



MichiganTech

Michigan Technological University

Western Upper Peninsula Center for Science, Mathematics and Environmental Education

A partnership of

Copper Country & Gogebic-Ontonagon Intermediate School Districts and Michigan Technological University
Serving schools and communities in Houghton, Baraga, Gogebic, Ontonagon and Keweenaw Counties

Website: <http://wupcenter.mtu.edu/>

Michigan Tech *Future Fuels from Forests* High School Field Trips

Schools Registered & Dates

- Wed., March 18 Clint Heikkala (Lake Linden-Hubbell High School) – 16 Physics students
Brian Rajdl (Hancock High School) – 8 students from PEAK (*Partnership for Environment and Academics in the Keweenaw*) class
- Friday, March 20* Susan Tollefson (L'Anse High School) – 24 Chemistry students
*This group needs to depart at 2:15 pm to get their bus back to L'Anse. This will cut short their last session. Please plan accordingly.
- Wed., March 25 Stephanie Mazzon (LLWright High School) - 12 Chemistry students
and Tracy Rowe (AD. Johnston High School)- 12 Math students
- Friday, March 27 Meg Vivian (Horizons High School) – 24 science students

Schedule & Session Locations (Print a campus map at: <http://www.mtu.edu/maps>)

- 9:00 am **Student drop off** at Chemical Sciences Building (#19 on campus map)
Students will walk from one building to another; dress for the weather!
- 9:00-9:45 am ***Biofuels in the Gas Tank? What Does It Take to Develop a Forest-based Fuel?***
by Maria Janowiak, Northern Institute of Applied Carbon Science (NIACS) (104A Chem Sci)
Cheap gas? Plenty of it? How do we transition from petroleum to a biofuel-based transportation fuel? Compare cost/benefits of different sources of biomass: corn, switchgrass, trees, and compare which source of biofuel may be more desirable?
- 10:00-11:15 **Ethanol Production in the Lab: Converting Tree Biomass to Fuel**
by Dr. David Shonnard and Jill Jensen, PhD candidate, MTU Dept of Chemical Engineering
(i) ½ group attends Presentation (404 Chemical Sciences Building conference room)
(ii) ½ group tours Dr. Shonnard's Research Lab (205 Chemical Sciences Building)
- The goal of this session is to introduce students to the process for converting woody biomass to ethanol, a transportation biofuel. Students will inspect different types of wood chips under the microscope and describe the surface features, as well as view fermenting microorganisms at work. Purified ethanol will be recovered from the fermentation broth using a small batch distillation column.
- 11:30-Noon **LUNCH** at Wadsworth Hall (Building #37 on campus map)
Compliments of Michigan Tech Office of Admissions

Schedule, cont'd

12:15-1:15 **Getting Trees from Forest to Processing Plant** (202 ME-EM Computer Lab Bldg. #20)
(Dr. John Sutherland and Tim Jenkins, PhD candidate, Dept of Mechanical Engineering)

A multi-node simulation model has been developed that allows the user to react to system changes and make decisions in order to satisfy operational requirements of an ethanol-producing facility. In this session, students will use a computer simulation program, ServiceModel, to interactively coordinate the flows of materials and information between the various points of supply and demand along the chain with the objective of minimizing system-wide costs while satisfying service-level requirements. The model will be run several times under varying conditions so students can see both visually and through simple analysis how system changes affect overall performance.

1:30-3:00 **Forest Resource Management: Impacts on Avian Biodiversity & Forest Productivity**
***Michigan Tech Trails (I will have a Tech van to transport students)**

i. **Impacts on Avian Biodiversity**

by Dr. David Flaspohler, School of Forest Resources & Environmental Sciences

What is biodiversity and why is it important? How can we manage the forest community as a feedstock for ethanol production, and maintain biodiversity? Plant and wildlife species have various habitat requirements to survive and reproduce. This session will provide an overview of the key resources needed by birds, mammals, amphibians, reptiles, and arthropods (insects) and how those features can be retained or lost depending on the management system used for growing plants for ethanol production.

ii. **Impacts on Forest Ecosystem Productivity**

by Dr. Chris Webster, School of Forest Resources & Environmental Sciences

A basic understanding of how trees grow is necessary to evaluate the potential of trees and other woody plants to provide a sustainable fuel source. In this session, students will learn how trees build woody tissue, how to measure and interpret tree rings, and some key considerations that need to be met in order to maintain tree and ecosystem productivity. Students will do a short tree ring exercise to determine how much biomass a tree has put on during the student's life time.

2:50 pm **Questions & Summary & Student Post-Test**

3:00 pm **Student pickup at Michigan Tech Trails parking lot** located across from the Michigan Tech football field (note sign along MacInnes Drive)

Questions during the field trip: call Joan Chadde at 487-3341 (105 Dillman Hall) or 369-1121 (cell).