

2010 Outlook for Forest Biomass Availability in Minnesota

Physical, Environmental, Economic & Social Availability

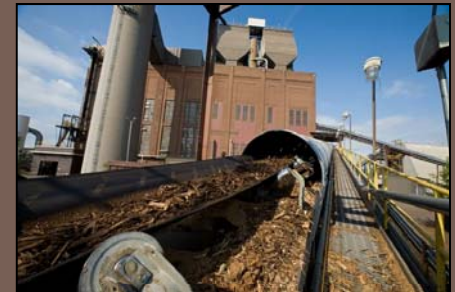
Staff Paper #211

<http://www.forestry.umn.edu/Publications/StaffPaperSeries/index.htm>



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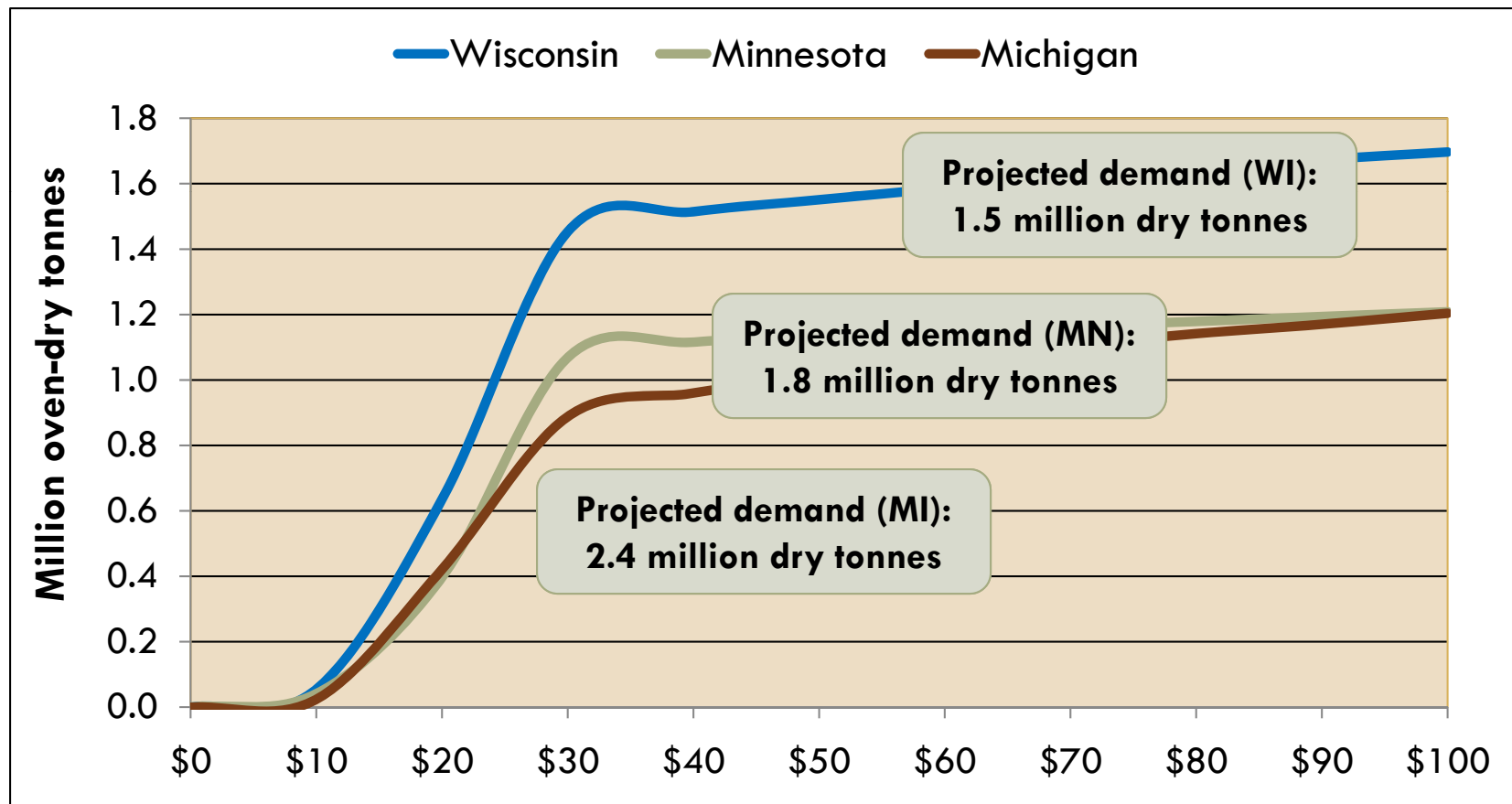


Funding Provided by the Next Generation Energy Board and the University of Minnesota Initiative for Renewable Energy and the Environment

Projected Demand: Euphoria or Fear?

