

Agricultural Focus Areas

National Themes:

Nutrient and Pesticide Management

Animal Waste Management



New England Regional Review,
October 16, 2007

<http://www.usawaterquality.org/newengland>



New England Agriculture

New England farms lie within urban/rural watersheds



Humid environment: nutrients and pesticides are mobile



<http://www.usawaterquality.org/newengland>



Impacts to Water Quality

Nutrients, pathogens, pesticides and sediments from agricultural lands impact water resources.

- Private well testing
- Public water supply
- USGS monitoring
- TMDL studies



<http://www.usawaterquality.org/newengland>

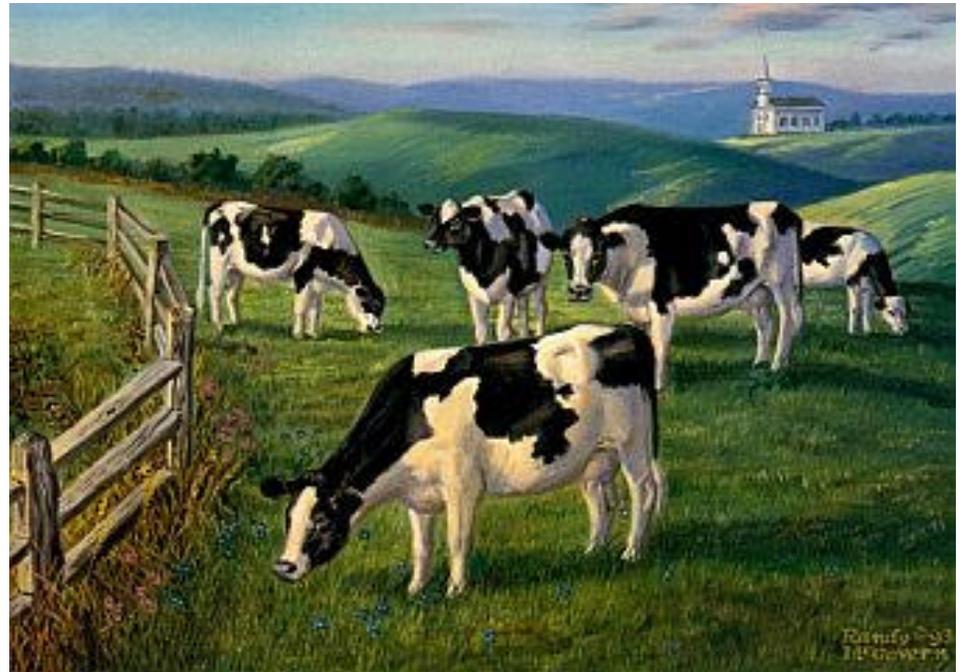


New England Agriculture

- History has been commodity agriculture: dairy, potato and vegetables



Spraying potatoes



<http://www.usawaterquality.org/newengland>



New England Agriculture

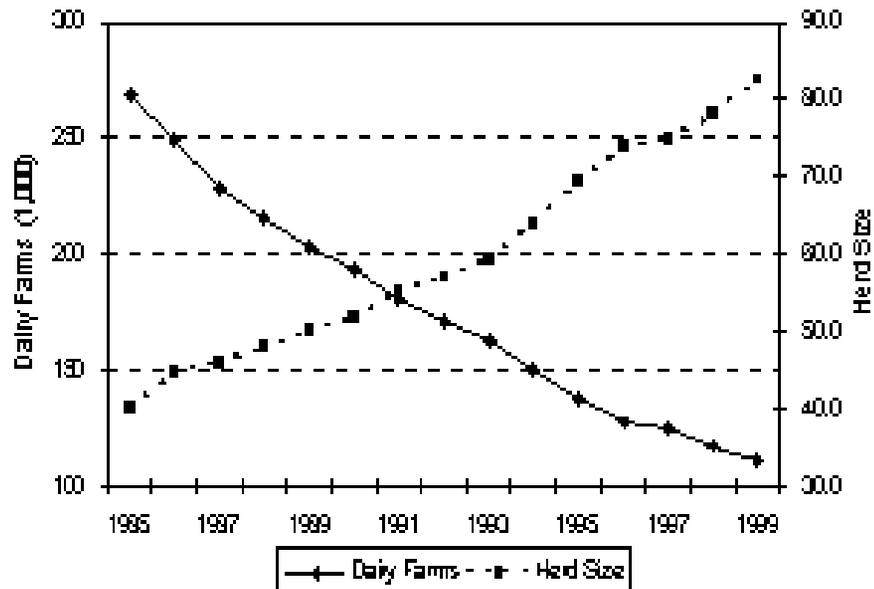
- Close to dense populations – urban/rural interface
- Land is expensive, scarce and often fragmented - high taxes
- High production costs: energy / imported grains / fertilizer



<http://www.usawaterquality.org/newengland>



Figure 1: U.S. Dairy Farms & Average Herd Size, 1985-1999



- Surplus of manure
- Concentrating nutrients
- Intensive row cropping
- Imported grains



New England Agriculture

Changing agriculture picture:

- Farms are diversifying
- Exploring niche markets
- Organic dairy
- Local grass-fed beef
- Biofuels

