



Bioenergy Feedstock Library Annual Summary Report

October 2022

2022

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**Prepared for the
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517**

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EXECUTIVE SUMMARY

The Bioenergy Feedstock Library (BFL), part of the Biomass Feedstock National User Facility (BFNUF) located at INL, is a physical sample repository and a web-accessible electronic database. The BFL stores physical and chemical characteristics of biomass and waste carbon sources for energy use as well as samples generated from across U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO) funded projects. The objective of this Bioenergy Feedstock Library Annual Summary Report for 2022 is to focus on the (1) publicly available analytical data and equipment tracked through the BFNUF, (2) physical samples available for request, (3) sample and data archival progress from recent BETO-funded projects, and (4) publicly available data sets created upon request from BETO, INL projects, or outside entities. This report highlights key statistics from FY22 and available data and information important for INL, BFL users, academics, and industry.

Some key highlights from this report include:

- The BFL currently tracks over 100,000 unique samples each with its own barcode; over 50,000 of these samples and associated data have been made publicly available.
- The BFL hosts over 150 unique feedstock types and over 400 unique subtypes (e.g., cultivars) for publicly available samples.
- For publicly available samples there are more than 70 unit operations tracked in the BFL spanning the biomass supply chain and nearly 18,000 samples representing fractionation, separation, and splitting type unit operations.
- Nearly 30,000 samples have analytical data in the BFL. Two of the biggest chemical data categories of publicly available data are moisture and fuel properties (i.e., volatiles, fixed carbon, ash, carbon, hydrogen, nitrogen, oxygen, sulfur, and calorimetry) accounting for 46% and 25% of the samples.
- Along with bulk reference materials the BFL freely provides to researchers, there are over 4,000 physical samples generated from the Regional Feedstock Partnership that are available for request.
- More than 1,000 samples from three projects funded by BETO's Affordable and Sustainable Energy Crops Funding Opportunity Announcement have been archived in the BFL to date.
- The BFL currently provides 18 accessible data sets containing sample and data summaries from peer reviewed publications, Regional Feedstock Partnership samples, and data generated in response to BFL user data requests that may be of interest to other researchers.



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ACRONYMS

ASEC: Affordable and Sustainable Energy Crops

BETO: Bioenergy Technologies Office

BFL: Bioenergy Feedstock Library

BFNUF: Biomass Feedstock National User Facility

DOE: Department of Energy

FOA: Funding Opportunity Announcement

INL: Idaho National Laboratory

MSW: Municipal Solid Waste

RFP: Sun Grant Regional Feedstock Partnership

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Bioenergy Feedstock Library Annual Summary Report

1. INTRODUCTION

The Bioenergy Feedstock Library (BFL), part of the Biomass Feedstock National User Facility (BFNUF) located at INL, is a physical sample repository and a web-accessible electronic database. The BFL stores physical and chemical characteristics of biomass and waste carbon sources for energy use as well as samples generated from across U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO) funded projects ([BFL About Us](#)).

The objective of the BFL is to provide a sample and data management system to bioenergy researchers as well as a catalog of physical samples and data for “researchers and industry to understand and overcome challenges posed by the variability of the physical and chemical properties of biomass while providing all stakeholders with accessible data for the physical and chemical properties of a wide variety of feedstock materials.”¹

1.1 FEEDSTOCK TYPES

The BFL houses information for over 150 unique feedstock types spanning agricultural, forest, waste, and algae resource types along with blends of multiple resource types (Figure 1)². Comprising approximately 94% of the publicly available samples in the BFL are herbaceous energy crops, such as energycane, agricultural residues (e.g., corn stover), and softwood trees (e.g., pine).

In addition to the more than 150 feedstock types, the BFL has over 400 unique subtypes. These subtypes are representations of cultivars, varieties, species, and other differentiating factors for multiple feedstock types. These feedstock subtype details are captured in metadata fields, such as cultivar, genotype, and species, that are tracked in the BFL. Table 1 provides a summary of some of the biomass subtypes represented for various publicly available biomass resource types. Barley straw and wheat

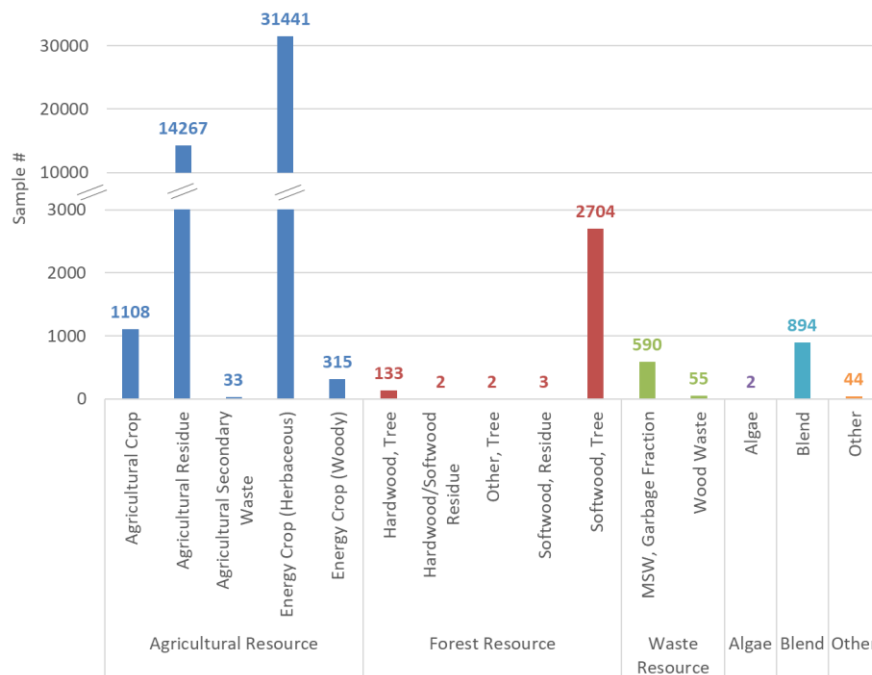


Figure 1. Number of samples for feedstock resource categories publicly available.

