

# THE ECONOMICS OF OBJECTIVE BASED FOREST MANAGEMENT: WHEN, HOW AND WHAT WILL IT COST

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College of Natural Resources  
University Of Idaho

Intermountain Forestry Coop: Technical Meeting  
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# KEY CONCEPTS

- Discounting
- Opportunity Cost
- Considerations for Density Control
  - Growth and Yield
  - Product Differentiation
  - Logging Costs
    - Valuing Future Rotations
    - Rotation Ages
- Example Bringing it all Together



# DISCOUNTING (TIME VALUE OF MONEY)

The idea that money today is worth more than the same amount of money in the future.

Years from Now	Discount Rate				
	0.02	0.04	0.06	0.08	0.10
0	453	208	97	46	22
5	500	253	130	68	36
10	552	308	174	99	57
15	610	375	233	146	92
20	673	456	312	215	149
25	743	555	417	315	239
30	820	676	558	463	386
35	906	822	747	681	621
40	1000	1000	1000	1000	1000



# OPPORTUNITY COST

The value of the next highest alternative use  
(or)

Value of Highest and Best Use

-

Value of Alternative

=

**I** Cost of Choosing the Alternative



"It cost \$699. But when you factor in the time wasted sitting in front of it, well, the real cost is enormous."

# CONSIDERATIONS FOR STOCKING EVALUATIONS

## Growth and Yield

- Information on how a stand will develop over time for a given silvicultural regime

## Product Differentiation

- The volume and prices of products the harvest will provide

## Logging Costs

- The cost of extracting the products from the forest

## Rotation Ages

- How your decisions change the timings of either the final harvest or other future thinnings

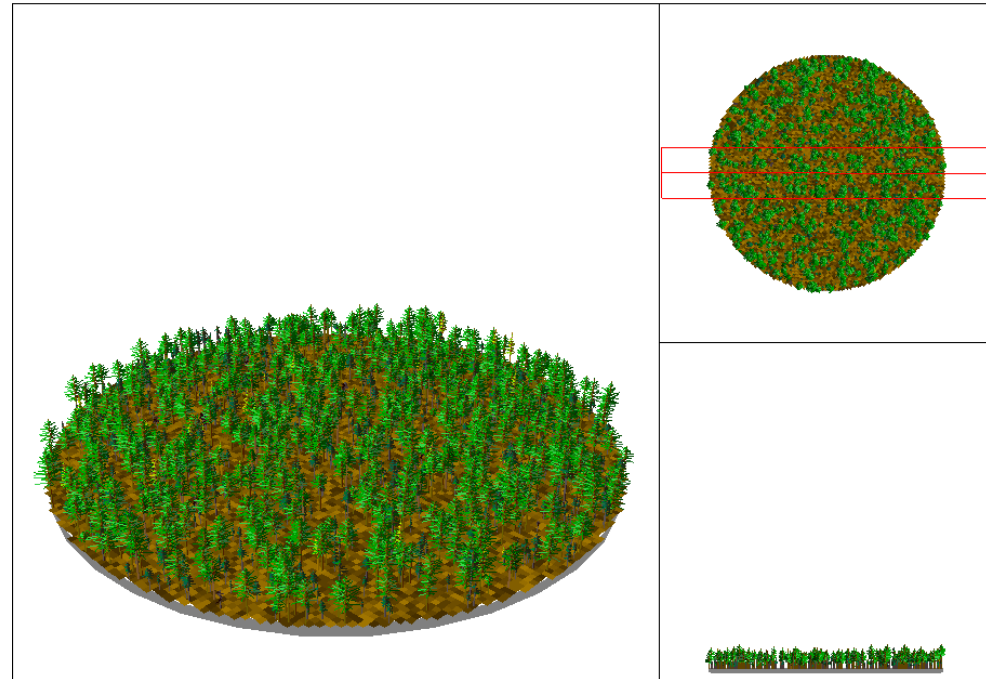


# EXAMPLE: INSTALLATION 20041

- About 30 miles east of here
- 1410 trees-per-acre mostly Douglas-fir
- 2.3 inches Quadratic Mean Diameter
- 50-year DF Site Index 106
- 136 Stand Density Index
- 345 Cubic Feet per Acre
- 0 Board Feet per Acre

