NARA
Northwest Advanced Renewables Alliance

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SAVE THE DATE: NARA Will Sponsor A Northwest Wood-Based Biofuels + Co-Products Conference In April 2014

It has been just over two years since the USDA invested $80 million to facilitate the development of a sustainable wood to biofuels and co-products industry in the northwest United States. This investment created the Northwest Advanced Renewables Alliance (NARA) and Advanced Hardwood Biofuels Northwest (AHB): two projects with multiple partners focused on softwood and hardwood feedstocks respectively.

These projects are proceeding along efforts from other northwest-based organizations (state government, research labs, industry, non-governmental organizations) who contribute to developing wood biomass as a sustainable resource for fuel and novel products.

With so much activity in the Northwest devoted to developing advanced uses for wood biomass, NARA and other sponsors will host the "Northwest Wood-Based Biofuels + Co-Products Conference" for April 28-30, 2014 in Seattle Washington.

For conference website visit here

This event will bring together the global, national, and regional communities of researchers, business leaders, government agencies, and economic development personnel to share research findings, ideas, and strategies that promote the sustainable development of a wood-based biofuels and co-products industry here in the northwest United States. Feedstocks of interest for this conference include forest slash, purpose-grown woody crops, and small diameter timber from hazardous fuel treatments and forest health restoration projects.

Northwest stakeholders will come away from this conference with a clear understanding of what's needed to develop a supply chain for this industry and the role that they could play in making it a success", says Vikram Yadama, NARA Outreach Team leader and conference director. "In addition, there are many outside the northwest United States with similar challenges to developing feedstocks, fuels, supply chains and products who we hope to attract to share our ideas and learn from their experience."

A preliminary agenda features an opening afternoon devoted to speakers who can provide a "big picture" perspective to how a wood based biofuels and co-products industry would affect the economic, social and environmental landscape in the Northwest. The second day will offer three parallel tracks covering 1) wood biomass transport and processing, 2) economic, social and environmental sustainability, and 3) pretreatment and conversion technologies. The final day will be devoted to co-product development from underutilized residual streams. The conference will also offer time for discussion and networking opportunities plus a poster session.

A conference steering committee has been formed and members include:

Charles Burke, Washington State University, NARA

Bob Dingethal, Gifford Pinchot Task Force

Karl Englund, Washington State University, NARA

Matt Krumenauer, Oregon Department of Energy

Scott Leavengood, Oregon State University, NARA

Eini Lowell, US Forest Service Pacific Northwest Research Station, NARA

Peter Moulton, Washington State Department of Commerce

Scott Stanners, British Columbia Bioenergy Network

Vikram Yadama, Washington State University, NARA

Shiba Kar, Advanced Hardwood Biofuels Northwest

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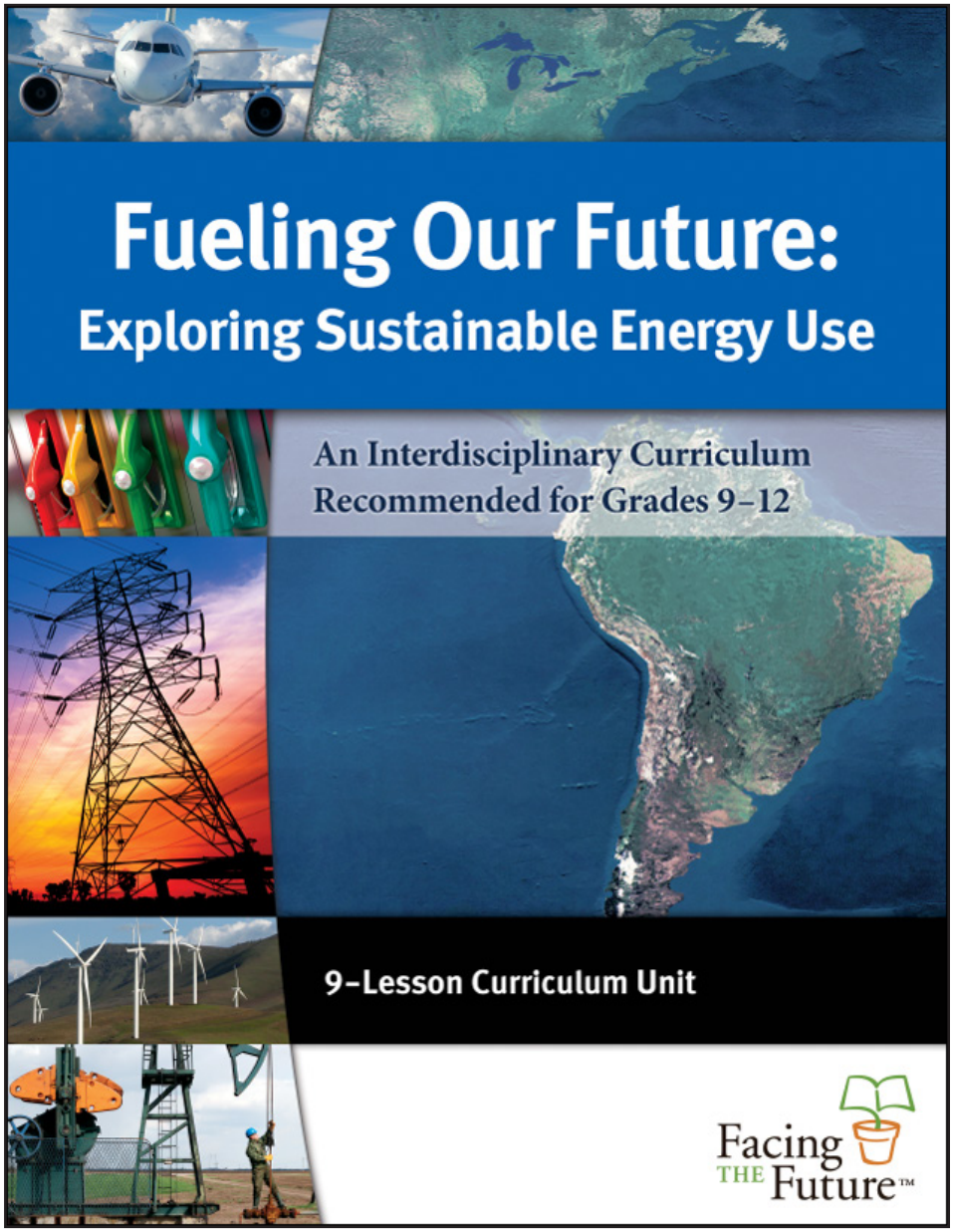


Curriculum front cover

Biofuels Knowledge Gets Placed In The Classroom

On October 31st, a day especially favored by kids in the US, NARA and Facing the Future, a NARA member organization, presented to the global teaching community a lesson plan entitled "*Fueling Our Future: Exploring Sustainable Energy Use*".

This set of lessons is timely because it accommodates the Next Generation Science Standards (NGSS) and the Department of Energy's (DOE) Energy Literacy Principles, which emphasize a need for energy literacy. In addition, the NARA Education Team is tasked with enhancing student bioenergy literacy and these lessons support our efforts to create a future workforce for an emerging forest residuals to biojet fuel and co-products industry.

The curriculum covers two weeks of instructional material relating sustainable approaches to energy. The first week features lessons that teach students fundamental energy concepts. The second week provides an in-depth study of transportation fuels including renewable fuels. Nested within these lessons are reading assignments, collaborative tasks, and projects that demonstrate and reinforce student knowledge. This broad approach to learning about energy and biofuels allows lessons to be taught in a single classroom or become a collaborative between science, social studies and language arts classes. The curriculum unit is available in two versions, one for middle school (grade 6-8) and one for high school (grade 9-12) students.

