



Shelley Pressley (WSU Director of Undergraduate Research; third row, center) and the 2015 NARA SURE students.

Undergraduate Research with NARA

This summer, 13 undergraduate students from across the U.S. invested their time to participate in the NARA Summer Undergraduate Research Experience (SURE) and assist NARA researchers in a wide array of studies.

NARA has sponsored undergraduate students through the WSU-SURE program since 2012. Each year, the pool of undergraduate applicants gets larger due to the program's exposure at major conferences and on websites like the [Pathways to Science](#). For the 2015 session, 93 applications were received. Approximately 20% of the applicants learned about the program from their academic advisor, 46% from searching the internet, and 22% from Pathways to Science website. Demographics of 2015 applicants were 49% women, 51% men; and 12% Hispanic, 2% Native American, 10% African American, 19% Asian/Pacific Islander/Filipino, 3% multicultural, and 45% Caucasian. Applications were received from 68 different schools.

From the 93 applicants, 13 were placed with NARA mentors at five locations: Washington State University (Pullman), Washington State University (Tri-Cities), The University of Idaho's McCall Outdoor Science School (MOSS), University

of Washington, and Pennsylvania State University. The students, their undergraduate institution and a link to posters that describe their work are listed below.

Maika Bui | *University of Washington*
[Synthesis of Lignosulfonate Hydrogels cross-linked with PEGDGE](#)

Kyle Thompson | *San Jose State University*
[Characterization and Modification of Asphalt With Epoxy Resins Synthesized From Pyrolysis Oil, a Derivative of Lignocellulosic Biomass](#)

Bailey Tebou | *North Carolina State Univ.*
[Air Quality Impact of the NARA Biorefinery](#)

Shakema Haynes | *University of Arkansas at Pine Bluff*
[Activated Carbon by Chemical Activation of Lignin with Potassium Hydroxide](#)

John Barth | *Washington State University*
[Comminution of Unmerchantable Forest Residuals to Determine Power and Energy Consumption as a Function of Moisture Content and Size Reduction Range](#)

Adriana Guzman | *Washington State University*
[Making The Chemistry of the NARA Project Visible](#)

Sarah Wilkins | *Yale University*
[Biofuel Transportation and CO₂ Emission](#)

Emily Schwartz | *University of Washington*
[Forest Ecology and Biofuel Production Potential for Tribally-Managed Forests in the Northern Rockies](#)

Jennifer Murphy | *University of Idaho*
[Educating Youth on Air Pollution Caused by Transportation](#)

Mark Wohlpart | *Penn State*
[Screening Value-Added Market Opportunities for Lignin](#)

Oshauna Morgan | *Johnson C. Smith University*
[Characterization of Biorefinery Lignins and Comparison of Reactivity for Value-added Chemical Production](#)

Kasey Markland | *Washington State University - Tri Cities*
[Modifying Lignin and its Model Compounds to Enhance Oxidative Ring Cleavage to Dicarboxylic Acids](#)

Aleksandr Kirpach | *Tufts University*
[Preventing Nitrogen Depletion in Forests Undergoing Forest Residual Removal](#)

Workforce development

Providing research opportunities for undergraduate students can be an effective way to motivate students for further study. A 2003 survey of undergraduates who participated in summer research programs indicated that 91% reported that their research experience sustained or increased their interest in postgraduate education ([Lopatto 2004](#)). The research can also expand a student's education and interests. Andrea Guzman, a biological science student who plans to enter the health care industry, developed

lessons for high school students. Three other students also designed lesson plans under [Karla Eitel's](#) mentoring at the McCall Outdoor Science School ([MOSS](#)) and helped transfer NARA's science into K-12 classrooms.

Read [more about Andrea's experience](#) here

The SURE program not only provides quality students to perform NARA research, but also exposes motivated STEM students to the challenges of supplying alternative biofuels into the marketplace.

This exposure may create professionals who can provide solutions and will certainly increase the pool of citizens who understand alternative biofuel research and potential.

Applications for the NARA SURE 2016 program will be available in November 2016.

Read [more about NARA SURE](#)

Reference

Lopatto, David. (2004). Survey of Undergraduate Research Experiences (SURE): First Findings. *Cell Biol Educ.*, 3(4), 270-277.



Students from Skyview High School look through their algae growing apparatus during the 2015 Imagine Tomorrow competition. *Credit WSU Communications.*

New Sponsor and Categories for Imagine Tomorrow

In 2012, NARA's sponsorship of the Imagine Tomorrow competition allowed the event to accept high school students throughout the Pacific Northwest and introduce a new "biofuels" challenge. In addition, assessments were developed to gauge whether the event improved energy literacy among high school students and to determine the level of interest students had to pursue STEM learning opportunities in college.

