

University Sustainability as a Teaching Tool: Applications from the University of Maine at Farmington



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Overview

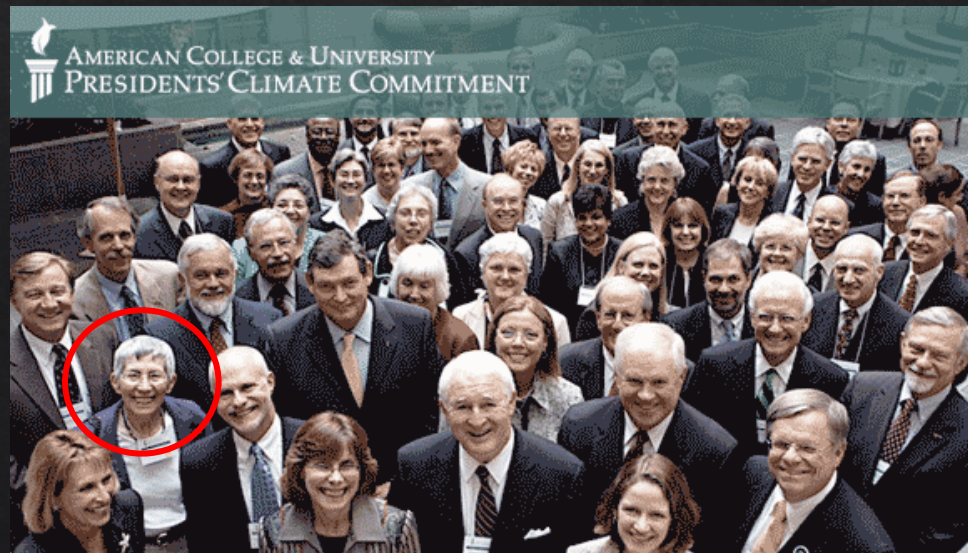
- ◆ The Sustainability Landscape in Higher Ed
- ◆ History of Sustainability at UMF
- ◆ UMF's Sustainable Campus Coalition
- ◆ Types of Academic and Experiential Learning
- ◆ Community Engagement
- ◆ Final Thoughts

The Sustainability Landscape in Higher Ed

- ◆ Increasing recognition that sustainability is critical part of undergraduate education (i.e. General Education).
 - ◆ Students are choosing colleges/universities based in part on an institution's commitment to sustainability.
 - ◆ Higher education is now accountable for sustainable practices and commitment to climate change mitigation and adaptation.
 - ◆ Large increase in sustainability officers on college campuses
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- ◆ **Result:** *Integration* of sustainability education, strategic planning and campus operations.

History of Sustainability at UMF

- ◇ Environmental academic programs start in 1980s.
- ◇ Creation of the Sustainable Campus Coalition (SCC) in 2002.
- ◇ In 2007 President Theodora Kalikow signed the ACUPCC on behalf of UMF.
- ◇ Half-time sustainability coordinator hired in 2009.
- ◇ Recognition by LEED, Princeton Review (Guide to Green Schools) and other organizations.



UMF's Sustainable Campus Coalition

- ❖ Coalition of UMF students, faculty, staff *and* community members.
- ❖ Events (e.g.. Waste Day, Earth Day, Maine Fiddlehead Festival)
- ❖ Weekly student and “entire group” meetings to discuss a range of issues.
- ❖ SCC support of student research (e.g., focus groups on Maine lakes, student research on compost).
- ❖ Initiatives (Compost, Terracycle, Thrifty Beaver Co-op).



Types of Academic and Experiential Learning

- ◆ Class visits (i.e. UMF infrastructure).
- ◆ Class projects/exercises
- ◆ Individual student research projects
- ◆ SCC student input on strategic planning in sustainability




Class Visits

- ◆ Tours of LEED buildings and UMF Biomass Plant
- ◆ Walking sustainability tour on campus to inform students of sustainable campus infrastructure.



Class Projects

UMF Geothermal Project



ECO 325 - Spring 2013

This paper is a critique of the geothermal project that has been proposed by the administration. It will include a cost-benefit analysis of the project, a review of the proposal, and recommendations regarding further action.