Programs have to be relevant



Canola



Potential Pollutant Sources

- **Improperly managed manure**

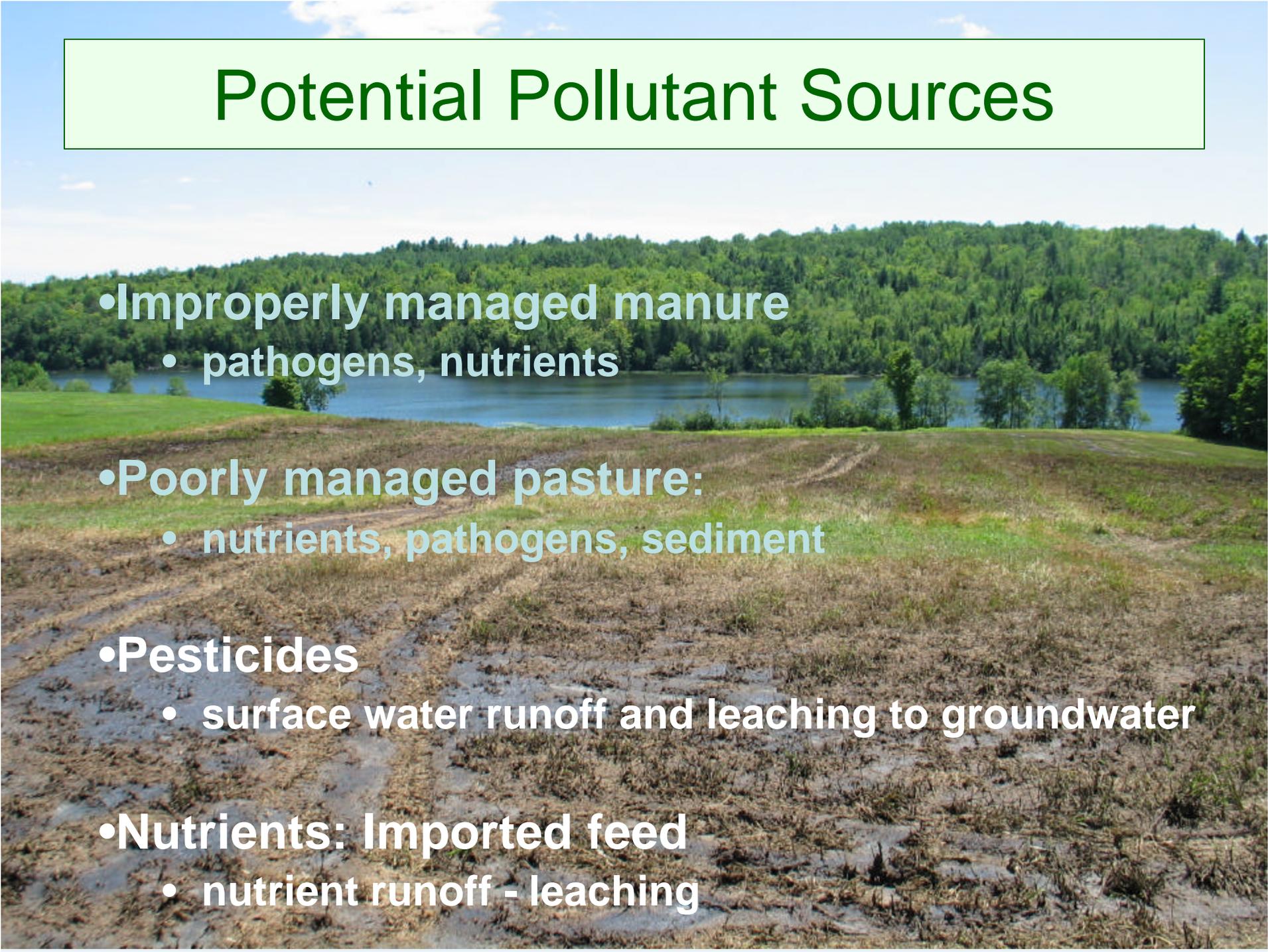
- pathogens, nutrients

- **Poorly managed pasture:**

- nutrients, pathogens, sediment



Potential Pollutant Sources

- **Improperly managed manure**
 - pathogens, nutrients
 - **Poorly managed pasture:**
 - nutrients, pathogens, sediment
 - **Pesticides**
 - surface water runoff and leaching to groundwater
 - **Nutrients: Imported feed**
 - nutrient runoff - leaching
- 

Accountability: Regional Leadership

- Developed our team around national themes
 - Assessed our strengths and challenges
 - Greatest strength - state expertise
 - Greatest challenge – limited staff
 - Integrated Research, Extension and Education
 - *Success – developing effective partnerships*



Leadership

Focus Area Participation: New England Land Grant Universities

Dr. John Jemison, UMaine – Facilitator, Ag. N&PM

Dr. Stephen Herbert, UMASS – Facilitator, AWM

Dr. Heather Darby, UVM

Dr. Tom Morris, UCONN

Holly Burdett and Dr. Arthur Gold, URI

Roy Jeffrey, UCONN



<http://www.usawaterquality.org/newengland>



Partners

International:

- Agriculture and Agri-Food Canada

Federal / USDA:

- New England Water Program
- Natural Resources Conservation Service (NRCS)
- Agricultural Research Service (ARS)
- Northeast Sustainable Agriculture Research and Education (NE SARE)
- Northeast Pasture Consortium
- National Livestock and Poultry Learning Center
- Risk Management Agency



<http://www.usawaterquality.org/newengland>



Partners

State Agricultural / Environmental Organizations:

- Boards of Pesticides Control
- State 319 Programs
- Nutrient Management Boards
- Conservation Districts
- NE Small Farm Institute



<http://www.usawaterquality.org/newengland>



Other Partners

Local producer groups

- Organic farming boards (ME, VT)
- Local marketing and food groups (ME, VT)
- Watershed Alliances (VT)
- Grazing Network and Farmer Research Groups
- Certified Crop Advisors



<http://www.usawaterquality.org/newengland>



Focus Area Goals

Strengthen New England Land Grant Universities' capacity to educate and empower agricultural producers to adopt sustainable production systems

UMaine and UVM regional summer tour, 2007



<http://www.usawaterquality.org/newengland>



Ag. Nutrient & Pest Mgt Goals

- Research and develop effective organic and conventional cropping systems that balance nutrient inputs and outputs, minimize pesticide use, and improve soil health.
- Educate farmers and service providers to adopt sustainable cropping systems