¹ EERE. DE-FOA-0001917: Affordable and Sustainable Energy Crops (ASEC). pp. 4-5. Retrieved from <https://eere-exchange.energy.gov/Default.aspx?Search=Affordable%20and%20Sustainable%20&SearchType=>.

² The difference between the ‘trees’ and the ‘residues’ in Figure 1 under Forest Resources is the tree typically represent the white wood or whole tree resources while the ‘residues’ typically represent the residue fractions of the tree after logging or thinning.

straw samples have some of the largest genetic variability currently in the BFL from BETO-funded projects dating back to the early 2000s. Barley straw has 69 unique cultivar/varieties represented amongst 242 samples while wheat straw has 240 cultivar/varieties represented amongst 2107 samples. Materials like construction and demolition (C&D) waste also use these subtype categories to differentiate multiple types of C&D waste.

Table 1. Summary of feedstock subtypes (e.g., cultivars) represented in the Bioenergy Feedstock Library for publicly available samples

Feedstock types	Subtypes	Sample number
Barley straw	69 unique cultivar/varieties (e.g., Baretta, Cochise, Drummond)	242
Construction and Demolition (C&D) waste	5 types (demolition lumber, framing lumber, laminated veneer lumber, oriented strand board, TGI joists)	15
Corn Stover/Cob	15 cultivars (e.g., DK 69-72 -RR2- AF2, Legend LR9779RR, Pioneer P0461xr)	3353
Energycane	12 cultivars (e.g., Ho 06-9001, L 99-233, Ho 72-114)	792
Grass Clippings/Mixed Lawn Grasses	5 genera (Cynodon, Poa, Lolium, Festuca, and Zoysia) 3 species (Bermuda, Kentucky Bluegrass, Ryegrass, Tall Fescue)	266
Hybrid Poplar	2 cultivars (P. deltoides × P. maximowiczii, P. deltoides × P. nigra hybrid)	185
Mixed Grasses	10 species ^a (e.g., tall fescue, orchardgrass, little bluestem)	5523
Shrub Willow	35 cultivars (e.g., Onondaga, Fishcreek, 00X-026-082)	1607 ^b
Sorghum	3 types (forage, biomass, sweet) 19 cultivars (e.g., ES5200, M81E, SugarT)	1469
Switchgrass	6 cultivars (Alamo, Blackwell, Cave-in-rock, Kanlow, Southlow, Sunburst)	8624
Wheat/Wheat Straw	240 cultivars/varieties (e.g., Amidon, Briggs, Alturas)	2107

^a mixed grass composition within each sample

^b Information for shrub willow currently available as a Data Set.

1.2 BFL OVERVIEW AND USERS

The diverse feedstock resource types represented in the BFL reflect the evolving bioenergy research priorities of BETO funded projects over the past decade. The BFL is a living database and is used as the primary sample and data management system for over 100 past and present bioenergy focused projects. This has resulted in sample information and data management for more than 100,000 bioenergy samples, with over 5,000 new samples created in FY22 alone. Using the BFL database, the data and samples from these projects can be easily made publicly available as projects are completed. To date, information for 51,593 samples has been made publicly accessible with a goal of continuing to increase this number as projects conclude. The BFL provides aggregated data and information for public samples through a public-facing web portal without a login. The BFL also allows users to create accounts to access more data and sample specific information. To register for an account please visit our [Registration](#)

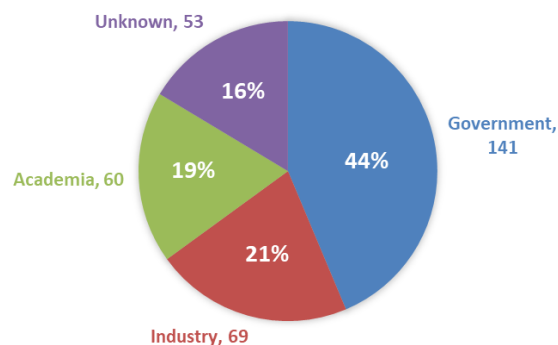


Figure 2. Summary of active users represented in the Bioenergy Feedstock Library.

page. To date there are 322 active registered users spanning government, industry, and academic institutions in the U.S. and internationally (Figure 2).

1.3 SUMMARY REPORT OBJECTIVE

The objective of this Bioenergy Feedstock Library Annual Summary Report for 2022 is to focus on the (1) publicly available analytical data and equipment tracked through the BFNUF, (2) physical samples available for request, (3) sample and data archival progress from recent BETO-funded projects, and (4) publicly available data sets created upon request from BETO, INL projects, or outside entities. This report is not intended to be a comprehensive overview of the BFL capabilities but rather to highlight what available data, samples, and information the BFL can provide to INL, BFL users, academics, and industry.