Stand=20041 Year=2013 Inventory conditions

IFC2\_001.svs

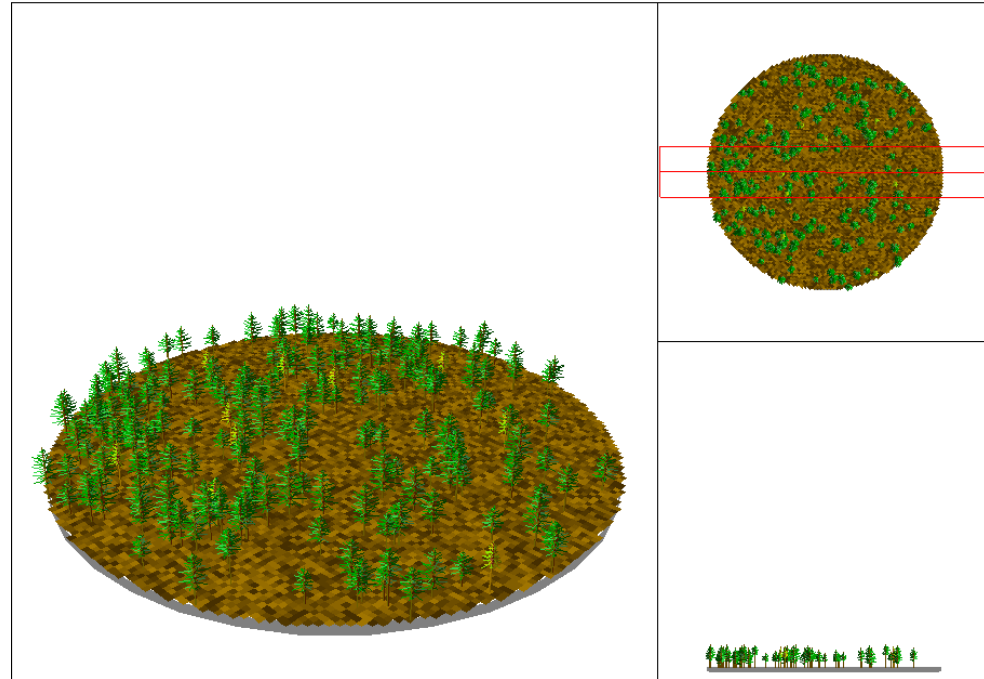


# EXAMPLE: INSTALLATION 20042

- About 30 miles east of here
- 210 trees-per-acre mostly Douglas-fir
- 3.7 inches Quadratic Mean Diameter
- 50-year DF Site Index 106
- 43 Stand Density Index
- 135 Cubic Feet per Acre
- 0 Board Feet per Acre

Stand=20042 Year=2013 Inventory conditions

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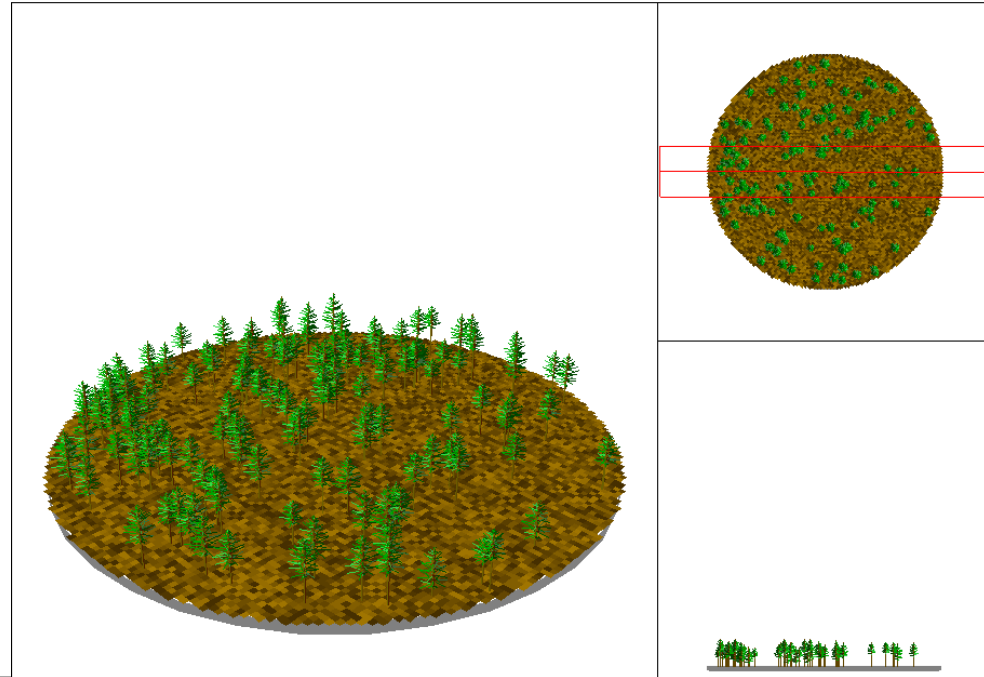