Research Highlights – Ag. N&PM

- Organic cropping systems research (UMaine, UVM, UNH, USDA-ARS ME)
- Organic and sustainable potato and vegetable production systems – dairy/potato integration (Potato - UMaine, Agriculture Canada, USDA-ARS ME; Vegetable - UMaine, UVM, UMASS, UCONN)
- Biofuel research (UMaine, UVM, UMASS)

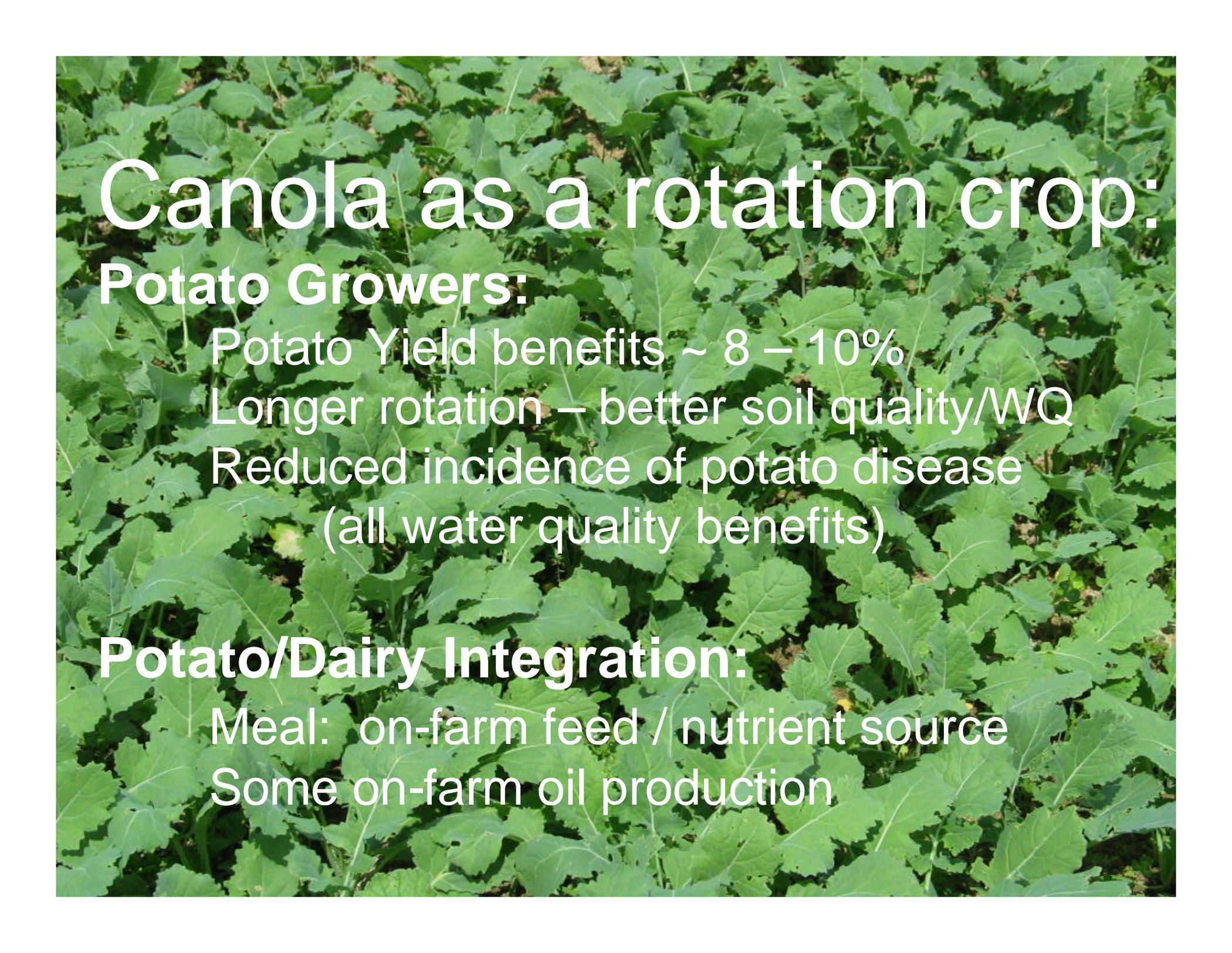


<http://www.usawaterquality.org/newengland>





**Canola as an oilseed crop for New England
Joint NE SARE Grant – UVM, UMaine, \$78K**

A photograph of a field of green canola plants, showing dense foliage with serrated leaves and some small yellow flowers. The text is overlaid on the image.

Canola as a rotation crop:

Potato Growers:

Potato Yield benefits ~ 8 – 10%

Longer rotation – better soil quality/WQ

Reduced incidence of potato disease
(all water quality benefits)

Potato/Dairy Integration:

Meal: on-farm feed / nutrient source

Some on-farm oil production

Pesticides the Issue: Go Organic

Three keys to success:

- control weeds
- reduce imported feed
- grow quality forage

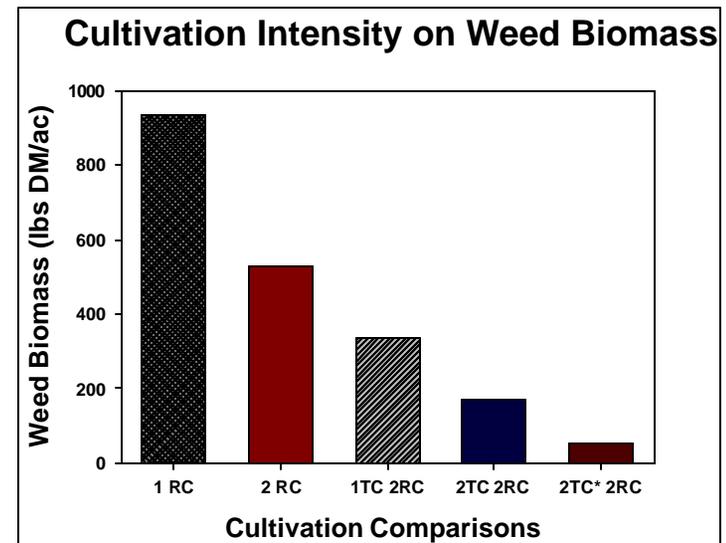


Pure from the beginning™

Nutrient and Pest Management

- Pesticides:

Develop integrated research/education program



Small Grain / Annual Grass Double Crop Systems

Triticale

Winter Spelt

Spring barley





Small Grain / Annual Grass Double Crop Systems



- * Forage yield statistically equivalent
- * Weed pressure five times less
- * Forage energy significantly lower

Water Quality Benefits of Double Crop Systems

- Pesticides
- Sediment, pathogens and nutrients
 - Winter grains – providing cover
 - Better manure management
 - Importing less nutrients in imported feed



<http://www.usawaterquality.org/newengland>



Collaborate and Build Program

- Next Step: a farming systems evaluation.
 - Sustainable rotations for different organic production systems.



<http://www.usawaterquality.org/newengland>



Reducing Off-farm Grain Inputs on Northeast Organic Dairy Farms

10/05-10/09



Integrated Organic Program
\$875,000



C. Horton / R. Kersbergen / C. Schwab
CSREES/USDA

Award No. 2005-51106-02390

Reduce the reliance on NE dairies on imported grains

Organic Systems Trial

Evaluating 4-yr Forage Production Systems:

Farmer-Directed

- Corn silage with no other grains
- Corn silage with other grains in rotation (triticale, soybeans)
- No corn silage with homegrown grains
 - triticale, soybeans, BMRSS etc.
- No corn – no grains
 - Producing quality grass hay – purchased grain



<http://www.usawaterquality.org/newengland>



Organic Dairy Forage & Grains

Additional research:

- Winter small grains / short season corn - UMaine
- On-farm trials: forage soybean production – UVM

UVM co-leader in developing **eOrganic.edu** - an organic web resource. Received **\$200K** along with OR and IL (\$600K total).

UMaine developed **New England Guide to Weed Control in Field Corn** (2007) incorporating research on non-chemical controls.



<http://www.usawaterquality.org/newengland>



Research/Extension Outreach



Producer meetings

Research Outreach

Over 30 farm tours, field days, training programs.

In 2006, UMaine hosted a regional summer field training program for ag. service providers, and NE SARE

* 20 CCA / Ag
service providers
from New England

* 60 SARE
representatives from
the Northeast



<http://www.usawaterquality.org/newengland>



New England Regional In-Service Training for Ag Service Providers / Certified Crop Advisors



<http://www.usawaterquality.org/newengland>



New England Training Program – Outputs

Organized by UMaine Cooperative Extension

- Conducted two-day winter meeting annually since 1996
 - Day One: cover regional research / general issues
 - Day Two: Program focused on a specific issue
- 650 people have attended 11 programs
 - Certified Crop Advisors, Agency, CE, Farmers – US / Canada
- Excellent example of Extension/Research integration



<http://www.usawaterquality.org/newengland>



New England Training Program – Outcomes

2007 Program Evaluation Results

Summary report available on website

Knowledge gained:

- 89% in nutrient and crop mgt
- 81% soil and water mgt
- 78% manure mgt
- 63% pest mgt

93% utilized this knowledge in their work and shared with others:

- 85% with farmers
- 78% with other professionals
- 67% incorporated materials into educational programs or policy



<http://www.usawaterquality.org/newengland>



New England Training Program – Outcomes

Ag. service providers / crop consultants assisted:

- 404 farmers with over 11 different *nutrient management practices* on over 69,000 acres. 41% saved \$25-50/acre. Estimated \$1.7M saved
- 206 farmers with over nine *manure management practices* on over 34,000 acres. 15% saved money in reduced fertilizer purchases; or shifted costs to hauling manure further.
- 328 farmers with over 10 *pest management practices* on 53,000 acres. 33% saved \$6-50/acre. Estimated \$300k to \$2.6M saved



<http://www.usawaterquality.org/newengland>



New England Training Program - Outcomes

Ag. service providers / crop consultants assisted farmers with adopting the following practices:

- 96% implemented non-chemical pest controls
- 41% reduced the overall amount of pesticides applied
- 63% reduced the overall amount of nitrogen applied
- 78% reduced the overall amount of phosphorus applied
- 78% changed timing and/or rate of nutrient applications



<http://www.usawaterquality.org/newengland>



Nutrient Management Programs for Farmers



Farmer Nutrient Management Course

- UVM Extension developed a Farmer Nutrient Management (NM) Training Course to enable farmers to write their own NM plan to meet NRCS 590 standards.
- The course consists of five, 3 hour classes.
- The local NRCS and NRCD assist the farmers with map development and RUSLE2.
- If all sections are completed by the end of the course, the farmer has completed a NMP that meets NRCS 590 standards.



Extending Course to Region

Outputs

3 NM Courses

30 farms attended the courses

28 farms completed a NM plan

14,342 acres with NMP practices

Developing course curriculum template for the region.

UVM, URI and RI NRCS to adapt the curriculum to RI NRCS 590 standards and pilot a course in 2008 – livestock and sod farms.

Outcomes

100% can implement their plans

100% would recommend to others

50% would follow the NMP recommendations 100% of the time

50% of farms would apply less N and P sources

67% would save money as a result of their NM plan



Animal Waste Mgt Goals

- Research and develop manure and feed management systems that reduce nutrient loading and loss.