2. EQUIPMENT AND ANALYTICAL DATA TRACKED

The BFL has tools to store, record, track, and retrieve analytical data and physical samples. Another unique and important feature of the BFL is its ability to track relationships between samples that are represented by unit operations. As material is handled or changes form via a unit operation, new sample identifiers (i.e., GUIDs) are created in BFL to represent the newly formed child sample. This hierarchical tracking allows for the capture of information particular to each step in a process. There are approximately 70 unique unit operations tracked in the BFL, spanning feedstock supply and logistics, preprocessing, and conversion process areas. Figure 3 shows the number of publicly available samples for some of the key categories of unit operations. Currently, samples with the highest representation in the BFL are those that have undergone preprocessing unit operations of size reduction through a variety of mills and grinders and fractionation using equipment such as air classifiers and screens. For many of these size-reduced and fractionated samples, moisture and particle characterization data has been collected and is associated with these samples in the BFL.



Figure 3. Equipment examples and number of samples for various unit operation categories represented in the Bioenergy Feedstock Library.

Researchers at INL's Biomass Feedstock National User Facility (BFNUF) address barriers facing the U.S. bioenergy industry ([BFNUF](#)). Specifically, the BFNUF is focused on these key areas that are critical to producing conversion-ready feedstocks from a variety of biomass and waste carbon sources: advanced feedstock supply logistics, post-harvest quality management, material handling, preprocessing, scale-up and advanced fractionation and separation technologies. Beginning in 2020, the BFNUF began a three year long equipment upgrade to expand preprocessing capabilities in size reduction, fractionation, sorting, and conditioning. The equipment upgrade aims to advance this facility to allow researchers to address risks

related to material flowability, source variability, equipment performance, and poorly defined feedstock specifications, which have caused production issues for biorenewable fuels. The BFL, as a key component of the BFNUF, supports the incorporation of the new upgrade preprocessing equipment and unit operations.

The BFL is also used to store analytical data representing the product characteristics of feedstock materials after they have undergone various unit operations. The BFL tracks analytical data for nearly 30,000 samples, of which over 17,000 have been made publicly available. The analytical data housed in the BFL are grouped into analysis type categories, as shown in Figure 4. Currently 89% of the available data in these analysis type categories is accounted for by moisture analysis, fuel properties characterization—which includes volatiles, ash, fixed carbon, total carbon, hydrogen, nitrogen, oxygen, sulfur, and calorific values—and compositional characterization—including carbohydrate, lignin, ash, extractives, and protein contents.

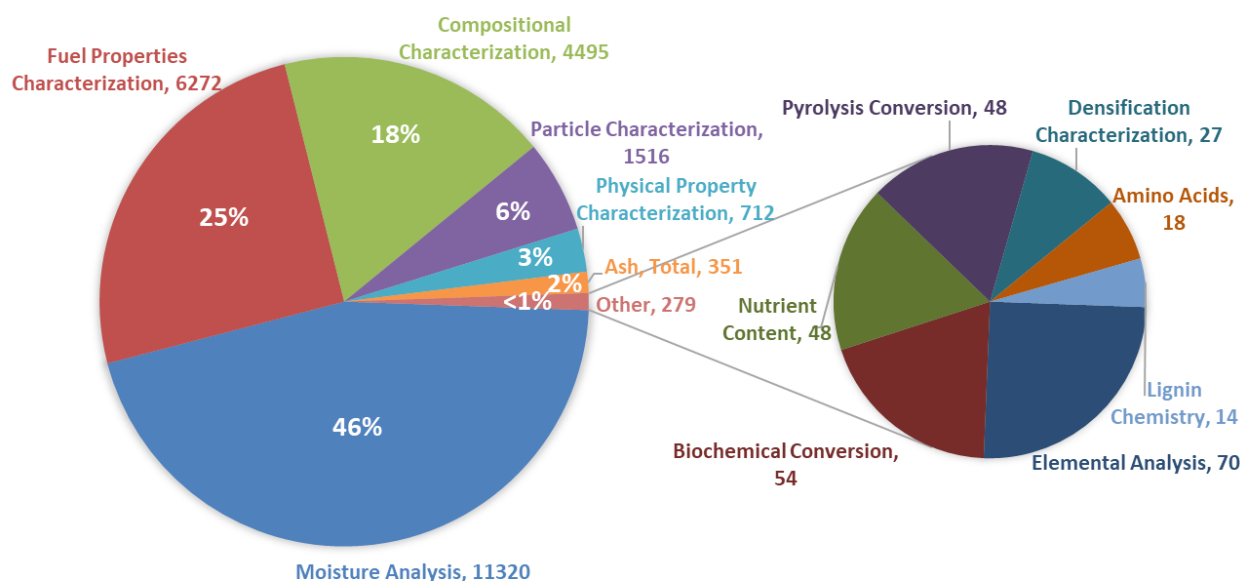


Figure 4. Publicly available analytical data in the Bioenergy Feedstock Library.

Like the preprocessing equipment, the BFNUF has also recently invested in new analytical characterization instrumentation, including equipment to measure inorganic species and perform particle image analysis. The BFL team is actively working with Bioenergy Feedstock Characterization Lab staff ([Bioenergy Feedstock Characterization Laboratory](#)) to develop standardized methods for the new analytical equipment from the BFNUF upgrade and the incorporation of resulting methods and data into the BFL.