# EXAMPLE: INSTALLATION 20043

- About 30 miles east of here
- 140 trees-per-acre mostly Douglas-fir
- 4.3 inches Quadratic Mean Diameter
- 50-year DF Site Index 106
- 36 Stand Density Index
- 142 Cubic Feet per Acre
- 0 Board Feet per Acre

Stand=20043 Year=2013 Inventory conditions

IFC2\_043.svs



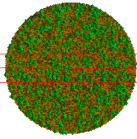
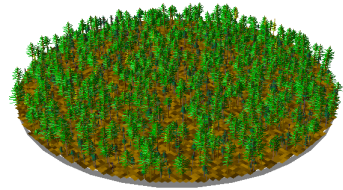


# DENSITY CONTROL: GROWTH & YIELD

Stand=20041 Year=2013 Inventory conditions

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**20041**

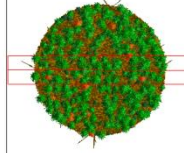
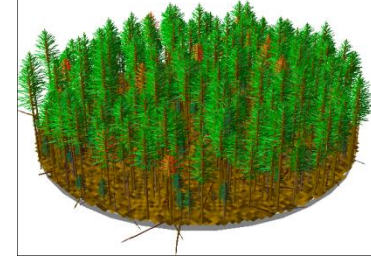


2013  2053

Stand=20041 Year=2063 Beginning of cycle

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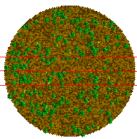
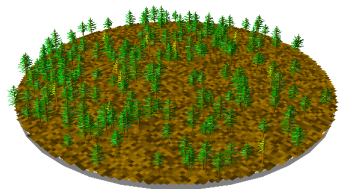
**20041**



Stand=20042 Year=2013 Inventory conditions

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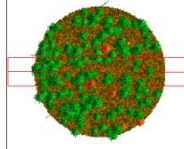
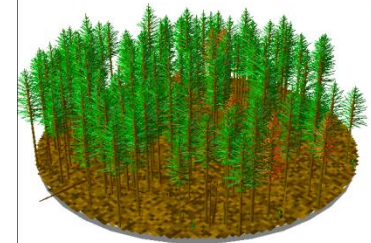
**20042**



Stand=20042 Year=2063 Beginning of cycle

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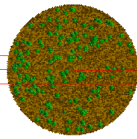
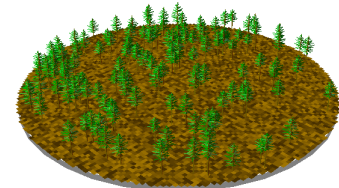
**20042**



Stand=20043 Year=2013 Inventory conditions

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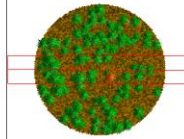
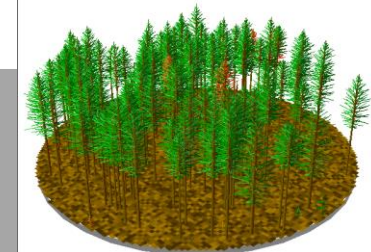
**20043**



