

World Class Research on a Small Red Berry

The UMass Cranberry Station

- Cranberries are the largest agricultural food commodity produced in the state with an annual crop value of $99.8 million dollars. Massachusetts is home to 30% of all cranberry acreage as well as the two largest cranberry handling companies in the world. This industry provides 6,900 jobs and total economic benefit of over $1.4 billion in the state.

2
Massachusetts' ranking in cranberry production nationally in 2015.

- The scope of work covered at the UMass Cranberry Station is wide. Staff provide diagnostic services and outreach programs while their core work advances knowledge of cranberry-related sciences including entomology, plant pathology, and weed science.

Full story at http://bit.ly/1SvnKI2

This work is supported in part by funding provided by USDA-National Institute for Food and Agriculture (NIFA) through the Smith-Lever and Hatch Acts, USDA-Agricultural Research Service (ARS), and USDA-Natural Resources Conservation Service (NRCS).

UMass Amherst
The Commonwealth's Flagship Campus

February, 2016

For a list of all the stories in this document and links to the full stories, go to **http://ag.umass.edu/impacts**

Spotlight on the Commonwealth's Research Orchard

Cold Spring Orchard Research and Education Center in Belchertown

- Cold Spring Orchard (CSO) is a hands-on laboratory for research and extension education related to tree fruit and small fruit.
- This 250-acre farm was donated to the university by the Massachusetts Fruit Growers' Association in 1961.
- CSO is the Massachusetts site for the Regional Rootstock Research Project, winner of the 2015 Excellence in Multistate Research Award from USDA.

Full story at http://bit.ly/1Pxevpk.

This facility is supported by funding provided by USDA-NIFA through the Smith-Lever and the Hatch Acts.

43

Number of peer-reviewed articles published in scientific journals by faculty associated with projects of the Mass. Agricultural Experiment Station in 2015.

What Motivates People to Conserve Water in Yards?

- This project is examining the influence of policy and outreach efforts on local residents' adoption of water conservation and storm water strategies.
- The strategies studied included: water harvesting using rain barrels; infiltrating storm water back into the ground using rain gardens; and landscaping with native plants.

Full story at http://bit.ly/1F9oqvQ

This project is supported by funding provided by USDA-NIFA through the Smith-Lever and the Hatch Acts.

$15.8B

Damage caused by Hurricane/Tropical Storm Irene in 2011.

Facilitating Responses to Extreme Weather Events

- Climate change is expected to increase the frequency and extent of future flood events in New England.
- The research focuses on responses to extreme flood events including what flood response actions were taken within the riparian forest areas and neighboring riparian farmland and when.
- The project will help inform decision-making and aid in the development of policies that meet human adaptation needs while simultaneously minimizing impacts on riparian forest ecosystems.

Project description at http://bit.ly/1KWyQ7C

This project is supported by funding provided by USDA-NIFA through the MacIntire-Stennis Act.

This project is supported by funding provided by USDA-NIFA through the Smith-Lever Act.

Young Energy for an Older City

UMass Design Center Helping to Reinvigorate Springfield

- UMass Design Center links faculty and students with city's Planning Department to help create opportunities for citizen engagement and innovation.
- "It is exciting for us as we get fresh sets of eyes from students eager to learn what is going on in the city," says city's principal planner.
- Six installations were displayed in the central business district using what is called 'tactical urbanism,' an emerging form of urban design that seeks to enliven cities with temporary interventions that are inexpensive and easy to install.

Full story at http://bit.ly/1TnPDlw

20,516
Number of young people enrolled in Massachusetts 4-H in program year 2014-2015.

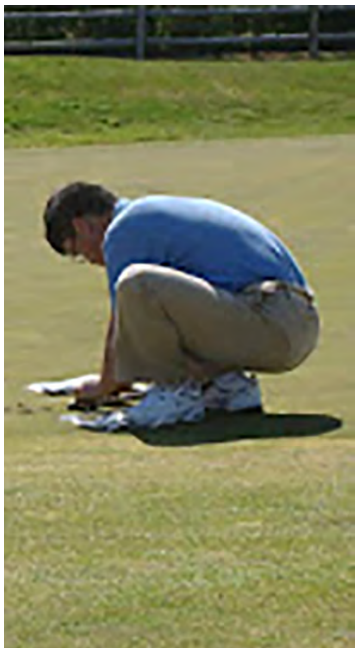
Golf Goes Green

UMass Amherst Studies Organic Golf Course Management

- The Turfgrass Breeding and Pathology Lab had the opportunity to use an organic golf course on Martha's Vineyard to study how long-term organic and conventional management systems affect soil communities and how this in turn affects turf health.
- The results of this study can be used to create better management practices and could potentially be applied to other perennial crops.

