Electronic Supplementary Information for:

The Role of Vegetation in Bioretention for Stormwater Treatment in the Built Environment: Pollutant Removal, Hydrologic Function, and Ancillary Benefits

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Representative Vegetation Bioretention Design Resources

USA

Region	Resource Name	Author	Date Published/ Updated	URL
US Mid-Atlantic	Maryland Stormwater Design Manual	Maryland Department of the Environment	2009	http://www.mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/stormwater_design.aspx
US New England	Native Plants for New England Rain Gardens	University of New Hampshire Cooperative Extension, New Hampshire Department of Environmental Services	2016	https://extension.unh.edu/resources/files/Resource005899_Rep8265.pdf
US Southeast	Plants for Rain Gardens Recommended for Southeastern North Carolina	North Carolina Cooperative Extension	Not dated	https://www.ces.ncsu.edu/wp-content/uploads/2013/04/Coastal-Plains-Plants.doc
US Upper Midwest	Plants for Stormwater Design: Species Selection for the Upper Midwest	Daniel Shaw, Rusty Schmidt, Minnesota Pollution Control Agency	2003	http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/stormwater-management/plants-for-stormwater-design.html
US Midwest	Stormwater Management: Plant Selection for Rain Gardens in Nebraska	University of Nebraska–Lincoln	2007	http://extensionpublications.unl.edu/assets/pdf/g1759.pdf
US Southwest/arid regions	Plant Selection for Bioretention in the Arid West	Houdeshel, C.D. and Pomeroy, C.A.	2010	http://ascelibrary.org/doi/pdf/10.1061/41099(367)127
US Pacific Northwest/Canadian Southwest	Low Impact Development: Technical Guidance Manual for Puget	Washington State University Extension, Puget Sound Partnership	2012	http://www.psp.wa.gov/downloads/LID/20121221_LIDmanual_FINAL_secure.pdf

	Sound			
US central Californian coast	LID Plant Guidance for Bioretention	Central Coast Water Board, UC Davis LID Initiative	Not dated	http://ucanr.edu/sites/mgslo/files/147107.pdf
US Alaska	Green Infrastructure Project Guide for Fairbanks, Alaska	Fairbanks Green Infrastructure Group	2015	http://www.fairbankssoilwater.org/user-files/pdfs/GI_Manual_January2015.pdf
US Hawaii	Hawai'i Residential Rain Garden Manual	Hui o Koʻolaupoko	Not dated	http://www.huihawaii.org/uploads/1/6/6/3/16632890/raingardenmanual-web-res-smaller.pdf

Outside of the USA

Region	**Resource Name**	**Author**	**Date Updated**	**URL**
Australia	Vegetation Guidelines for Stormwater Biofilters in the South-West of Western Australia	Monash University Water for Liveability Centre	2014	http://www.sercul.org.au/docs/381_Biofilter_vegetation_guidelines_for_southwestWA.pdf
Singapore/Tropical Regions	A Selection of Plants for Bioretention Systems in the Tropics	Benjamin Loh	Not dated. Discusses study conducted 2010–2011.	http://www.cuge.com.sg/research/download.php?product=47
United Kingdom	(UK) Rain Garden Guide	Bob Bray, Gary Grant, Dusty Gedge, Lani Leuthvilay	Not dated	https://raingardens.info/wp-content/uploads/2012/07/UKRainGarden-Guide.pdf

Biomass Energy Production Calculations and Assumptions

Calculation Assumptions:

- 1.4 kg per m^2 per year yield of switchgrass biomass (converted from 6 tons per acre per year given in source)[1]
- Bioretention area of 102 square meters[2]
- 1.6×10^4 kJ per kg of switchgrass[3]
- Assuming one harvest per year
- 0.25 gallons of gas is used in a brushcutter for harvesting
- 15 miles total are needed to transport the biomass to the power plant
- Transportation to the power plant is in a dump truck that gets 5 miles per gallon
- Both the dump truck and brushcutter use E10 gasoline (*i.e.*, 10% ethanol)
- E10 gasoline generates 112,400 BTU/gallon (net)[4]

kJ Produced Per Year:

$$\frac{1.4\ kg\ switchgrass\ biomass}{m^2\ yr} \times 102\ m^2 \times \frac{1.6 \times 10^4\ kJ}{kg\ switchgrass\ biomass} = \frac{2.3 \times 10^6\ kJ}{yr}$$

kJ Used for Biomass Harvest and Transport:

Harvest:

$$0.25\ gallons\ E10\ gas \times \frac{112{,}400\ BTU}{gallon\ E10\ gas} \times \frac{1.06\ kJ}{1\ BTU} = 29{,}786\ kJ$$

Transport:

$$15\ miles \times \frac{gallon\ E10\ gas}{5\ miles} \times \frac{112{,}400\ BTU}{gallon\ E10\ gas} \times \frac{1.06\ kJ}{1\ BTU} = 357{,}432\ kJ$$

Total Harvest + Transport:

$$29{,}786\ kJ + 357{,}432\ kJ = 387{,}218\ kJ$$

Net Production per Year:

$$2.3 \times 10^6\ kJ - 387{,}218\ kJ = 1.9 \times 10^6\ kJ$$

Or

$$1.9 \times 10^6\ kJ \times \frac{1\ kWh}{3{,}600\ kJ} = 527\ kWh$$

Sources:

(1) *Switchgrass for Biomass*; University of Kentucky College of Agriculture New Crop Opportunities Center; **2009**. https://www.uky.edu/Ag/Forage/switchgrass (11-2009)1.pdf.

(2) Muerdter, C.; Özkök, E.; Li, L.; Davis, A. P. Vegetation and Media Characteristics of an Effective Bioretention Cell. *J. Sustain. Water Built Environ.* **2016**, *2* (1), 4015008.

(3) Sami, M.; Annamalai, K.; Woolridge, M. Co-firing of coal and biomass fuel blends. *Prog. Energy Combust. Sci.* **2001**, *27* (2), 171–214.

(4) Oak Ridge National Laboratory. *Appendix B - Transportation Energy Data Book*; **2016**. http://cta.ornl.gov/data/appendix_b.shtml