Learn [more about NARA's involvement](#) here.

Now the Imagine Tomorrow competition is poised for further expansion. Recently, Alaska Airlines joined Boeing and NARA

as major sponsors of the 2016 Imagine Tomorrow competition. In fact, the competition is now named "Alaska Airlines Imagine Tomorrow". This development secures sustainable funding for the event and provides the perfect backdrop and exposure to encourage high school students to explore the use of biofuels within the airline industry.

Learn [more about Alaska Airline's sponsorship](#) here.

New categories

Aligned with the new sponsorship, the competition categories have been changed. For the upcoming 2016 com-

petition, students can compete in four challenge topics:

- The NARA Biofuels Challenge
- The Aerospace Challenge
- The Built Environment Challenge
- The Food Energy and Water Challenge

Within each of these challenges, students can explore one of three approaches: Technology, Design and Behavior. In the case of the NARA Biofuels Challenge, this means that students can explore the technical challenges with producing fuels as well as the logistical and sustainability challenges connected with biofuel development and use. Cash prizes will be awarded for the top teams in each approach. That means that in the NARA Biofuels Challenge for instance, there will be three first place winners and plenty of opportunities for teams to do well.

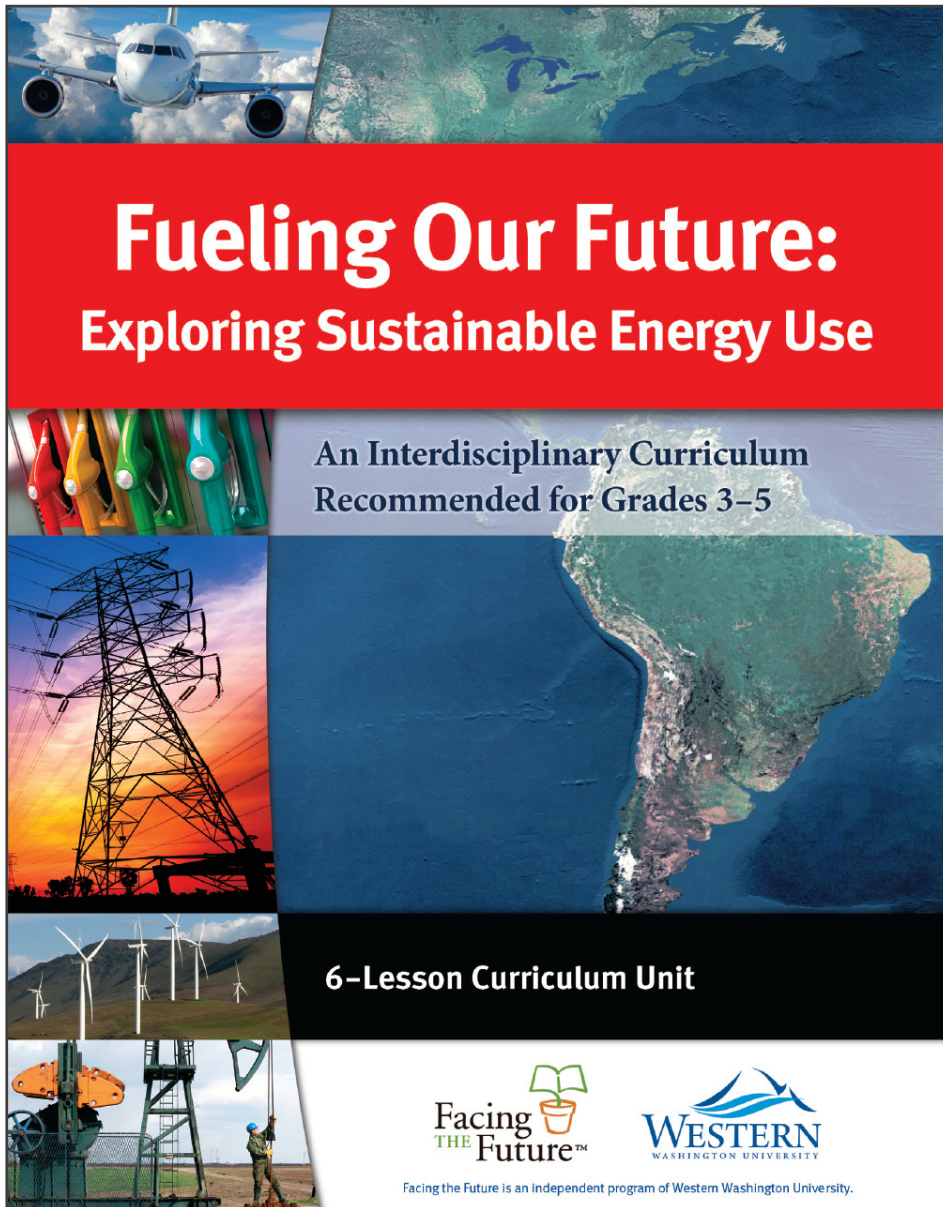
To help teams prepare for the NARA Biofuels Challenge, staff and graduate students at the University of Idaho's McCall Outdoor Science School (a NARA affiliate organization) have conducted workshops and other mentoring services to high school teachers. This year, MOSS will continue to work with teachers on integrating the whole NARA story into their curriculum and will serve as a resource for any teacher who would like ideas on how to approach the NARA biofuels challenge.