Full story at http://bit.ly/1JmdttA

This project is supported by funding provided by USDA-NIFA through the Hatch Act.



2
Number of truly organic golf courses in United States.

Expanding New England Winter Farmers' Markets

300,000
Number of visits to website of UMass Extension Vegetable Program in 2015.

- It's official: eating local vegetables all winter has become popular—and easy. A four-year project has aimed to support New England farmers as they expanded their vegetable production into the winter months.
- The project offered 50 educational programs that reached over 4,000 people, produced over twenty fact sheets and a website, conducted 16 field research trials and supported growth in winter farmers markets in Massachusetts and New Hampshire.

Full story at http://bit.ly/1DUqByw

This project is supported by funding provided by USDA's Northeast Sustainable Agricultural Research and Education program.

Planning for Climate Change

- A coalition of groups developed online Mass. Wildlife Climate Action Tool to help landowners, community and government leaders take action in response to climate change.
- The tool includes projections for over 30 climate variables and vulnerability assessments for fish, wildlife, and habitats.

Full story at http://bit.ly/1OJL2H5

This project is supported by funding provided by the Mass. Division of Fisheries and Wildlife.

1,050
Number of diagnostic tests conducted for the public by UMass Plant Diagnostic Lab in 2015.

Symposium on Bee Health

- 300 beekeepers, educators, landscapers, farmers and others attended.
- UMass faculty and experts from Maine and Connecticut discussed ways to protect pollinator health.
- One speaker encouraged attendees to "Think like a bee, think like Mother Nature and think like a land manager."

Full story at http://bit.ly/1EhzLKS

This symposium was supported by funding provided by USDA-NIFA through the Smith-Lever and the Hatch Acts.

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Creating a New Environmental Refuge

Tidmarsh Restoration Project and Living Observatory in Plymouth

- This project involves retiring and restoring commercial cranberry bogs in order to restore natural wetlands and streams, improve water quality, and enhance biologic diversity.
- UMass faculty have led efforts to understand the hydrogeological nature of the site and its native vegetation.
- Another aspect of the project is the Living Observatory, a technology-enhanced window on wetlands and wildlife, in partnership with the MIT Media Lab. Extension assistant professor Christine Hatch said, "I'm thrilled to participate in this unprecedented scope and scale of collaboration between scientists from so many disciplines, and...working with the MIT Media lab is an invaluable conduit for bringing science to the public."

Full story at http://bit.ly/1ChXxlk

The involvement of UMass Extension faculty is supported by USDA-NIFA through the Smith-Lever Act.

20,000

Number of seeds of Atlantic white cedar collected for planting at Tidmarsh Living Observatory with participation of UMass undergrads.

Unearthing Secrets of Food

How Four Award-Winning UMass Scientists Bring Invention to the Table

- Four scientists from the UMass Food Science Department have received international honors for their work.
- Yeonhwa Park received the Timothy L. Mounts award from the American Oil Chemists' Society for her "significant and important contributions in the area of bioactive lipids and their impact on health conditions such as obesity."
- Sam Nugen is the winner of the 2015 Future Leaders Award from the International Life Sciences Institute for work developing methods to engineer viruses to rapidly detect and separate microbial contaminants from food.
- Julie Goddard received IFT's 2015 Samuel Cate Prescott Award for outstanding researchers in the early stages of their career.
- Julian McClements' contributions to promoting public health through nutrition earned him this year's Babcock-Hart Award from the Institute of Food Technologists (IFT), the world's premiere food science association.

Full story at http://bit.ly/1JeVEb9

Support for projects of the four researchers has been provided over time by USDA-NIFA through the Hatch Act, the Agriculture and Food Research Initiative (AFRI) and by the National Institutes of Health (NIH).

1

UMass' ranking in food science research nationally.

For a list of all the stories in this document and links to the full stories, go to **http://ag.umass.edu/impacts**

60,213

Number of low-income individuals in Massachusetts who received nutrition education from UMass' SNAP-Ed program.

Assessing Stream Crossings and Culverts in 13 States

UMass Amherst hosts regional stream-crossing database

- Database will help direct proactive attention to most vulnerable road-stream crossings in advance of floods and other natural disasters.
- Assessments will help identify culverts that block movement of turtles, trout, salamanders and other wildlife.
- Project involves large-scale multi-state collaboration with many private groups and public agencies.