Company

University of Maine at
Farmington

246 Main St. Farmington
Maine

207-778-7000

3/20/2013

- ◆ ROI analysis, short vs. long term costs/benefits, opportunity costs

Edible UMF: An Action Plan for a Healthy, Tasty and Sustainable Campus

Richard James Card, Riley Chickering, Stark Duphiney, Isaiah Fallon, Craig Gajewski, Casey Griffin, Andrew Harmon, Robert Hollis, Charles Martin, Matt McCourt, Savannah Menard, Kayla Pingree, Jenessa Talarico



FYS100: Science and Practice of Sustainability

What Is an Edible Campus?

Landscaping with edible plants is becoming an increasingly common way of promoting healthy diets, building community through civic participation and re-connecting people to their food. Our seminar has worked together to create an action plan for edible landscaping at UMF that includes:

- A GIS analysis of sun exposure, road salt, pedestrian flows and other important criteria for siting and designing edible landscapes across campus
- Identification of suitable edible plants adapted to specific sites on campus based on harvest sequence, cultivation and maintenance requirements
- A program for sustainable long-term maintenance and experiential education opportunities

This poster provides an overview of our action plan, mapping a practical way of creating an edible UMF, enabling students to snack on tasty fruit, veggies and herbs between classes by Fall 2016.

Our Analysis

Past attempts to grow edible plants on UMF's campus have not been sustainable due to siting problems and inconsistent maintenance and upkeep. We took steps to find the best places for edible plants on campus and to prioritize low-maintenance, hardy perennials. We found the best locations by performing a GIS analysis to determine where specific types of plants would thrive. GIS analysis uses computer mapping software to combine the essential factors that insure the success of edible plantings. These factors include sun exposure, residual road salt from the winter, and areas that received the most pedestrian traffic flow.

When evaluating sun exposure we took into account the shadows cast from buildings and trees. We estimated the height of the buildings and trees around campus and entered them into a database so the shadow were accurately calculated. When considering the peak growing season we modeled the sun shadows cast on July 1. The reason the peak growing season is important is because many favorite edible plants require full sunshine. We also looked at the effects of residual road salt on soil fertility and plant growth. Because of salt sensitive plants it was determined that there should be a 30 foot distance from major roads to where any plant would be planted and a 15 foot distance from walking paths. Lastly, we discussed and then mapped flows of student pedestrians around campus. Edible plantings that are not accessible are unlikely to be used by students.

Each member of the class selected a site and specific plant types that were suitable for that site.



Biomass at UMF - Part II

Heating the Campus with Local Wood - Starting Fall 2015

BIO 294 (Forest Ecology & Conservation) Class & Dr. Andrew Barton

Economic Considerations

Chips burned per year	3822 tons
Cost of chips per ton	\$120-140
Estimated chip cost per year	\$485,640
Current cost of the ~400,000 gallons of oil per year	\$1.2 million
Estimated Annual Savings (wood is cheaper, plant 22% more efficient)	\$900,000
Projected cost of biomass plant	\$11 million
Approximate timeline of payoff	9 years

Local Economic Impacts

- Creation of jobs at biomass plant through construction and maintenance.
- Fueling the local forest products industry.
- Support of a local middle man who arranges chip deliveries and transactions.
- Reduction in dependence on foreign and out-of-state energy sources.



Environmental Benefits

Four aspects of biomass plant will reduce UMF's environmental impact

- burning renewable wood is better than oil
- most pollution is removed from exhaust
- plant is more efficient: 22% fewer BTUs needed to heat campus

Reduction in CO₂ Emissions & Pollution

Emission Type	Oil only Emissions	Oil with Biomass Emissions	% Reduction
CO2	9,242,339lbs	462,117lbs	95%
SO2	55,750lbs	41,813lbs	25%
Nox	19,526lbs	2,441lbs	87.50%

Current emissions without the Biomass Plant compared to the expected emissions once it is completed and operational. *% reduction values are from the initial values (Oil emission), they do not mean that the introduction of Biomass will eliminate 95% of the CO₂ released.