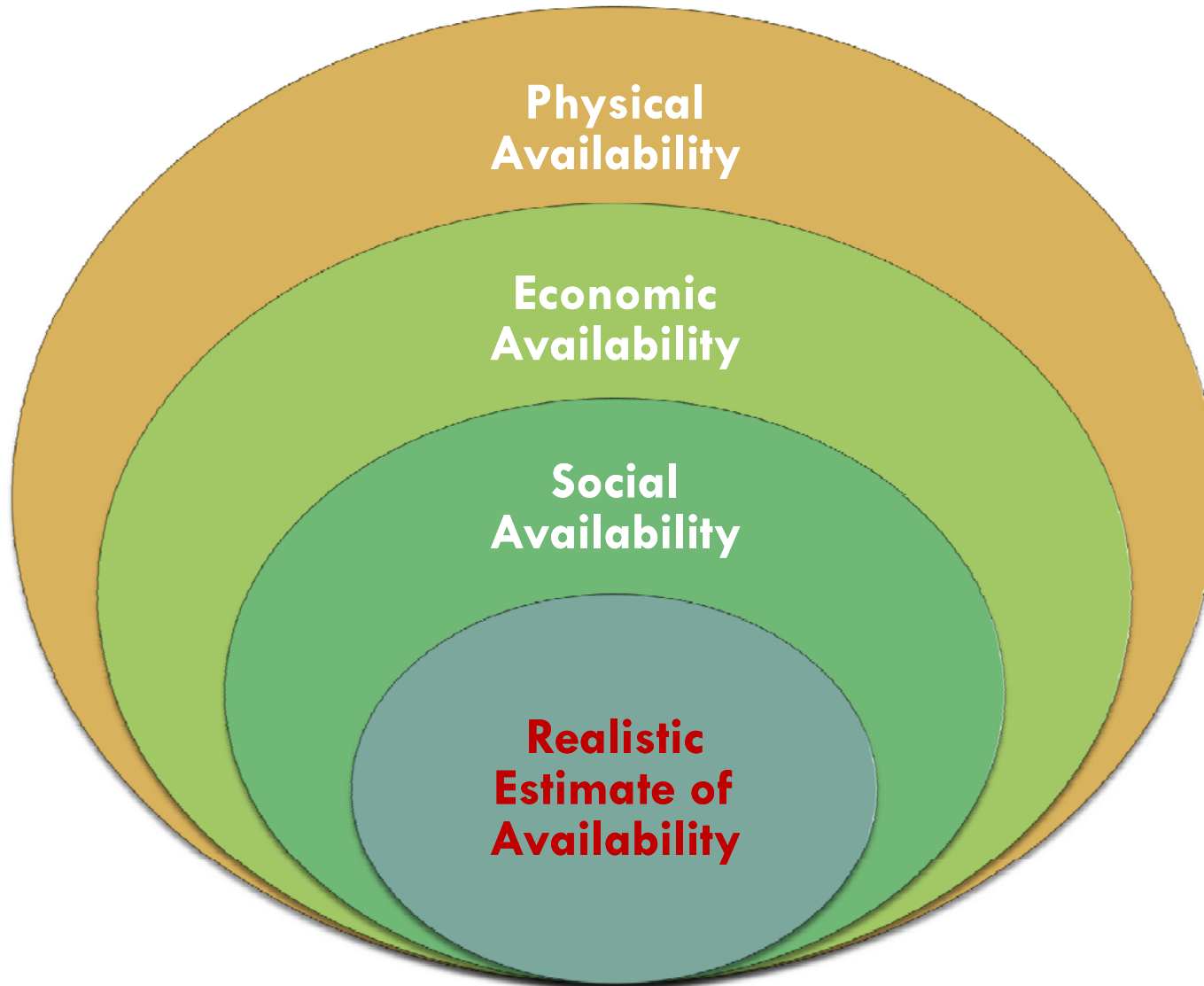


Estimated biomass supply (\$ per oven-dry tonne at roadside)



Source: Becker et al. (2009) *Outlook for sustainable forest bioenergy production in the Lake States*

Realistic Supply Assessments



Modeling Physical Availability

How much woody material can we physically remove from our forests for biomass utilization?