Stand=20043 Year=2063 Beginning of cycle

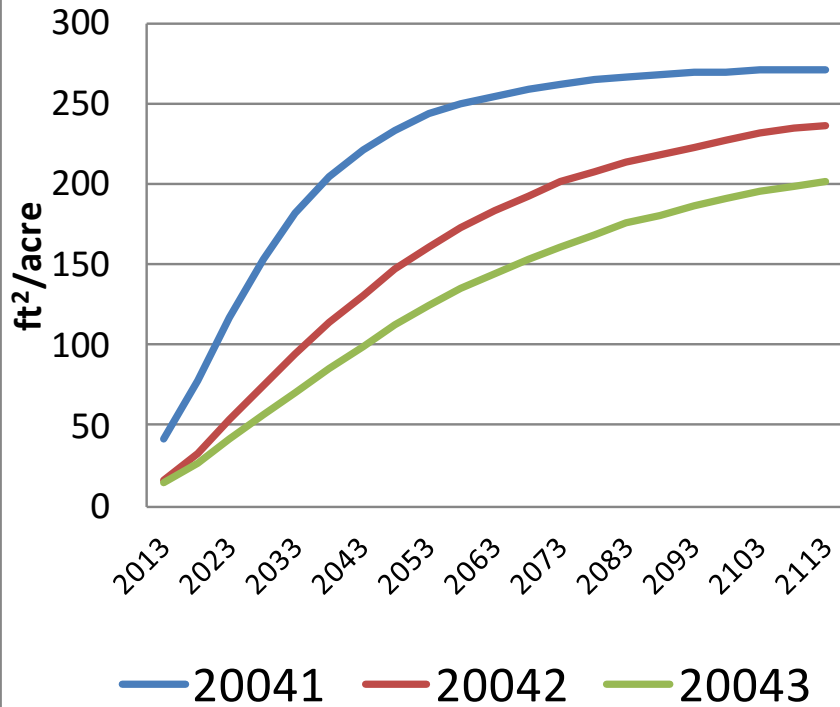
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**20043**