University of Maine Farmington			
Year One Annual Energy Savings:			
Annual Fuel Oil Saved	365,857 Gallons		
<i>*Assumes Sustainably Sourced / Renewable Wood Biomass Feed Stock</i>			
Emission Reductions	In One Year	In 5 Years	In 10 Years
Pounds of Carbon Dioxide	8,780,222	43,901,108	87,802,216
Pounds of Sulfur Dioxide	51,987	259,837	519,673
Pounds of Nitrogen Oxide	16,844	84,218	168,436
Metric Tons of Carbon Dioxide	3,983	19,913	39,823
Metric Tons of Sulfur Dioxide	23.6	118	236
Metric Tons of Nitrogen Oxide	7.6	38	76
Equivalent Impact	In One Year	In 5 Years	In 10 Years
Passenger Cars Off the Road	860	4,302	8,603
Passenger Car Miles Driven	10,325,623	51,628,117	103,256,233
Planted Acres of Trees	1,187	5,987	11,873
Gallons of Gasoline	453,524	2,267,619	4,535,238
Barrels of Oil	9,263	46,314	92,628
Number of Powered Homes	509	2,546	5,090

Energy Savings and Comparisons for Year One of the Biomass Plant

Fuel Type	Annual Total CO2 Emissions to Heat a Typical House
Oil	13,845lbs
Natural Gas	10,008lbs
Wood Chips	308lbs

Comparison of CO₂ emissions between topical fuel types

Heating UMF: Starting 2015

The biomass plant will greatly change the mix of energy sources used to heat the UMF campus

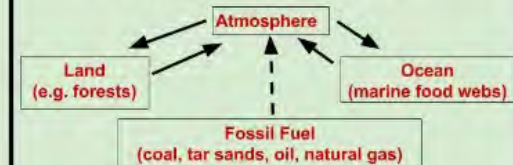
	Existing Fuel Mix (MMBtu)	Existing Fuel Mix (%)	Expected Future Fuel Mix (MMBtu)	Expected Future Fuel Mix (%)	Change in Usage (MMBtu)	Change in Usage (%)
Crude Oil	49,189	89%	1,205	3%	(47,985)	-98%
Propane	4,458	8%	4,628	10%	140	3%
Biomass: Wood Chips			35,855	79%	35,855	
Geothermal	3,516	6%	3,516	8%		
Total	57,194	100%	44,704	100%	(12,490)	-22%



Is Biomass Carbon Neutral?

Old Answer: Yes!

Burning wood does not add CO_2 to the biosphere - atmosphere carbon cycle, whereas fossil fuel does



New Answer: It depends!

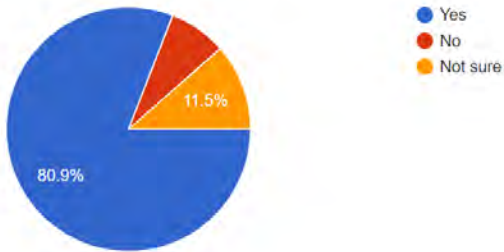
Ex 1: Waste sawdust, which would have released CO_2 to the atmosphere anyway \rightarrow Nearly Carbon Neutral

Ex 2: Forest cleared, turned into mall → As Bad As Fossil Fuel
Ex 3: Sustainably harvested forest → Complicated!

ANT/GEO 265S - Climate Change & Society

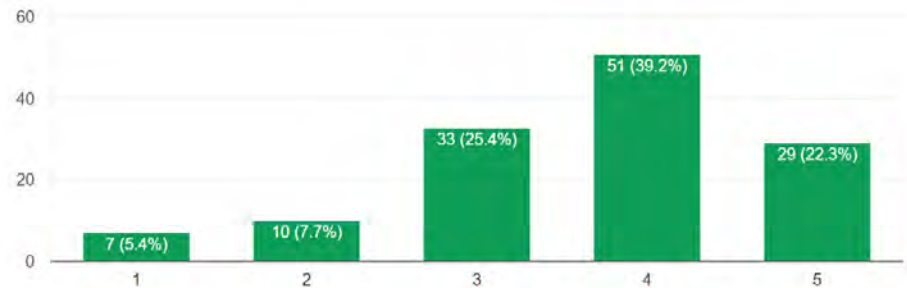
Do you generally support this renewable energy project?