Learn [more about MOSS's contribution to the Imagine Tomorrow competition](#) here.

Not only do NARA and Alaska Airlines contribute to the Imagine Tomorrow competition, but they have also part-

nered to conduct a demonstration flight in Spring 2016 using a bio-jet fuel blend made from forest residuals.

Learn [more about the demonstration flight](#) here.



Front cover of Fueling Our Future: Exploring Sustainable Energy Use; grades 3-5.

Bioenergy lessons for 3rd, 4th, and 5th grades

[Facing the Future](#) (FTF) recently published a lesson plans that introduce energy concepts to elementary students in grades 3-5. These lesson plans were vertically aligned to the middle and high school curricula previously published by FTF. The lesson plans and assessments will contribute to the NARA Education GreenSTEM K-12 Initiatives' goals by providing age-appropriate energy and

bioenergy lessons for teachers along the K-12 spectrum.

The elementary curriculum consists of six lessons and a pre and post assessment designed to show students' growth in content knowledge, ability to analyze energy concepts, and personal energy-related attitudes and behaviors. Lessons cover topics such as basic energy science,

energy flow through food chains, and the supply chain of fuel. In the final lesson, students analyze case studies that showcase youth implementing energy conservation strategies in their homes, schools, communities, and beyond.

Learn more about Fueling our Future: Exploring Sustainable Energy Use: [Grades 3-5](#)

Learn more about Fueling our Future: Exploring Sustainable Energy Use: [Grades 6-8](#) and [Grades 9-12](#)

Facing the Future is an affiliate organization with NARA, and has been instrumental in using the NARA project as a backdrop to introduce bioenergy concept to students throughout the K-12 spectrum. These curricula, funded by the USDA-NIFA, fit well into NARA's goal to raise bioenergy literacy and prepare a future workforce for alternative energy development.

The elementary edition was directed by FTF's [Danica Hendrickson](#) and underwent extensive pilot testing last year. The curriculum was released this summer and a formal launch will take place this fall. The Fueling our Future series has been introduced to a large number of teachers. To date, over 388 copies (combined elementary, middle and high school editions) have been purchased with an estimated reach to nearly 20,000 students.



MOSS Students learning about trees

MOSS receives international Innovative Education Award for STEM education

NARA affiliate, The University of Idaho McCall Outdoor Science School ([MOSS](#)), received the prestigious [Underwriters Laboratories Innovative Education Award](#) for their work to advance STEM learning through projects involving real environmental problems.

MOSS, a program of the College of Natural Resources at the historic McCall Field Campus, was one of five national programs, out of 120 applicants in the US and Canada, to receive the award. The

award also included a \$25,000 recognition grant.

Some of the work recognized by the award committee centered on MOSS' contributions with NARA. In the award application, MOSS described their work with NARA to 1) enhance [teacher development](#) through workshops and webinars, 2) to provide resources that promote and enhance student participation with the [Imagine Tomorrow](#) competition, and 3) to assist in the development

of web-based bioenergy literacy tools like the [NARA Energy Literacy Principles Matrix](#).

MOSS is able to introduce energy and climate issues in novel and innovative ways by involving students and teachers directly with NARA scientists and with the technical, sustainability, logistic and social challenges being addressed by the project.

“The NARA project has allowed MOSS to greatly expand its reach into the surrounding states of Washington, Oregon and Montana. As a result, even more K12 students and teachers have been impacted by engaging inquiry-based STEM education. In addition, MOSS has been able to collaborate with a leading edge nationwide team of experts to develop bioenergy literacy principles that can be applied and assessed widely.” said Lee Vierling, MOSS Executive Director.

This is not the first prestigious award presented to MOSS while affiliated with NARA. In 2014, [Karla Eitel](#) was awarded the 2014 [University of Idaho Outreach and Engagement Award](#) for excellence in outreach programs like the MOSS teacher workshops. In 2013, MOSS received the [W.K. Kellogg Engagement Scholarship Award](#). The award program honors colleges and universities that have redesigned their learning, discovery and engagement functions to become even more involved with their communities. In 2012, MOSS earned the [ID21 award](#) for innovative teaching.

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