A function of:

- Timber harvest levels (*also market driven*)
- Forest management guidelines (*environmental constraints*)
- Forest growth (*productivity*)
- Silvicultural practices (*rotation age, TSI activities, non-timber objectives*)



Total Living Biomass



Table 4.2. Estimated oven-dry tons (ODT) of living biomass on Minnesota timberland by stand attribute and ownership.

Biomass attribute	----- Government -----			Private		Total
	Federal	State	Local	industrial	Woodlands	
Bolewood	20,864,262	31,893,861	30,447,010	17,182,948	69,360,697	169,748,778
Tops and limbs	5,663,335	8,512,962	8,490,353	4,816,259	19,487,695	46,970,605
Stumps	1,334,828	2,053,847	1,930,673	1,075,673	4,294,443	10,689,464
Saplings	9,926,636	15,765,104	14,186,581	6,953,321	24,398,497	71,230,139
Roots	8,363,791	12,810,150	12,066,265	6,501,099	24,983,356	64,724,660
Total	46,152,852	71,035,924	67,120,882	36,529,300	142,524,688	363,363,646

Scenarios Modeled

Target harvest levels – **(a)** 10-year average of 3.47 million cords (4.2 million ODT); **(b)** GEIS sustainable threshold of 4.90 million cords (5.9 million ODT); and **(c)** intensive management of 5.50 million cords (6.6 million ODT)

Biomass retention level – **(a)** theoretical max – 0% retention; **(b)** logistic max - 15% retention; **(c)** MFRC guidelines - 33% retention; **(d)** assumed current practice - 50% retention; and **(e)** low utilization rate - 75% retention.

Roundwood competition – assumes that 10% and 20% of harvested roundwood is chipped and utilized for biomass production.

TSI/early stand treatments – assumes utilization of biomass from early and commercial thinnings in Aspen-birch and White-red-jack pine types. Net increase in subsequent yields.

Harvest rotation age – shortens and extends the baseline rotation ages by 10 years for each forest type.

2010 Minnesota Biomass Outlook



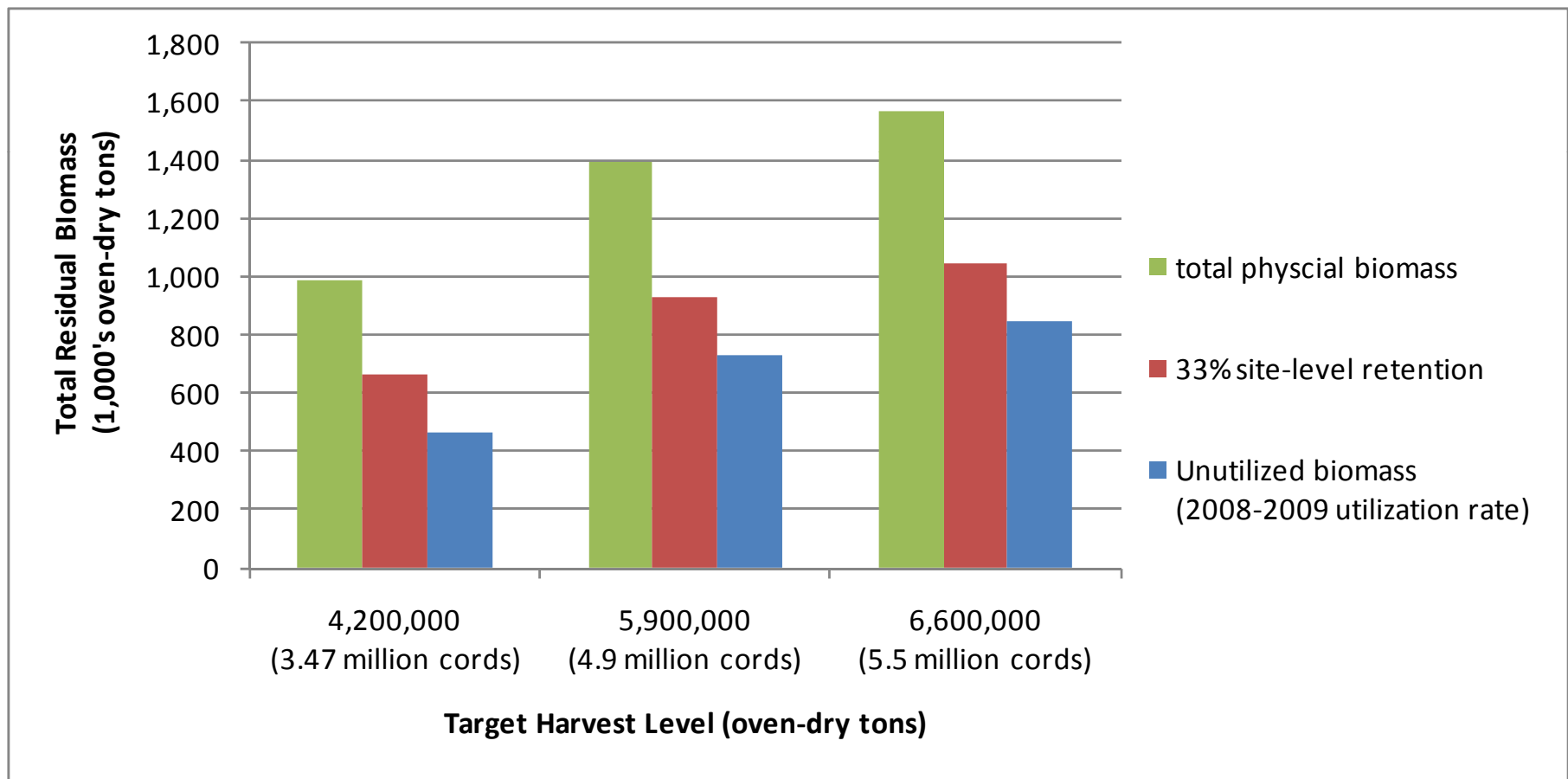
Tables 4.3–4.4. Statewide annual oven-dry tons of residual biomass by ownership and forest management scenario (33% retention per the MFRC harvest guidelines).