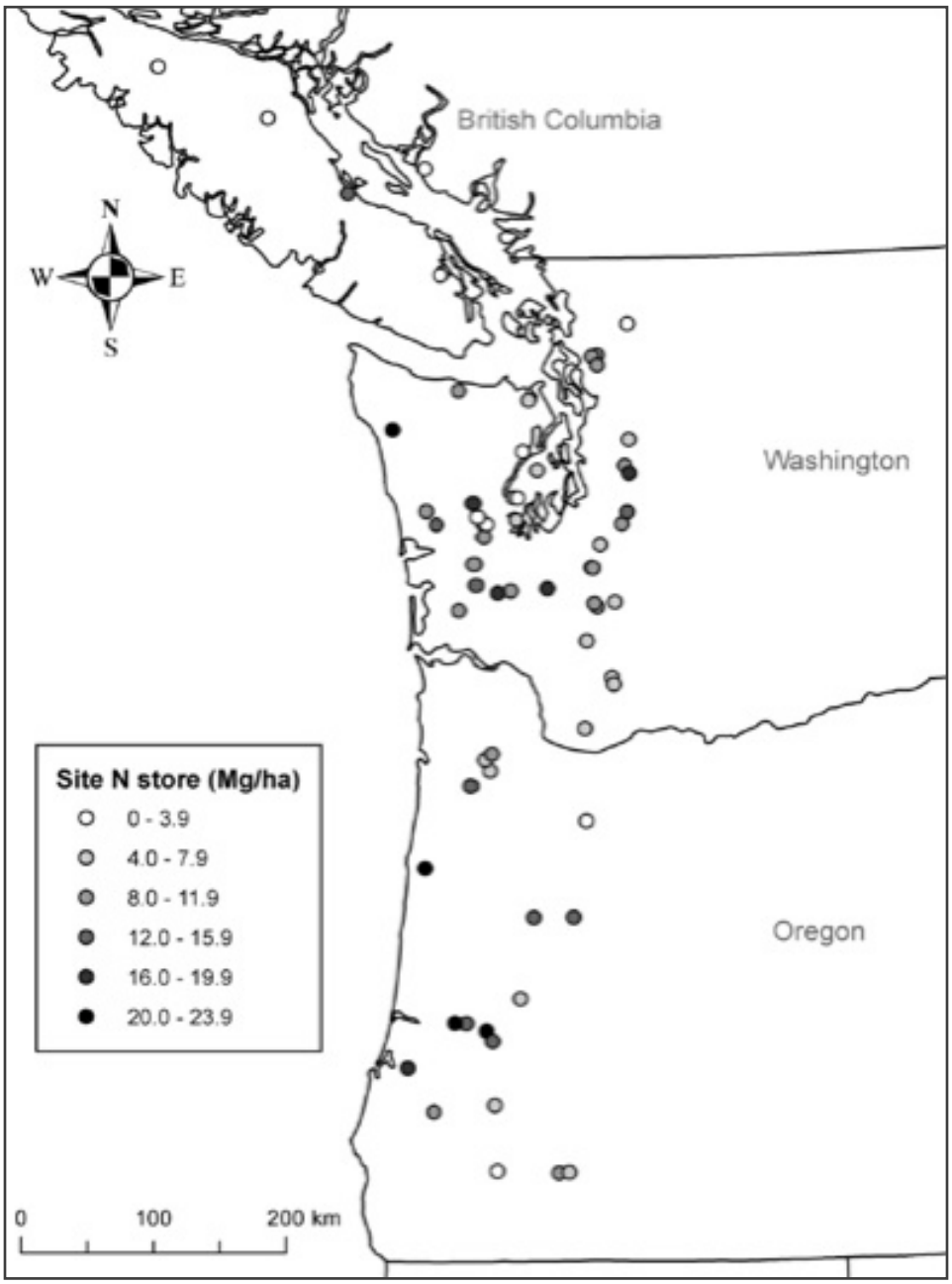
NARA's Contribution

NARA played many significant roles in developing this new education product. The biofuels sections of this product was inspired and funded through our USDA NIFA project. These lesson plans have been pilot tested at the McCall Outdoor Science School, an institution leading NARA's K12 curriculum development. "The NARA project was such a great example of real science and collaboration, that we wanted to model that in these lessons," says Danica Hendrickson, curriculum developer for Facing the Future. NARA central effort provided the model for the final three lessons exploring a biofuel supply chain and stakeholder input.

This curriculum unit complements NARA's

other education efforts directed to K-12 students such as classroom instruction for teachers and students at the McCall Outdoor Science School (MOSS), an annual biofuel project competition through Imagine Tomorrow and the development of a web-based matrix to pair biofuel related teaching resources to the Department of Energy's (DOE) Energy Literacy Principles.

These curriculum units are currently available to preview through the Facing the Future website (www.facingthefuture.org) where it can also be purchased for $14.99.



Locations of 68 Douglas-Fir plantations evaluated in this study by site N store (total N content of soil to 1.0-m depth, or compacted layer, plus forest floor).

Understanding Whether Utilizing Forest Residuals Will Deplete Soil Nutrients

NARA is helping to develop a Pacific Northwest industry that uses the forest residues from timber harvest and thinning operations to produce biojet fuel and other valuable products. It is anticipated that softwood forest plantations will provide a significant amount of the forest residues needed to sustainably supply this industry. Many people are concerned, however, that if the nutrient-rich forest residues (branches, stems and leaves) are remove, soil nutrients needed to sustain forest growth will be depleted.

