Improving Land Management and Lowering Costs Through Biomass Harvest

Opportunities for biomass production from brushlands and Short rotation woody crops

Woody Biomass Harvesting and Utilization Workshop
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Biomass opportunities

- Virginia Hibbing Utilities
- Central Minnesota Ethanol Cooperative
- Metro area biomass burners including UMN
- Others:
  - Turkey litter plant in Benson (15-20%)

Opportunities to:

- Produce dedicated woody biomass crops
- Improve forest management
  - Previously pre-commercial operations may be used for bioenergy – lowering costs, breaking even or generating a profit
- Increase the value of timber sales through the sale of slash materials
- Manage brushland areas for wildlife habitat and biomass production.

Opportunities to reduce costs:

- Different than stand-alone profitability
- Areas of opportunity:
  - Brushland clearing for wildlife
  - Fuel removal from National Forests
  - Pre-commercial thinnings/Timber stand improvement
- By selling or utilizing biomass for energy those costs could be reduced

Other Current Projects

- USDA - **Development of Existing Biomass Resources through Education for Key Supply Bottlenecks**
- USFS – **Biomass Utilization Grant** (BUG) reduce fuels management costs
- IREE **Minnesota Terrestrial Carbon Sequestration Project – Carbon trading**

Project: Development of Principles for the Removal of Woody Biomass from Forests and Brush Lands (UMN/IREE/MFRC)

The project - Background

- Laurentian Energy – Converting Virginia Hibbing utilities to biomass burning
- Concern about supply and impacts of plantations
- Legislature changed definition to include harvest of brushlands as source of biomass and requested the development of guidelines

The project – Components/Partners

- **UMN** – Development and elaboration of research principles to help inform guideline development – The research base
- **MFRC** – Actual development of the guidelines based on principles using their established procedures for guideline development

The Project Components

- Biophysical review
- Economic review
- Transport model

Biophysical Assessment

Issue	Debris	Upland	Lowland
Soils (nutrients, structure)	X	X	X
Plant community impacts interaction with regeneration	X	X	X
Carbon (soil, biomass and emissions)	X	X	X
Wildlife impacts	X	X	X

Soil nutrient recovery

Scenario Name	(years)	Biomass (kg/ha)	N	P	K	Ca	Mg
Conifer overstory Total Shrub (high multiple soil nutrients)	**Estimate**	**3830.80**	**3.16**	**2.44**	**3.18**	**3.13**	**1.02**
	lower	2068.90	1.63	1.25	1.65	1.62	0.53
	upper	5592.70	4.84	3.74	4.83	4.76	1.55
Conifer overstory Total Shrub (low multiple soil nutrients)	**Estimate**	**1411.60**	**1.17**	**0.90**	**1.17**	**1.15**	**0.38**
	lower	1159.00	0.91	0.70	0.92	0.91	0.30
	upper	1664.20	1.44	1.11	1.44	1.42	0.46
Conifer overstory Total Shrub (mod. multiple soil nutrients)	**Estimate**	**3730.20**	**3.08**	**2.38**	**3.10**	**3.05**	**0.99**
	lower	2756.60	2.17	1.67	2.20	2.16	0.71
	upper	4703.80	4.07	3.15	4.07	4.00	1.30
Minerotrophic with Alder	**Estimate**	**13757.20**	**16.91**	**8.77**	**9.88**	**9.22**	**3.53**
	lower	7556.10	8.97	4.57	5.19	4.82	1.86
	upper	19958.30	25.38	13.35	14.94	14.01	5.32
Minerotrophic with Willow	**Estimate**	**9769.88**	**5.78**	**6.23**	**7.01**	**9.99**	**2.50**
	lower	6233.93	3.49	3.84	4.25	6.08	1.53
	upper	13305.83	8.30	8.76	10.03	14.24	3.55

Soil nutrient recovery

- For brush growing in lowland areas,
  - replacement of P 4.7- 24.6 years for willow
  - replacement of P 6.5-29.7 years for alder
  - replacement of K 8.7- 44.5 years for willow
  - replacement of K 11.2-52 years for alder

Impact on birds (example)

Species	Lowland Brush 0-3 years	Lowland Brush >3 years	Upland Brush 0-3 years	Slash Remvoal	Lands cape	Patch Size
Sharp-tailed Grouse	positive	unknown			x	x
American Black Duck			negative			
American Bittern	negative	unknown				x
Northern Harrier	positive	unknown			x	x
Yellow Rail	positive	neutral				x
Virginia Rail	negative	unknown				
Upland Sandpiper	positive	neutral				x
Wison's Phalarope	positive	neutral				x
American Woodcock	negative	unknown	negative	positive		
Black-billed Cuckoo	negative	unknown	negative			
Short-eared Owl	positive	neutral			x	x

Note: Years are # of years following harvest

Harvest Systems

- Bulldoze, windrow, and chip or grind – shearing
- Bulldoze, windrow, bundle then chip or grind
- Combined harvest, chip and transport
- Evaluation of equipment

Compressing logging residues into bundles makes it possible to use standard forwarders and trucks to transport the forest biomass.

SLASH - BUNDLER

Brushland shearing

Harvester and wagon

- Special harvester which harvests, chips and blows chips into a trailer
- Limited to certain ground conditions
- Probably following initial harvest

Photo: Forest Research

Self-propelled forage harvester (Claas)

Harvesting system - SRWC

- Short rotation woody crop biomass harvesting system
- (SUNY Willow Project)

Information needs

- Impacts on wildlife and vegetation communities
- Productivity of brushlands
- More information on management options
- Viable harvest, storage and transport options
- Integration of biophysical and economic info. to define viable systems

Next steps

- Deliver research assessment to MFRC/DNR
- Continued support to guideline process in close coordination with MFRC/DNR
- Preparation of guidelines by MFRC
- Further development of transport model
- **Integrate biological and economic issues**
- Disseminate results

Questions?