Forest Management scenario	----- Government -----			Private industrial	Woodlands	Total
	Federal	State	Local			
3.53 million cord harvest (10 yr average)						
MFRC retention (baseline)	101,301	130,029	141,440	48,366	240,847	661,983
+ 10% bolewood	157,248	202,683	216,726	74,511	368,182	1,019,351
+ 20% bolewood	213,196	275,338	292,013	100,657	495,517	1,376,720
Early stand treatments	128,740	160,436	179,263	60,750	302,792	831,982
Shortened rotation (-10 yrs)	99,294	128,188	138,435	46,707	238,444	651,068
Extended rotation (+10 yrs)	103,186	131,182	144,194	49,824	241,792	670,179
4.90 million cord harvest (GEIS threshold)						
MFRC retention (baseline)	123,587	168,032	184,974	76,056	378,560	931,208
+ 10% bolewood	191,478	260,461	283,141	116,763	578,704	1,430,547
+ 20% bolewood	259,368	352,891	381,309	157,470	778,847	1,929,887
Early stand treatments	152,183	199,767	224,408	89,019	442,981	1,108,358
Shortened rotation (-10 yrs)	120,950	165,076	182,039	73,723	377,412	919,199
Extended rotation (+10 yrs)	125,839	169,606	188,008	78,113	381,351	942,918
5.50 million cord harvest (UMN Staff Paper #204)						
MFRC retention (baseline)	138,736	188,988	206,470	86,558	426,935	1,047,687
+ 10% bolewood	214,861	292,800	316,662	132,465	652,179	1,608,968
+ 20% bolewood	290,986	396,612	426,853	178,373	877,424	2,170,249
Early stand treatments	169,426	222,901	247,240	101,263	492,121	1,232,951
Shortened rotation (-10 yrs)	137,245	186,674	203,862	84,463	425,180	1,037,425
Extended rotation (+10 yrs)	140,627	190,775	209,420	88,730	430,120	1,059,673

2010 Minnesota Biomass Outlook



Unutilized residual biomass assuming 2008-2009 utilization rate



Economic & Social Availability



- Mail back survey (20+ acre parcels; 1,109 questionnaires, 668 returned)
- Surveyed payment levels of \$0, \$2, \$5, \$10, and \$15/acre
- Median payment level of **-\$9.28** per acre (*half said yes and half said no*)
- 64% of respondents were willing to accept an average payment of \$6.52/acre
- No regional differences in willingness to accept payment (WTA)

Payment (\$/acre)	% willing to accept payment
-\$50	18%
-\$25	36%
\$0	58%
\$10	67%
\$25	78%
\$50	90%

Economic & Social Availability



Figure A.1. Estimated residual biomass supply from woodland owners in the 22 northern Minnesota counties (*3.47 million cord statewide harvest; 33% on-site residual retention*)



Increasing Biomass Availability

- Utilization of bolewood significantly increases the supply of biomass available to biomass markets, particularly in Northeast region
- Early stand treatments in aspen-birch and white-red-jack increased annual availability by about 170,000 ODT (*~78,000 ODT in the Northeast region*)
- Shortening rotations by 10-years has a small impact on increased availability
- Residual retention practices significantly impact availability



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