This concern has led to a number of studies that examine the effects of forest residuals (stem, branches, needles) removal on forest productivity. Taken collectively, these studies suggest that forest residue removal can deplete soil carbon and nitrogen levels depending on the site location. Predicting which soil types or forest ecosystems are at risk to nutrient depletion due to residue removal is important if the economic and environmental sustainability of the working forest is to be maintained.

Soil productivity research papers and reports can be found in the NARA knowledge base.

Surveying 68 Douglas-Fir Plantation Sites In The Pacific Northwest

A recently published research paper, partially funded by NARA, surveyed 68 Douglas-fir plantation sites scattered through western Oregon, Washington and British Columbia to determine whether stem + residues and stem only harvest would likely deplete the soil nutrients on these sites. These sites contain a wide range of soil types and host primarily Douglas-fir trees aged 15 to 30 years.

To do this, NARA researchers Austin Himes, Robert Harrison, Kimberly Littke, Warren Devine in addition to authors Eric Turnblom, Dalene Zabowski and Dave Briggs used a "stability ratio" (Julian Evans, 1999, 2009) to assess risk of nutrient depletion. The stability ratio is calculated

by dividing the amount of nitrogen removed during forest harvest by the total amount of nitrogen stored at the site. A stability ratio of 0.1, for instance, would indicate that the total amount or nitrogen removed by harvest represents 10% of the total amount of nitrogen stored on the site. Guidelines suggested by Evans state that a stability ratio less than 0.1 presents little risk for soil nutrient depletion, whereas a stability ratio greater than 0.3 represents a high risk to soil productivity.

To determine stability ratios for each site, the authors measured the amount of nitrogen in the soil, the forest floor residues, and the tree roots. They then used established equations and model simulations to predict the amount of biomass and nitrogen in the above ground tree components (stemwood, bark, and foliage) for harvest ready trees aged 50 to 55 years old.

With this data, they were able to calculate stability ratios for each site based on future harvest of 50 to 55 year old trees. They found that if only tree stems were removed and the remaining branches and needles were left on the forest floor, the stability ratios for these sites could range all the way from 0.03 to 0.46; but only 1% of the sites had a stability ratio above 0.3. When all of the tree biomass was removed (stem and branches), the stability ratio ranged from 0.04 to 1.03 with 6% of the sites registering stability ratios above 0.3. With this increase, the challenge is to understand the specific sites at risk.

Few Sites Were At Risk

Their data show that only a small percentage of sites in either case displayed a stability ratio above 0.3. This result suggests that a majority of the sites showed little risk of soil nitrogen loss even if the entire residual biomass was removed. Removing 100% of the residuals is impractical however. Based on empirical time motion studies, it is assumed that 35% of the residual woody biomass is left on the forest floor when residuals are harvested. Assuming harvest rotations of 40 years, soil nitrogen in the majority of sites would be replenished by the atmospheric nitrogen, soil bacteria and the residuals left on site.

Sites with stability ratios above 0.3 would most likely require fertilizer to maintain growth productivity. These sites had relatively low soil nitrogen content compared to the other 64 sites and the soil was formed with glacial material. In addition, the nitrogen content in the Douglas-fir needles and branches on these four sites was the lowest measured from all 68 sites.

Another outcome of this study is that the stability ratio was demonstrated to be a useful tool that can be applied at a regional level to assess risk of nutrient removal. The stability ratio can adjust to varied assumptions and given harvest systems. In addition, it provides a relatively inexpensive and rapid assessment without having to rely on extensive data collection.

Additional NARA Contributions

NARA researcher Doug Maguire and his team are developing a more precise and predictive method to assess the risk of nutrient depletion from residual removal. They have measured the nutrient content in different biomass components including trees, shrub and herbaceous vegetation and will use these measurements to develop models that can estimate the nutrient and carbon amounts removed under a range of harvesting and climate changing scenarios. The model is still undergoing testing, but should soon be available to help determine sustainable levels of bioenergy feedstock removal in a given forest. Besides providing assessments on soil nutrient effects to forest residual harvest, NARA researchers are also evaluating how forest residual removal affects water quality and wildlife. Publications from these efforts should be made available soon.

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