3. SAMPLES AVAILABLE FOR REQUEST

The BFL has physical biomass samples available for request. Researchers and industry can contact the BFL Librarian or other BFL team members to inquire about sample availability ([BFL Contacts](#)). In addition, requests can be made for samples using the BFL sample request form page ([Request Biomass](#)). Samples are archived in the BFL from many BETO-funded projects and are provided based on availability. Two primary sets of biomass samples available publicly include biomass from INL's Reference Materials and the Regional Feedstock Partnership.

3.1 INL REFERENCE MATERIALS

INL's Reference Materials are industrially relevant, real-world biomass samples available in kilogram quantities with associated characterization data sheets (Figure 5, [Biomass Info](#)). The Reference Materials were originally generated through a BETO funded project with the intention of creating a sharable feedstock resource. Most of these samples INL processed in bulk, split, and characterized during the 2015/2016 timeframe. The Reference Materials currently available include corn stover, switchgrass, miscanthus, sorghum, wheat straw, and sugarcane bagasse. The BFL aims to identify new reference materials to either refresh feedstock types that are almost depleted or add additional relevant feedstocks (e.g., MSW) as funding permits.

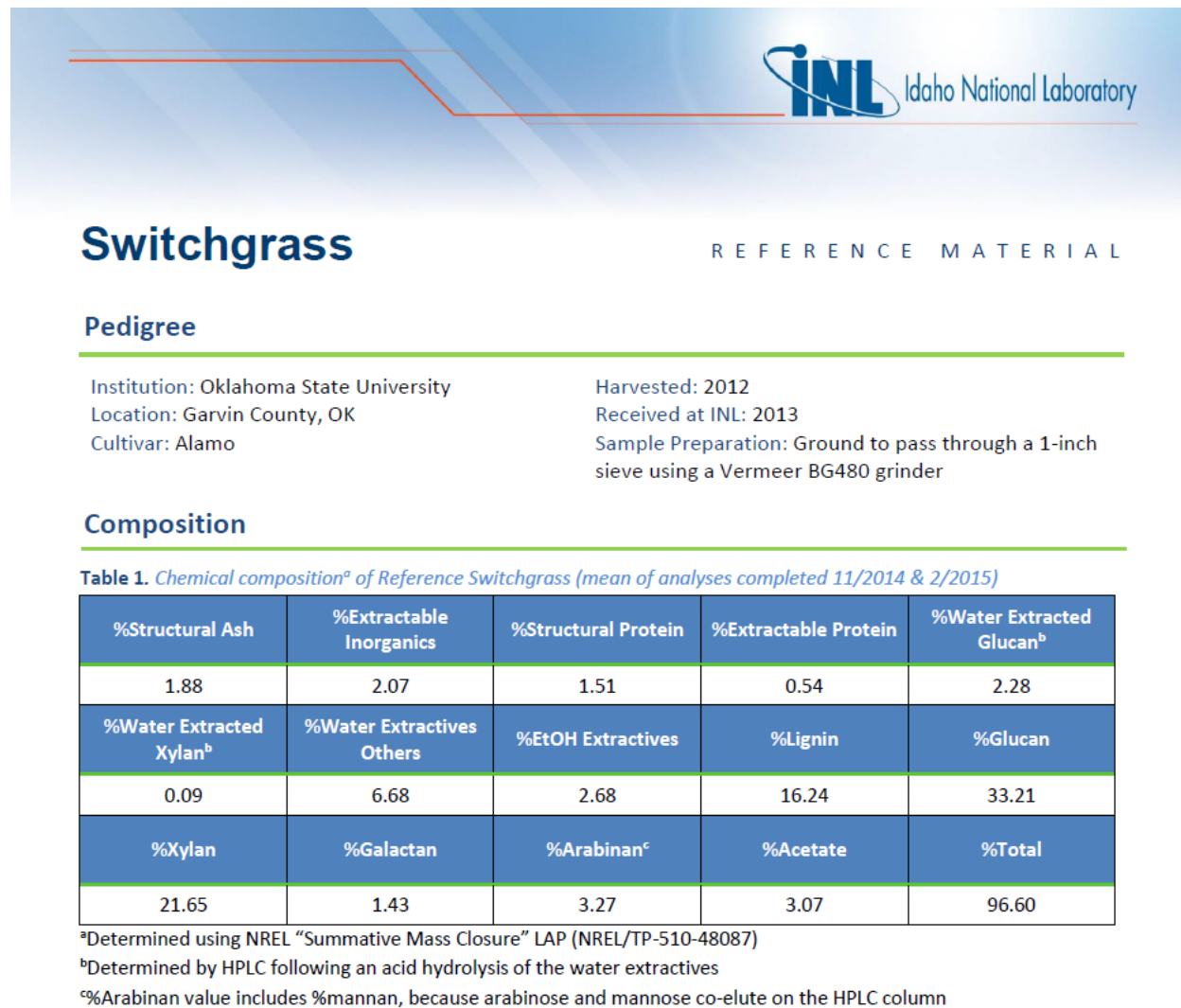


Figure 5. Excerpt from switchgrass reference material data sheet.

