Energy Literacy as a Co-Product of the NARA Supply Chain:
Closing the gap from emerging science to education

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A Few of the Education Team Goals:

- Strengthen overall science literacy of students in areas particular to biofuels
- Improve energy and biofuels literacy of teachers educating our future citizens
- Support bioenergy workforce development
Educating and assessing “the pipeline”

31,674 K12 students
845 Teachers
173 Undergrads
159 Graduate

Assessment
Digital Asset Management

MOSS
Tribal Partnership Program

SURE

IDX
Integrated Design Experience

DX
Integrated Design Experience

Assessment
Digital Asset Management
31,674 K12 Students

845 Teachers
173 Undergraduates

159 Graduate students
Digital Asset Management

Educational Resources
The NARA Energy Literacy Principles Matrix is a collection of educational resources related to biofuel solutions that are economically viable, socially acceptable, and meet the high environmental standards of the Pacific Northwest. You can use the Matrix to find teaching materials such as lesson plans, datasets, videos, images, activities, software, and modules. All of the resources align to the energy principles and concepts as outlined in the Department of Energy's peer reviewed Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education framework. Please take a look at an overview for how to use this site here.
More than 60 lessons have been developed

60 webinars have been produced

2 energy literacy instruments have been developed and validated by the NARA education team

16 peer reviewed publications
Assessment Results

Teachers

- are more knowledgeable about biofuels and biofuels research
- have more informed opinions about bioenergy
- Incorporate biofuels into their curriculum
- Are more likely to use problem-based learning in the classroom

K12 Students are

- More knowledgeable about bioenergy
- Interested in pursuing STEM careers
Education and Research Connections

Education feeds research

Research feeds education

3) Education and Outreach Products & User Groups
   1) K-12
   2) Outdoor Science Ed.
   3) Webinars and Workshop
   4) Collegiate Course Work

2) Research Products
   1) Research Data
   2) Academic Publishing
   3) Social Media
   4) Print Media
   5) Digital Media

1) NARA Supply Chain
   1) Forest Residues Preparation
   2) Transportation
   3) Pretreatment
   4) Enzymatic Hydrolysis
   5) Fermentation
   6) Blojet + Co-products
Supply Chain Analyses

Pacific Northwest (PNW)
Supply Chain Analysis
This site provides supply chain data and analysis generated by NARA research for the region identified as the Pacific Northwest, which includes Montana, Idaho, Washington, and Oregon.

Mid-Cascades to Pacific (MC2P)
Supply Chain Analysis
This site provides supply chain data and analysis generated by NARA research for the region identified as Mid-Cascades to Pacific, which includes the western sections of Washington and Oregon.

Western Montana Corridor (WMC)
Supply Chain Analysis
This site provides supply chain data and analysis generated by NARA research for the region identified as the Western Montana Corridor, which includes the western section of Montana, Northern Idaho and northeast Washington.

Clearwater Basin
Supply Chain Analysis
This site provides supply chain data and analysis generated by NARA research for the region identified as the Clearwater Basin, located in central Idaho.
NARA SURE
EDUCATION FEEDING RESEARCH
SURE Participants (35 total)
NARA SURE Goals: Support Bioenergy Workforce Development

Develop skills for future biofuels and bioproducts research careers

Excite undergraduate students about research in biofuels and bioproducts

Increase number of students participating in biofuels and bioproducts research, including those from schools without research programs
<table>
<thead>
<tr>
<th>Possible Benefits of Doing Research (Ranked based on their 2015 Experience)</th>
<th>‘Extremely valuable’ or ‘valuable’ benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learned what it's like to be a researcher</td>
<td>80%</td>
</tr>
<tr>
<td>Determined that I want to continue studying science or engineering</td>
<td>60%</td>
</tr>
<tr>
<td>Travel to an interesting/different/new place</td>
<td>70%</td>
</tr>
<tr>
<td>I found a particular field of research offered through this program very interesting</td>
<td>60%</td>
</tr>
<tr>
<td>Learned what it's like to do research for grad school</td>
<td>50%</td>
</tr>
<tr>
<td>Obtained hands-on experience to go with my class experience</td>
<td>80%</td>
</tr>
<tr>
<td>Get experience/publications that I'm proud of and can put on my resume</td>
<td>80%</td>
</tr>
<tr>
<td>Financially benefit</td>
<td>90%</td>
</tr>
<tr>
<td>I want to improve my analytical abilities.</td>
<td>70%</td>
</tr>
<tr>
<td>Something different than I've done before.</td>
<td>90%</td>
</tr>
<tr>
<td>This was my only option/job possibility for this time during the summer.</td>
<td>70%</td>
</tr>
</tbody>
</table>
TRIBAL PARTNERSHIP PROGRAM
EDUCATION FEEDING RESEARCH
The TPP project has greatly contributed to the number of Native Scholars pursuing and achieving both their undergraduate and Graduate degrees!

Photo courtesy: Karl Oleson – UW NARA TPP

- **Student participation in research:** 15 Undergraduate students and 9 graduate students have participated in the Tribal Partnership Program. Students are members of Yakama Nation, Navajo Nation, Crow, Blackfeet, Pit River Nation, Confederated Salish & Kootenai Tribes.

- **Support Tribal research projects** on biofuels and biorefining, economic development and forest restoration
Tribes contribute to NARA’s 1,000 Gallon

Confederated Salish & Kootenai Tribes (MT)  Muckleshoot Indian Tribe (WA)

2 truckloads from CSKT and 1 truckload from MIT
Other tribes contacted and could not participate for various reasons.

Photos courtesy: John Sessions – NARA OSU
What’s Next?
Next up for Year 5

Interest is growing! Planning a proposal to USDA in 2016.
Educational Products

THE VALUE OF A TREE
COMPARING CARBON SEQUESTRATION TO FOREST PRODUCTS

Fueling Our Future: Exploring Sustainable Energy Use
An Interdisciplinary Curriculum Recommended for Grades 3-5

Interactive Venues

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What follows is a discussion of the steps of lignocellulosic biomass conversion.