Full story at http://bit.ly/1CNiu8e

This project is supported in part by funding provided by USDA-NIFA through the Smith-Lever Act.

Effects of Common Pesticides and Chemicals on Mitochondrial Function

- The goal of this research project is to develop methods to screen for mitochondrial impairment in tissues. In mice, prolonged exposure to mitochondrial toxins can lead to symptoms that mimic Parkinson's disease.
- Environmental exposure to mitochondrial toxins has caused growing concern limiting productivity of livestock and human health.
- These experiments will provide tests to assess mitochondrial sufficiency in livestock.

Project description at http://bit.ly/1Q3mX0f

This project is supported by funding provided by USDA-NIFA through the Hatch Act.

8

Number of foods that cause 90% of allergic reactions: peanuts, tree nuts, eggs, dairy, soy, wheat, fish and shellfish.

Have a Great Food Product Idea? Ready to Grow Your Business?

- Extension Food Science faculty recently taught a short course at two Massachusetts food processing incubator and business development centers on food safety principles.
- The goal of the courses is to support local entrepreneurs who are working hard to build a more sustainable local food system, encouraging them to consider moving from a small scale kitchen operation to planning for a successful larger scale business in the early stages of their business.

Full story at http://bit.ly/1Am8vYx

This project is supported by funding provided by USDA-NIFA through the Smith-Lever Act.

Fish are in Hot Water

- However, this particular fish story is not all doom and gloom. Fish conservation is at the heart of the research conducted by Andy Danylchuk, a professor of environmental conservation. He studies the world's fish populations and then disseminates best practices to conserve and protect them.
- Danylchuk says, "Fish are the last wildlife we harvest for food. We have domesticated cattle, chickens and pigs. One interesting thing about fish is that they are below the waterline, so we can't readily observe them as we can, for example, birds. In this case, 'Out of sight, out of mind' is not a good thing."

Full story at http://bit.ly/1NsBKMd

This work is supported in part by funding provided by USDA-NIFA through the Hatch Act.

10%

Percentage of fish remaining in world oceans, compared to 50 years ago.

A Taste of Home, Fresh from the Farm

Working at the Intersection of Urban Agriculture and Nutrition

- New four-year project is based in Worcester and incorporates both outreach education and research to work with community members to identify barriers to better nutrition and to develop culturally sensitive ways to increase fruit and vegetable consumption.
- The target population has been shown to be at risk for diet-related illnesses such as heart disease, type 2 diabetes, and certain types of cancer.
- The project team is building relationships with local Latino and African markets and is working with farmers to increase the availability of viable crops, such as cassava leaves, jiló, and abóbora japenesa.

- The team includes agricultural and nutrition expertise and represents a collaboration between several UMass Amherst departments and UMass Extension.

Full story at http://bit.ly/14n-9rA5

This project is supported by funding provided by USDA-NIFA through the Smith-Lever and the Hatch Acts.

74%

Eligibility for free or reduced school lunches in the public schools in Worcester, New England's second-largest city and one of its most ethnically-diverse.

The Center for Agriculture, Food and the Environment

Mass. Agricultural Experiment Station

Mass. Water Resources Research Center

UMass Cranberry Station

UMass Extension

USDA United States Department of Agriculture National Institute of Food and Agriculture

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Office of Jody Jellison, Director
Stockbridge Hall
80 Campus Center Way
University of Massachusetts
Amherst, MA 01003-9246
413-545-4800

www.ag.umass.edu

Offices and Facilities

Office of the Director, Amherst

(incorporating main offices of UMass Extension and Mass. Agricultural Experiment Station)

Research and Education Farms:

Cold Spring Orchard Research and Education Center, Belchertown

Joseph Troll Turf Research Facility, South Deerfield

Crops Research and Education Farm, South Deerfield

Equine and Livestock Research and Education Center, Hadley

Cranberry Experiment Station, East Wareham

Diagnostic Laboratories, Amherst:

Environmental Analysis Laboratory

Plant Problem Diagnostic Laboratory

Soils and Plant Tissue Testing Laboratory

Water Resources Research Center, Amherst

Extension Off-Campus Offices:

Cape Cod Cooperative Extension, Barnstable

Central Extension Center, Worcester

Greater Boston Nutrition Education Office

Lawrence Nutrition Education Office

Pittsfield 4-H Office

Plymouth County Office, Plymouth

Raynham Nutrition Education Office

Springfield Nutrition Education Office

Walpole 4-H Office

Waltham Center

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APPENDIX TWO

Science-Based Conservation

Working With Watersheds

How can the effectiveness of watershed management decisions be maximized? What do water managers need to know to plan for and maintain secure water supplies under uncertain conditions? What are the factors that need to be examined?