3.2 REGIONAL FEEDSTOCK PARTNERSHIP

The Sun Grant Regional Feedstock Partnership (RFP) large field trial-based project was developed to fill information gaps and validate biomass yield assumptions from the U.S. DOE Billion-Ton Study.^{3,4} The

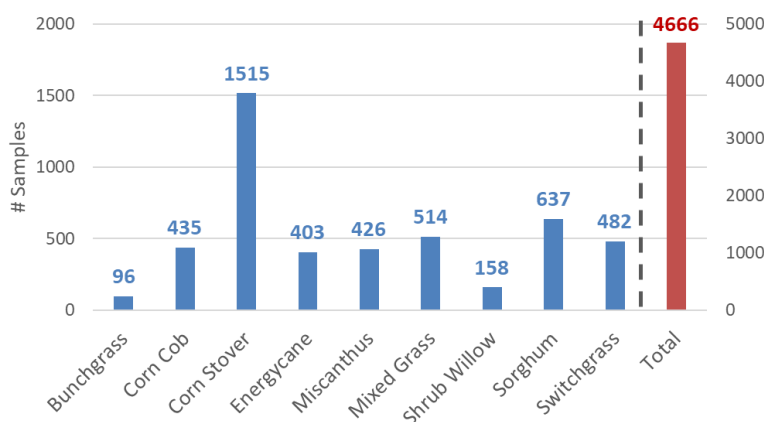


Figure 6. BFL archived energy crops and agricultural residues from the Regional Feedstock Partnership field trials.

series of field trials included nine bioenergy feedstocks grown in diverse environments across the United States for 5 to 7 years. The field trials conducted by the RFP led to over 130 scientific publications and were critical in developing both the U.S. Billion-Ton Update report from 2011 and the 2016 Billion-Ton Report.^{5,6} The BFL archived samples from these field trials resulting in over 4,000 biomass samples that have been processed to an approximately 2 mm particle size and are available at quantities under one kilogram (Figure 6). Samples are

from a variety of agricultural residues and energy crops, including corn stover, energycane, miscanthus, mixed perennial grasses, shrub willow, sorghum, and switchgrass. Data sets of biomass chemical quality are also available in the BFL for the RFP field trial samples. The links are provided in the “DATA SETS” section of this report. Summaries of the chemical quality data were also published in the Regional Feedstock Partnership Biomass Quality Assessment Final Report.⁷

4. DATA HIGHLIGHTS

The chemical quality data generated through the RFP samples are an important data set for the BFL. Variability in key biomass attributes for specific feedstock types is a common data request by BFL users.

³ Owens, V. N. (2018). Sun Grant/DOE Regional Feedstock Partnership: Final Technical Report. DOE SDSU-85041, South Dakota State University, Brookings, SD, USA. Retrieved from: <https://www.osti.gov/servlets/purl/1463330/>.

⁴ Owens, V. N., D. L. Karlen, and J. A. Lacey, et al. (2016). Regional Feedstock Partnership Report: Enabling the Billion-Ton Vision. INL/EXT-15-37477. U.S. Department of Energy and Idaho National Laboratory, Idaho Falls, ID, USA. Retrieved from: https://www.energy.gov/sites/prod/files/2016/07/f33/regional_feedstock_partnership_summary_report.pdf.

⁵ U.S. Department of Energy. (2011). U.S. Billion-Ton Update: Biomass Supply for a Bioenergy and Bioproducts Industry. R. D. Perlack and B. J. Stokes (Leads), ORNL/TM-2011/224. Oak Ridge National Laboratory, Oak Ridge, TN, USA. Retrieved from: https://www.energy.gov/sites/default/files/2015/01/f19/billion_ton_update_0.pdf.

⁶ U.S. Department of Energy. (2016). 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Volume 1: Economic Availability of Feedstocks. M. H. Langholtz, B. J. Stokes, and L. M. Eaton (Leads), ORNL/TM-2016/160. Oak Ridge National Laboratory, Oak Ridge, TN, USA. Retrieved from: <http://energy.gov/eere/bioenergy/2016-billion-ton-report>.

⁷ Emerson, Rachel M, Hoover, Amber N, Cortez, Marnie M, Rials, Timothy, Owens, Vance, Voigt, Thomas, Lee, DoKyoung, Fike, John, Baldwin, Brian, Rooney, William L., & Volk, Timothy A. Regional Feedstock Partnership Biomass Quality Assessment Final Report. United States. <https://doi.org/10.2172/1862678>

Data from the RFP are almost always included in responses to these chemical variability data requests.