Animal Waste Mgt Goals

- Develop and deliver effective BMPs to small acreage livestock owners.



Animal Waste Mgt Goals

- Educate and empower farmers and service providers to adopt sustainable manure and feed management systems.



Research Highlights - AWM

- Feed and nutrient mgt. tools
 - Fecal P Indicator test and survey (UMASS)
 - Revision of P-Index based on local research and conditions (UMASS, UVM)
- End-of-season nutrient recovery in field corn using cover crops (UMASS)
- Pasture Mgt (UMASS, UVM, USDA-ARS PA)
 - reduce nutrient and pesticide loading and loss and soil erosion.



<http://www.usawaterquality.org/newengland>



Fecal P Indicator Test



UMASS – conducted on 34 farms, 2006

- Measures certain forms of P in feces
- Used as a “reflection” of P supply-utilization status; i.e. near adequate? or too much?
- Over 50% of farms over-feeding P
- Over 80% farmers not sure of P levels in grain ration
- Over 50% not sure/willing to reduce P in grain ration with majority due to feed specialists advise against it.

Need to educate farmers and feed specialists.



<http://www.usawaterquality.org/newengland>



End-of-season Nutrient Recovery

- Establishing cover crops early to capture residual nutrients - fall applied manure, carryover of N from previous crop to reduce N leaching
- Developing fall growing degree day model for cover crop planting dates
- Evaluating cover crop species, seeding methods and cropping systems
- Over \$100K Northeast SARE and NRCS