One research project at UMass Amherst is asking how the ecosystem services provided by watersheds are affected by accelerating urbanization at varying scales—on-site, sub-basin, reach, stream order, headwaters, riparian, and watershed. Another project is examining the effects of three stressors—land use, extreme precipitation, and climate change—on water quantity and quality chaes in a watershed.

These projects are supported by USDA-NIFA through the Hatch Act.

MassWoods: Will the Kids Keep the Forest?

Massachusetts: there are few places on earth where so many people live among so many trees; it is the third-most densely populated state as well as the eighth-most forested. The state's private, non-industrial woodlands are owned by 46,000 families and individuals, and 71% of those owners (representing 1.2 million acres of land) are 55 years old or older. In the coming years, these landowners will be making decisions that will determine whether these forested landscapes will continue to provide public benefits that include clean water, wood products, carbon sequestration, biodiversity and rural tourism.

One current research project seeks to understand the dynamics of the family decision-making process in order to create local resource networks and tailor outreach programs to help families make informed choices about the future of their land.

HTTP://MASSWOODS.NET/

This project is supported by USDA-NIFA through the McIntire-Stennis Act.

Are Certain Tree Species Headed Northward?

A recently-completed project focused on understanding potential threats and changes in the red spruce and balsam fir population along the Berkshire Plateau of Massachusetts. The project examined the southern end of the continuous range of those species, named by the Commonwealth as the terrestrial species in the state most vulnerable to total loss due to climate change.

The findings suggest that red spruce within the observed area has suffered significant change over the last fifty years, one that leaves its continued vigor and viability at the southern edge of its

range in doubt. Prior to the 1960's, the species would normally benefit in growth from increased precipitation. More recently, that correlation has ceased, a shift the study attributes to the effects on the species of increased regional temperatures.

This project is supported by USDA-NIFA through the McIntire-Stennis Act.

Knowledge Makes Communities "River-Smart"

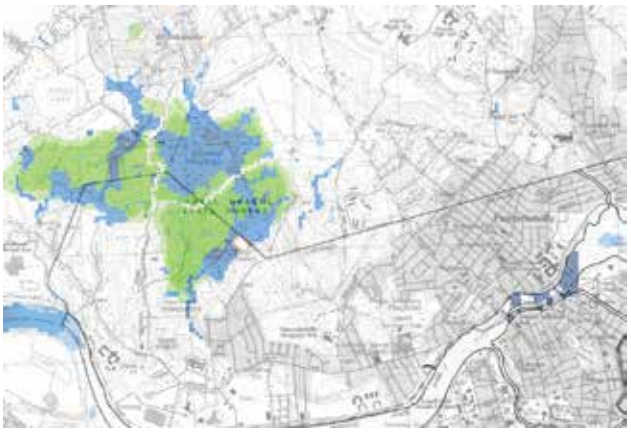
The RiverSmart Communities project began as an integrated research and extension project that relied on both geological and social sciences to address pressing needs in the Commonwealth. In the aftermath of Hurricane Irene, understanding the many challenges surrounding ecologically supportive and community collaborative management of rivers and the lands surrounding them was recognized as a valuable resource for preventing future flooding.

In New England, agricultural and undeveloped rural forested lands are often located in river corridors where they can play a crucial role in diminishing the destructive power of floodwaters by receiving, spreading, and slowing the flood wave as it moves through a watershed. Farms remain at the forefront of flood concerns, both as a potential contributor and a solution to the problem.

http://extension.umass.edu/riversmart/

This project is supported by USDA-NIFA through the McIntire-Stennis Act.

The Data's in the Details



CAPS—the Conservation Assessment Prioritization System—provides a way for municipal, regional and state level decision-makers to reap the benefits of a highly detailed analysis focused on exactly the information that would be most helpful to them. It is an ecosystem-based approach for assessing the ecological integrity of lands and waters and subsequently identifying and prioritizing land for habitat and biodiversity conservation. Ecological integrity is the ability of an area to support biodiversity and the ecosystem processes necessary to sustain biodiversity over the long term. CAPS is a computer software program and an approach to prioritizing land for conservation based on the assessment of integrity for various ecological communities (e.g., forest, shrub swamp, headwater stream) within an area.

http://umasscaps.org/

This project is supported by USDA-NIFA through the Hatch and McIntire-Stennis Acts.

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