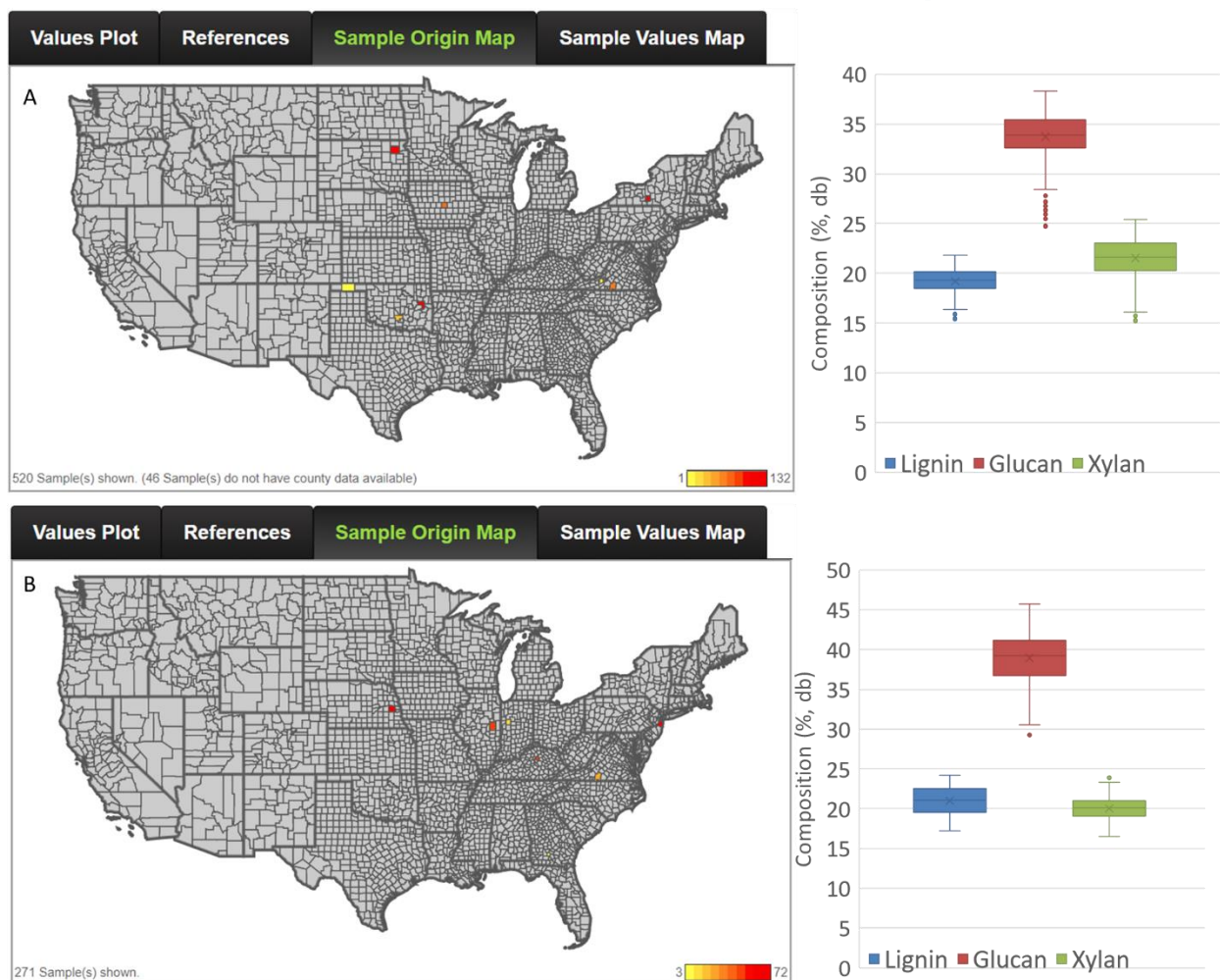


Figure 7 provides publicly available glucan, xylan, and lignin data across multiple counties in the U.S. for switchgrass and miscanthus feedstocks that are supported through the inclusion of RFP data sets. Another key feature represented by these plots is the geospatial tracking, which is achieved based on the location metadata at county and/or field level collected for samples tracked in the BFL. These plots were generated through the BFL's [Data Visualization](#) tools. These figures represent one of many ways to access and interrogate publicly available data.