131 responses



To what degree do you think this project will impact Farmington's traditional image and identity?

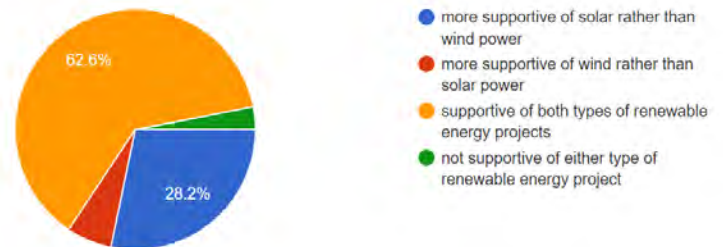
130 responses



- ❖ Survey on new solar array (\$110 million, 77 megawatts, 490 acres) in Farmington.

How do you feel about solar vs. wind power development in Maine?

131 responses



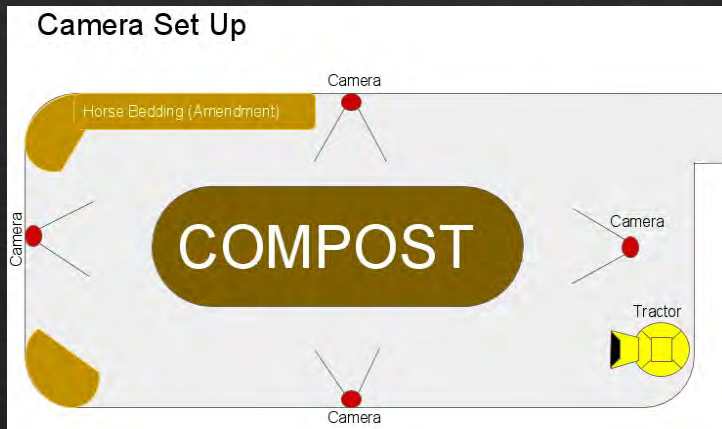
Exercises

- ◆ Garbology exercise in Introduction to Archaeology (ANT 102S) course to examine UMF student culture and sustainability practices.



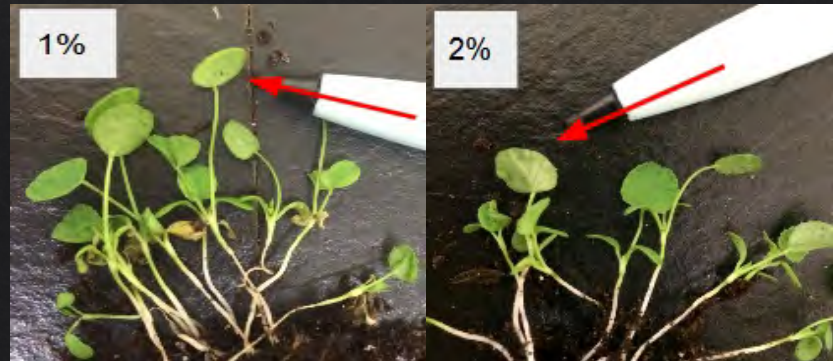
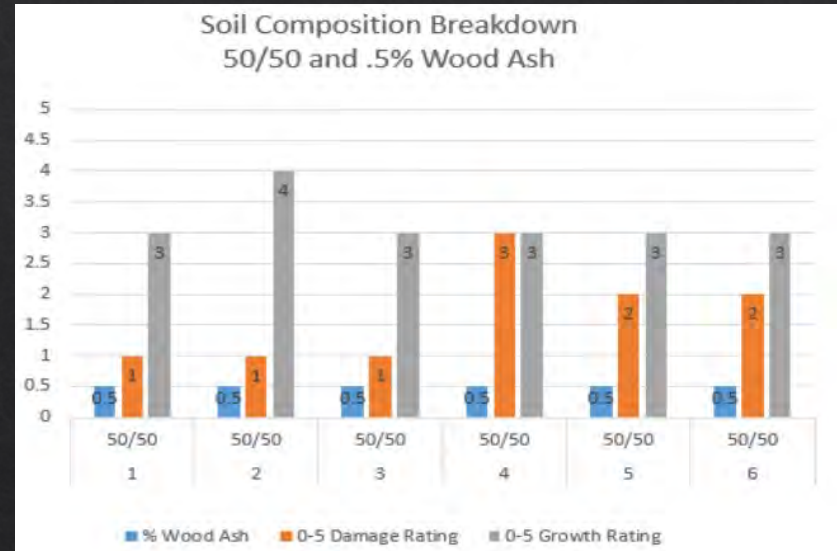
Individual Research Projects