<http://www.usawaterquality.org/newengland>



End-of-season Nutrient Recovery



Aug. 18

Sep. 1

Sep. 15

Sep. 29

Oct. 13

Oct. 27

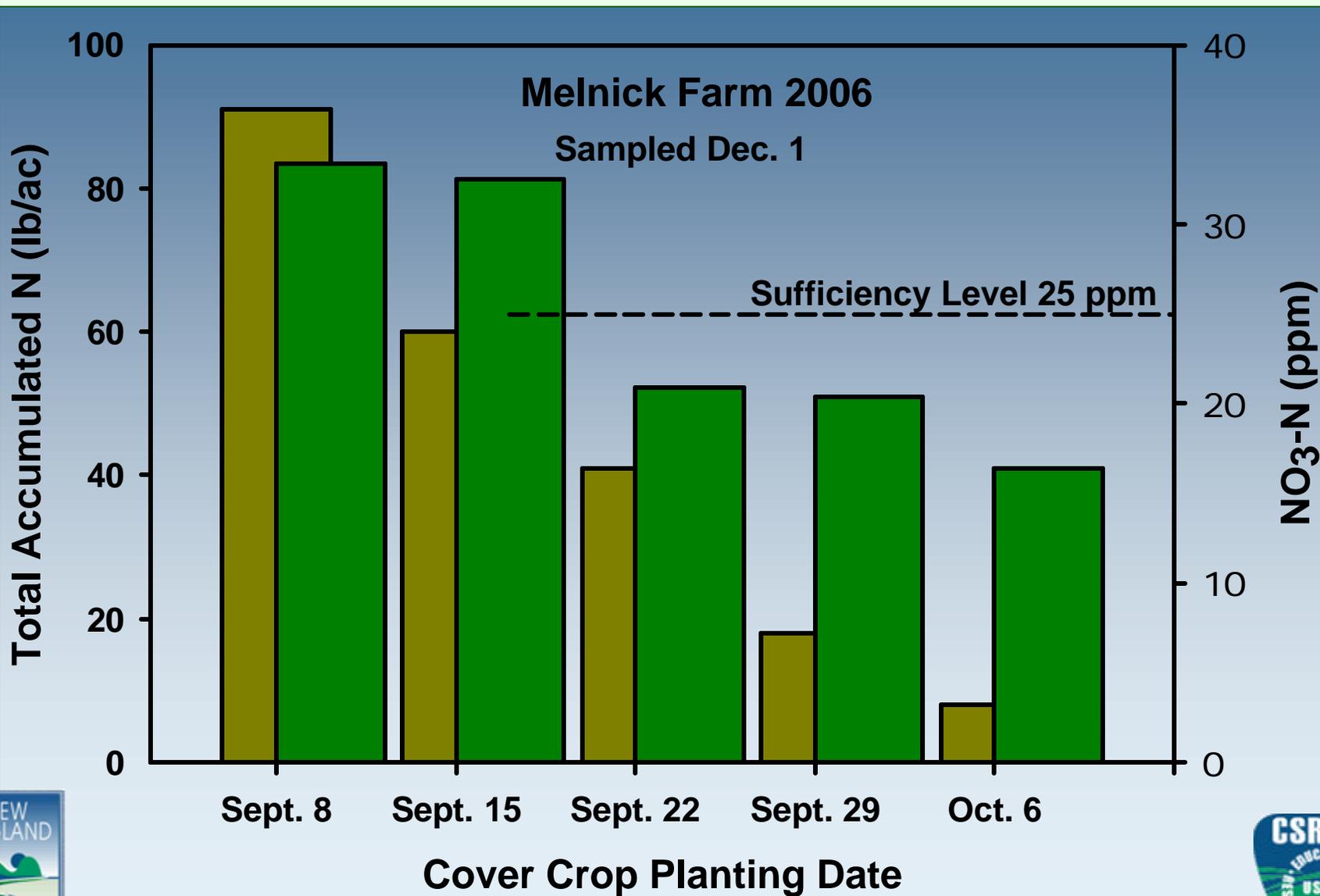


Cover Crop Growth on Dec. 31, 2004



<http://www.usawaterquality.org/newengland>

N accumulation and PSNT level

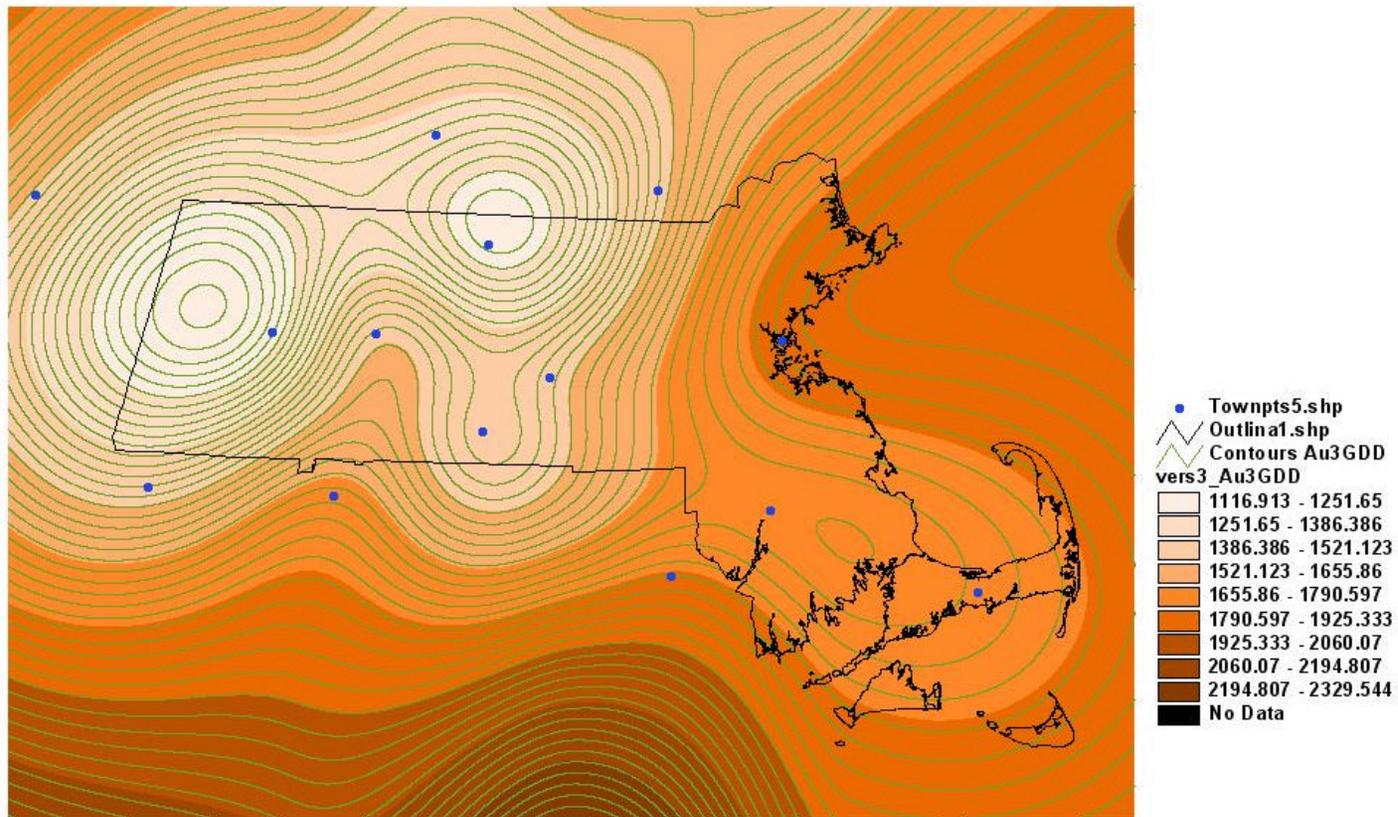


<http://www.usawaterquality.org/newengland>



Growing Degree Day Maps

Average GDDs Rye 3rd Week of August



0 70 140 Miles

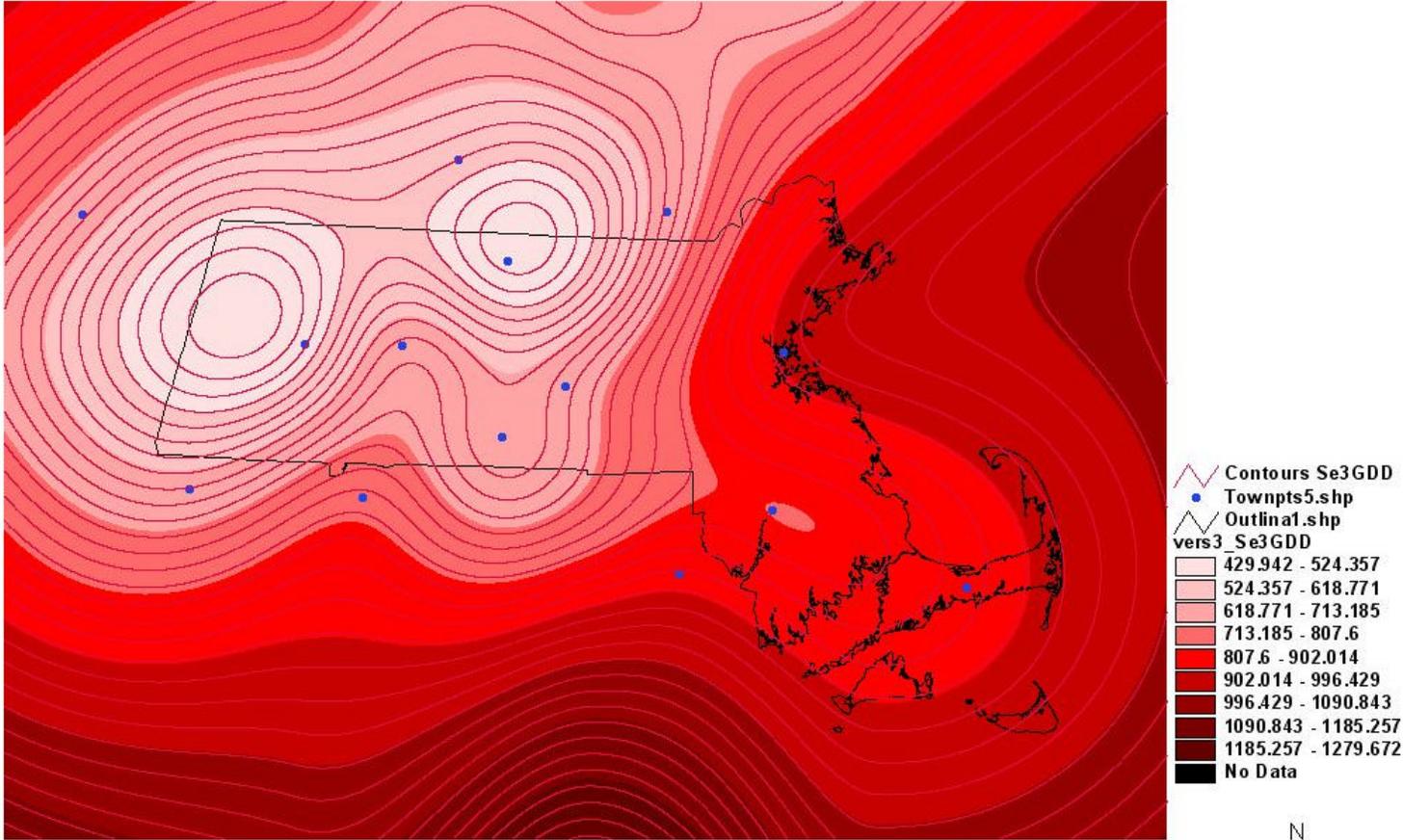


<http://www.usawaterquality.org/newengland>



Growing Degree Day Maps

Average GDDs Rye 3rd Week of September



0 70 140 Miles



<http://www.usawaterquality.org/newengland>



A photograph of a cornfield with green corn plants and inter-seeded grasses. The corn plants are in the foreground, and the grasses are visible between the rows. The text is overlaid on the image.

End-of-season nutrient recovery in field corn

Inter-seeding Species

- winter rye
- annual ryegrass
- smooth brome

Includes on-farm trials, MA

Improving On-farm Feed and Nutrient Flows

UMASS received a grant from the Mass. Ag. Innovations Center matched by UMASS Ag Expt. Stn for **\$370K** to:

- Continue research on end-of-season nutrient recovery in field corn using cover crops.
- For research improvement in corn management for increased grain contribution.
- For field tools for estimating on-farm nutrient balance and nutrient needs and credits.
- Water quality benefits from reduced applied N, end-of-season N recovery, and reduced soil and nutrient loss.



<http://www.usawaterquality.org/newengland>



Nutrient Flows on Livestock Farms

- UMASS participates in Northeast Regional Hatch Project 1024: **Whole Farm Dairy and Beef Systems for Environmental Quality** and the previous NE 132 Project.
- Organized trip to New Zealand to study nutrient flows, pasture and manure management – 13 LGU and USDA scientists from the US attended, Jan. 07

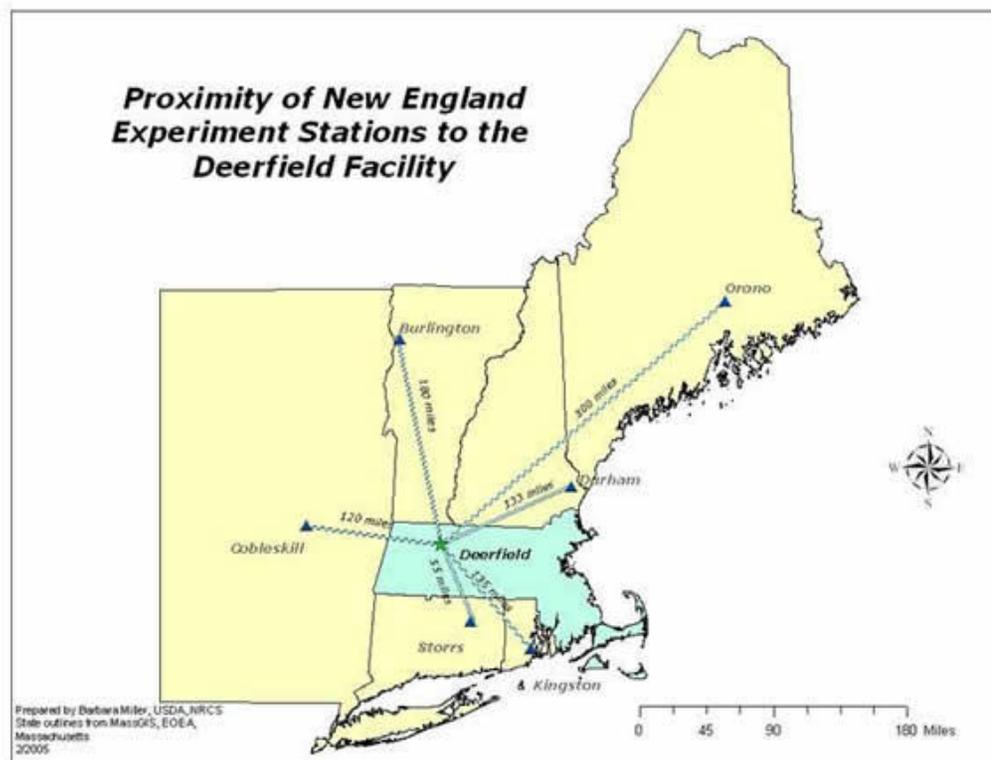


<http://www.usawaterquality.org/newengland>



Pasture Management

- Proposed Pasture Research and Learning Center for New England and Eastern NY – UMASS
- Received Joint NE SARE Grant, over **\$211K**, UMASS, UVM, USDA-ARS PA – includes on-farm trials in New England
- Received grant from Mass. Ag. Innovations Center and UMASS Expt. Stn. match for **\$340K**