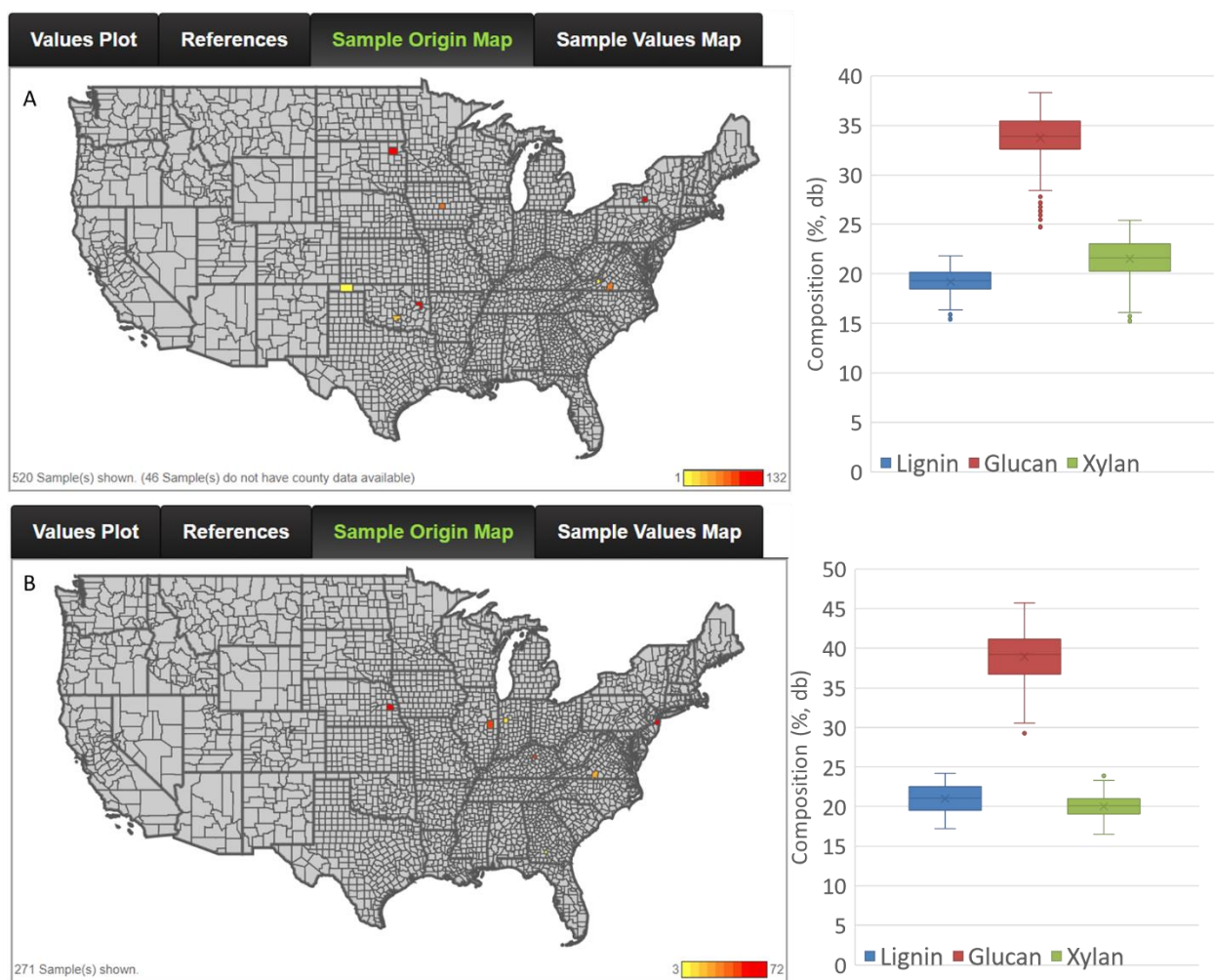


Figure 7. Spatial availability and chemical composition variability for publicly available (A) switchgrass and (B) miscanthus samples.

5. SAMPLE ARCHIVAL

The BFL aims to make commercially relevant biomass and MSW samples available publicly for research use. To support this objective and to get additional value from DOE BETO-funded bioenergy research, the BFL archives biomass and MSW samples from each of the DOE BETO Renewable Carbon Resources program funded competitive projects that are required to send samples to the BFL. Each project has its own partnership with the BFL, in which a Sample and Data Management Plan details how samples will be archived, analyzed, and shared; how long samples will be retained; how data will be managed and shared; and what are necessary data set disclaimers and other pertinent details. Samples and data will be made available publicly according to each project's plan.

The BFL team has begun working with projects funded by the BETO Affordable and Sustainable Energy Crops (ASEC) Funding Opportunity Announcement (FOA),⁸ BETO FY20 Multi Topic Funding

⁸ <https://www.energy.gov/eere/bioenergy/affordable-and-sustainable-energy-crops>

Opportunity FOA Topic Area 4,⁹ and the FY21 BETO Feedstocks FOA Topic Area 1.¹⁰ To date, the BFL has archived switchgrass, miscanthus, sorghum, and energycane for the three projects funded under the ASEC FOA:

- University of Illinois-led *Next-Generation Feedstocks for the Emerging Bioeconomy*¹¹
- North Carolina State University-led *Next Generation Miscanthus: Hybrid Performance Evaluation and Enhanced, Sustainable Feedstock Production and Supply in the Southeast U.S. for Biofuels and Bioproducts*¹²
- Texas A&M University-led *Sustainable Herbaceous Energy Crop Production in the Southeast United States*.¹³

These ASEC projects have submitted 1,324 samples for archival, representing energy crops harvested during 2020 and 2021 harvest years. Additionally, these projects have worked with the BFL Team to develop Sample and Data Management Plans to identify sample and data public release dates beginning in 2023.

MSW samples generated from five projects funded under the FY21 BETO Feedstocks FOA Topic Area 1 and biomass samples from 3 projects funded under the BETO FY20 Multi-Topic FOA Topic Area 4 will begin archival in the BFL in following years.

6. DATA SETS

There are multiple ways to access sample information and data for the various bioenergy resources in the BFL. One mechanism the BFL uses to make data and sample information accessible is through data sets. A data set is a compilation of meaningful and curated data and sample information. For example, the samples and data associated with a peer-reviewed publication or industrially relevant data sets that have been requested by industry. The current BFL data sets are summarized in Table 2 and can be found in the BFL here: [Data Sets](#). Data sets marked as public do not require a BFL login to access. In 2022, 6 new data sets based on BFL data were made publicly available. In addition, RFP data, discussed in the “SAMPLES AVAILABLE FOR REQUEST” section, including chemical quality data has been made available as data sets. This includes data sets for energycane, mixed perennial grasses, miscanthus, sorghum, switchgrass, and willow.

Table 2. Data sets available on the Bioenergy Feedstock Library.

Data Set Name	Description	Author/Institution
Image analysis for rapid assessment and quality-based sorting of corn stover data set Data Set 1006	Experimental data supporting publication focused on developing a rapid assessment for quality-based sorting of corn stover using images. ¹⁴	Ding, L., Hoover, A.N., Emerson, R.M., Lin, K., Gruber, J.N., Donohoe, B.S., Klinger, J.L., Colby, R.D., Thomas, B.J., Smith, W.A., and Ray, A.E.