❖ Wildlife interaction at the Farmington/UMF compost pile



Individual Research Projects

- ◆ Effects of hardwood ash (from campus biomass plant) on soil toxicity (bioremediation).



Individual Research Projects

- ◆ Behavioral analysis of removal of disposable of coffee cups in UMF dining hall.




Student Involvement on Strategic Planning in Sustainability

- ◆ Student are encouraged to play a role in campus decision making on sustainability issues.
- ◆ UMF Energy Committee
- ◆ Dining Committee
- ◆ UMF Sustainability Council
- ◆ Discussions of campus policies and projects by the SCC.


Community Engagement On Campus

- ❖ UMF Campus serves as a venue for students to understand and hear from stakeholders on a range of sustainability issues.

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NEWS > Posted November 20, 2014

INCREASE FONT SIZE 

Forum at UMF explores natural gas alternatives

About 50 people attend a discussion that centered around diversifying energy sources on campus.


BY [RACHEL OHM](#) MORNING SENTINEL

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FARMINGTON — Word that Summit Natural Gas of Maine will be unable to meet a deadline for bringing natural gas to Franklin County provided the backdrop Wednesday when community members gathered at the University of Maine at Farmington to discuss alternatives.

About 50 people attended New Directions in Farmington's Energy Future, a forum on ways to reduce dependence on heating oil and explore more cost-effective and environmentally friendly energy sources.

ADDITIONAL IMAGES



Bill Crandaw, program manager at Western Maine Community Action, speaking Wednesday in Farmington during a community forum on alternative energy, calls for the University of Farmington to start using wood pellets to heat the university campus. Staff photo by Rachel Ohm

"There have been lots of changes in energy on the local, state and regional level," said Luke Kellett, a member of the Sustainable Campus Coalition, which hosted the event. "Part of that in Farmington includes the recent news from Summit."

Summit, which recently completed a 68-mile natural gas pipeline from Pittston to Madison and planned to expand to Farmington, announced earlier this month that it wouldn't be able to fulfill a commitment to bring natural gas to UMF by 2016. If the university, the largest potential customer in the county, does not connect to the pipeline, the company has said it will not serve other customers in the county.

BROWSE MORE IN NEWS

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Community Engagement Off Campus

- ❖ UMF students are encouraged to attend town meetings and hearings on a range of sustainability and environmental issues (e.g., Mill Pond Dam removal, NextEra solar, NECEC Transmission Line).

NECEC discussion draws a crowd in Farmington

Posted by [Amber Kapiloff](#) • February 27, 2019 •



NRCM representative Sue Ely speaks to the crowd at the Community Center Tuesday night.

Why does UMF succeed as a Laboratory for Sustainability Education?

- ◆ Long-term commitment to sustainability by the campus.
- ◆ Staff and faculty have a good rapport and work well together towards supporting learning in sustainability.
- ◆ Open and available data sharing for student projects and research.
- ◆ Student input and perspectives valued at all levels of sustainability decision making.
- ◆ Farmington is well positioned geographically to merge classroom learning with real world sustainability and environmental issues.

Acknowledgements

- ◆ Special thanks to UMF faculty, students and staff for contributing to this presentation.
- ◆ Green Campus Consortium (GCC) of Maine
- ◆ Town of Farmington & Community Partners