<http://www.usawaterquality.org/newengland>



Proposed Pasture Research Center

- Planning and coordination led by UMASS involving farmers, agencies, and organizations throughout the region has resulted in:
- 2 regional stakeholder meetings (74 people) and several conference calls
- Southern New England Grazing Network, formed in 2006. Group website:
http://tech.groups.yahoo.com/group/graze_it_up
- Regional pasture walk series in 2006 and 2007 – Extension, NRCS/GLCI, MA NOFA
- Development of 2 regional research proposals, both funded in 2007 for over **\$550K.**



<http://www.usawaterquality.org/newengland>



Pasture Management

- Assessing pasture grasses, legumes and pasture blends for varying soil conditions.
- More than 25 pasture blends evaluated in MA, PA and VT – includes on-farm trials in all New England states.
- Evaluating summer annuals for times of pasture shortage and grazing season extension.
- Barriers to pasture mgt.



Tumble wheel in action



<http://www.usawaterquality.org/newengland>



More Research Highlights - AWM

- Reducing nutrient loss from manure field stacks - UCONN; requested by farmers, SNE Farmer Research Network
- Adapting Low Impact Devlp. Technology - bioretention filters for small acreage livestock runoff, URI, UCONN NEMO.
- UMASS served on National Livestock and Poultry Learning Center webcast panel, Feb. 2007 – manure applications to legume crops research.



<http://www.usawaterquality.org/newengland>



Small Acreage Livestock

- URI fact sheet and site assessment series developed in 2005 as part of USDA CSREES 406 Extension Education Grant, **\$278K**.
- Adapted and utilized by UNH Cooperative Extension and the New England Small Farm Institute.
- In 2006, URI received 406 Extension Education Grant to conduct needs assessment and develop train the trainer education program, partnering with 4-H, **\$180K**.



<http://www.usawaterquality.org/newengland>



Small Acreage Livestock

- UMASS Extension conducts annual MASS Aggie seminars and received a s319 grant in 2007 to conduct an Equine Education Program, **\$150K**. Three other s319 dairy-livestock grants, **\$400K**, one NRCS-UMass Extension grant, **\$160K**
- URI and UMASS are sharing resources, and will incorporate manure management research from UCONN (manure field stacking) and URI/UCONN NEMO (bio-retention filters) – Conservation Innovation Grant, RI NRCS, **\$75K**.
- URI is a team member on the Small Farm Animal Waste Management Group for the National Livestock and Poultry Learning Center to develop an eXtension Community of Practice.



<http://www.usawaterquality.org/newengland>



Incorporating and Extending Research

Over 30 workshops, farm tours, field days, training programs for farmers and service providers.



<http://www.usawaterquality.org/newengland>



Leveraging Summary

Ag. Nutrient and Pest Management

- Over **\$1.25 M** in external grants

Animal Waste Management

- Over **\$2.25 M** in external grants



Focus Area Strengths

- Research
- Extension Programming
- Leveraging
- Collaboration with partners and stakeholders



What's Next

- Continue research and on-farm trials
- New England In-service Training Program – annual
- Regional Summer Field Training programs – annual
- Nutrient Management Course for Farmers – encourage other states to adapt – RI to pilot in 2008
- Development of eOrganic for eXtension and other publications / web-based resources on research topics
- Pasture Research and Learning Center for New England and Eastern New York
- Small Acreage Livestock Education Programs & Resources



Thank You



<http://www.usawaterquality.org/newengland>



LGU Education

LGU Graduate student research projects:

- UCONN - nutrient management soil and tissue tests and evaluation of farmer behavior change.
- UCONN – manure management, reducing nutrient loss in manure field stacks.
- UMASS – nutrient management soil and tissue testing.
- UMASS – cover crops for end of season nutrient recovery.
- UMASS – students to be involved with upcoming pasture research and improving on-farm feed and nutrients flows.



LGU Education

LGU Curriculums:

- UMaine Sustainable Agriculture Program / INT 482
- UNH Organic Dairy Farm
- UMASS Soil and Crop Management Class
- UMASS Organic Vegetable Student Initiative
- URI Introduction to Animal and Veterinary Science Class



Needs Assessments Summary

Grass Roots Initiatives / Stakeholder Meetings

- Maine Organic Milk Producers
- Farmer's Watershed Alliance
- Southern New England Grazing Network - includes state and federal agencies and organizations
- Massachusetts dairy farmer survey

Annual New England In-service Training for Ag. Service Providers / Certified Crop Advisors

- Annual Program Evaluation for effectiveness, needs, impacts

USDA CSREES Extension Education Grant

- Small acreage livestock owner needs assessment



Summary of Outputs

- **45+** - research & demonstration trials – On-Farm, LGU, ARS
- **25+** - cropping systems, and nutrient, feed, manure and pest mgt BMPs and tools that can be transferred to farms
- **11**- regional in-service training for ag. service providers
- **3** - regional summer field training for ag. service providers
- **30+** - farm tours, field days, workshops, training programs
- **30+** - presentations at professional conferences
- **1** web cast presentation, National Livestock and Poultry Learning Center, February 2007



Summary of Outputs

- **4** - Soil Health Courses for farmers, VT
- **3** - Nutrient Management Courses for farmers, VT
- **9,500 acres** – Under UCONN Performance-based Comprehensive Nutrient Management Planning
- **Annual** New England Guide to Weed Control in Field Corn
- **1** - eOrganic.edu - an organic web resource for eXtension
- **6** backyard livestock fact sheets
- Regional and LGU websites and web-based resources / fact sheets / BMPs