⁹ <https://www.energy.gov/eere/bioenergy/articles/bioenergy-technologies-office-fiscal-year-2020-multi-topic-funding>

¹⁰ <https://www.energy.gov/eere/bioenergy/articles/department-energy-announces-nearly-34-million-advance-waste-and-algae>

¹¹ <https://sustainability.illinois.edu/research/next-generation-feedstocks-for-the-emerging-bioeconomy-project/>

¹² <https://cals.ncsu.edu/news/fueling-the-future/>

¹³ <https://www.ars.usda.gov/research/project/?accnNo=437685>

¹⁴ Ding, Ling, Hoover, Amber N., Emerson, Rachel M., Lin, Kuan-Ting, Gruber, Josephine N., Donohoe, Bryon S., Klinger, Jordan L., Colby, Rachel D., Thomas, Brad J., Smith, William A., & Ray, Allison E. Image Analysis for Rapid Assessment and Quality-Based Sorting of Corn Stover. United States. <https://doi.org/10.3389/fenrg.2022.837698>

Elemental Ash Data - All Biomass Types Data Set 1007	This export from the Bioenergy Feedstock Library contains instances of publicly available data for biomass resources with Elemental Analysis data for all samples available regardless of treatment (e.g., chemical altering preprocessing or pretreatment). Instances of treatments are captured in the metadata and using the 'Include in Research Tools' and 'Include in Research Tools Reason' fields in the 'Sample Export' tab.	INL - Bioenergy Feedstock Library
Extractives Data - Softwood Biomass Data Set 1008	This export from the Bioenergy Feedstock Library contains instances of publicly available data for biomass resources with extractives data for softwood feedstocks.	INL - Bioenergy Feedstock Library
Elemental Ash Data - Softwood Biomass Data Set 1009	This export from the Bioenergy Feedstock Library contains instances of publicly available data for softwood resources with elemental data.	INL - Bioenergy Feedstock Library
Fuel Properties Data - All Biomass Types Data Set 1010	This export from the Bioenergy Feedstock Library contains instances of publicly available data for biomass resources with Fuel Properties analytical data that were considered representative of raw biomass feedstock (e.g., prior to any chemically altering preprocessing or pretreatment).	INL - Bioenergy Feedstock Library
All Analytical Data - All Biomass Types Data Set 1011	This export from the Bioenergy Feedstock Library contains instances of publicly available data for all biomass resources with analytical data and resources with carbon data that were considered representative of raw biomass feedstock (e.g., prior to any chemically altering preprocessing or pretreatment).	INL - Bioenergy Feedstock Library
Compositional Analysis and Fuel Properties - All Biomass Types Data Set 1012	This export from the Bioenergy Feedstock Library contains instances of publicly available data for all biomass resources that had 'Compositional Characterization' and/or 'Fuel Properties' analytical data specifically that were considered representative of raw biomass feedstock (e.g., prior to any chemically altering preprocessing or pretreatment).	INL - Bioenergy Feedstock Library
Regional Feedstock Partnership Miscanthus Data Set Data Set 1001	Chemical attribute data available for Regional Feedstock Partnership Miscanthus field study samples harvested 2008-2014 across 6 established field locations. Chemical data included compositional analysis, proximate/ultimate analysis, amino acids analysis, ash speciation analysis, elemental analysis for C and N, and biochemical conversion reactivity analysis.	Regional Feedstock Partnership and Idaho National Laboratory
Regional Feedstock Partnership Switchgrass Data Set Data Set 1002	Chemical attribute data available for the Regional Feedstock Partnership switchgrass field study samples.	Regional Feedstock Partnership and Idaho National Laboratory
Regional Feedstock Partnership Energy cane Data Set Data Set 1013	Chemical attribute data available for the Regional Feedstock Partnership energy cane field study samples.	Regional Feedstock Partnership and Idaho National Laboratory

Regional Feedstock Partnership Sorghum Data Set Data Set 1003	Chemical attribute data available for the Regional Feedstock Partnership sorghum field study samples.	Regional Feedstock Partnership and Idaho National Laboratory
Regional Feedstock Partnership Mixed Perennial Grasses Data Set Data Set 1004	Chemical attribute data available for the Regional Feedstock Partnership mixed perennial grasses (Conservation Reserve Program (CRP) land grasses) field study samples.	Regional Feedstock Partnership and Idaho National Laboratory
Regional Feedstock Partnership Willow Data Set Data Set 1005	Chemical attribute data available for the Regional Feedstock Partnership willow field study samples.	Regional Feedstock Partnership and Idaho National Laboratory

7. SUMMARY

Biomass variability in the form of physical or chemical characteristics continues to be a primary challenge to integrated biorefineries achieving continuous operation and meeting yield requirements necessary for commercial-scale biofuels and chemicals. Challenges resulting from biomass variability range from microbial degradation in storage and plugged conversion processing equipment to potential health hazards and incomplete conversion. These challenges increase conversion costs for biofuel and bioenergy producers. There are multiple gaps in understanding biomass variability including the diverse array of sources impacting the range of variability in biomass properties and how this variability impacts processing. The BFL seeks to address these gaps to decrease the risks and provide as much information as possible to an emerging biorefining industry.

The BFL furthers understanding of biomass variability by providing a centralized, publicly available location that is readily and easily accessible and understandable to bioenergy researchers and industry stakeholders. The BFL is quickly becoming the most comprehensive, actively managed, living database of its kind, which is continuously updated with new samples and data. This database provides tools to store, record, track, retrieve, and analyze data to help researchers and industry overcome challenges posed by biomass variability. Together, the BFL and BFNUF researchers provide industry with a resource to address challenges at the interface between feedstocks and conversion. The result is a better understanding of feedstock convertibility and processability.

To access the data effectively in the BFL registration is required. Registration for the BFL is easy and free. To register for an account please visit our [Registration](#) page. For more information regarding the BFL, specific data availability, or other questions please [Contact us](#).