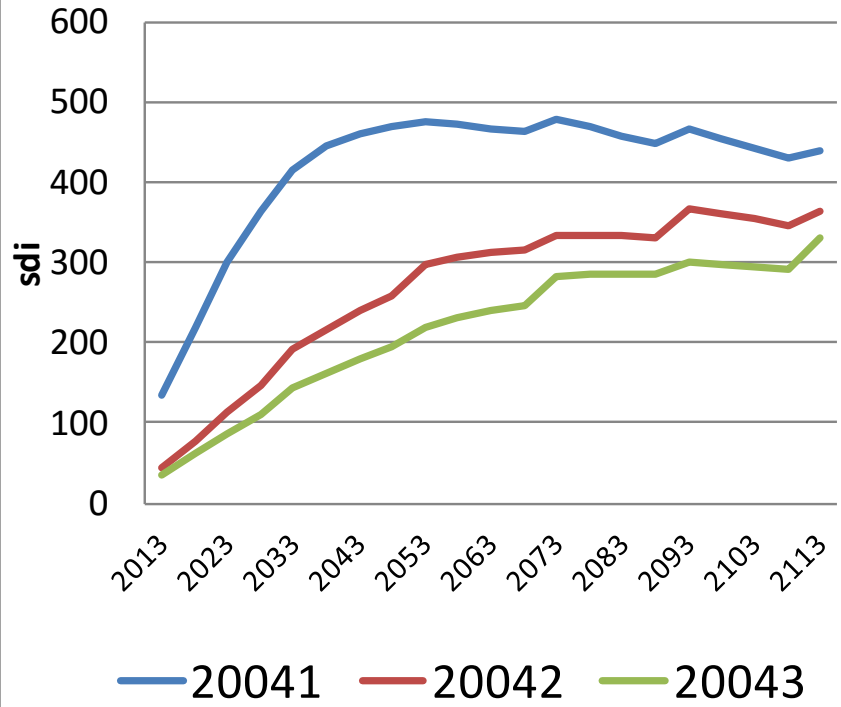


# DENSITY METRICS

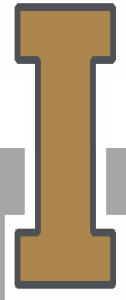
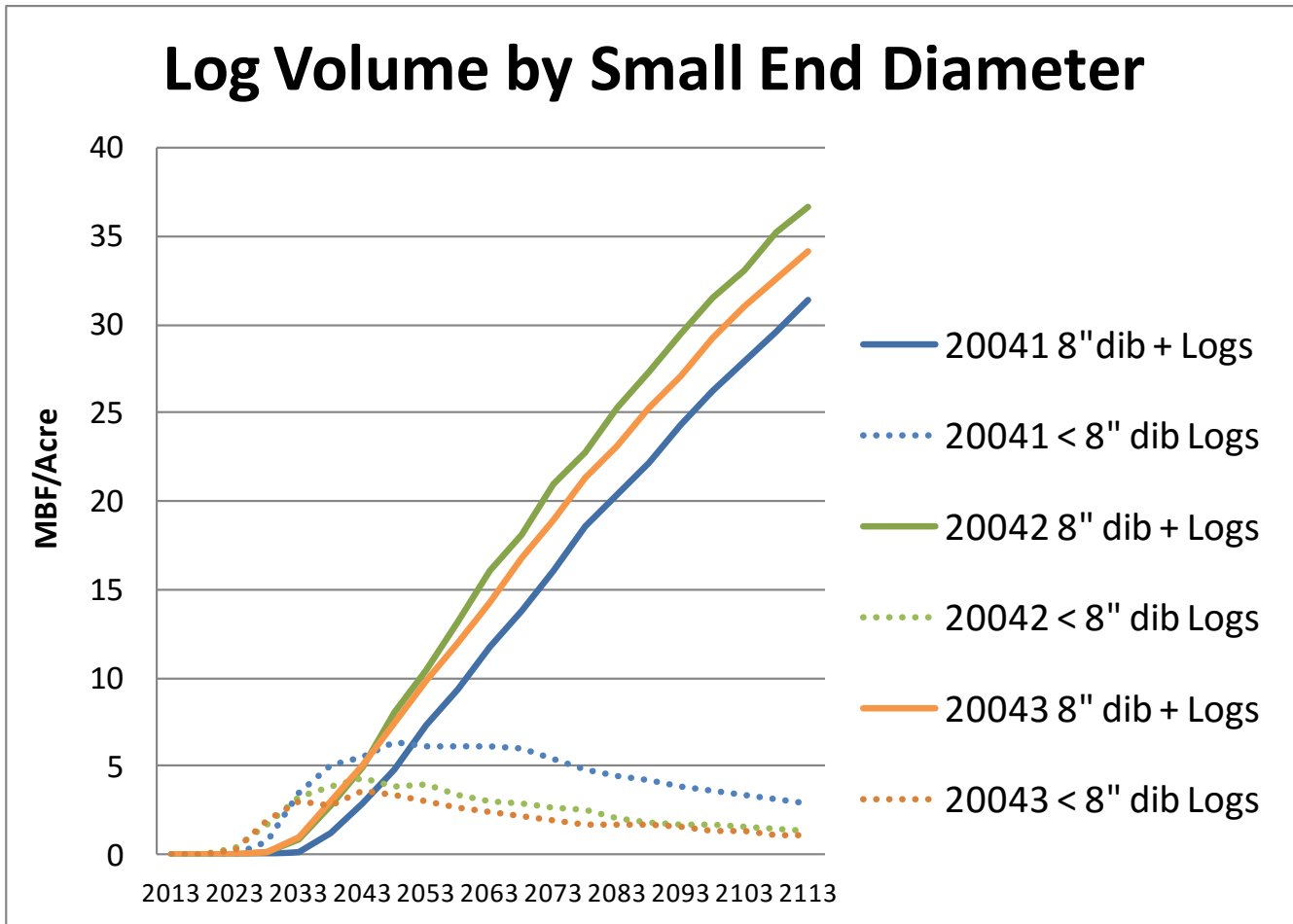
## Basal Area



## Stand Density Index



# LOG PRODUCT DIFFERENTIATION



# LOG PRICES



P.O. Box 670  
Clarkston, Washington 99403  
Office (509) 758-5558 → Sales (208) 875-1321

## GUY BENNETT LUMBER COMPANY LOG PRICES

Date: 08/01/08

Expiration: 09/15/08



Dave Fritts – Ext.203  
Mike Miraglio – Ext.209  
Scott Bruce – Ext.217

SPECIES	NET F.O.B.	NET F.O.B.	SPECIES	NET F.O.B.	NET F.O.B.
LENGTHS	Incr of 16.6'	All Other	LENGTHS	Incr of 16.6', 18.6', 20.6'	All Other
P. Pine 6"-7"	225	200	DF/L 6"-7"	225	200
P. Pine 8"-12"	300	275	DF/L 8"-24"	350	325
P. Pine 13"-19"	350	325	DF/L 25"+	350	325
P. Pine 20"+	450				
Blued Pine or Spruce	125				
LP 6"-7"	225				
LP 8"-12"	300				
LP 13"+	350				
Spruce 6"-7"	225				
Spruce 8"-12"	300				
Spruce 13"-19"	350				
Spruce 20"+	425				

FOR VIEWING PURPOSES



NORTHWEST  
MANAGEMENT, INC.

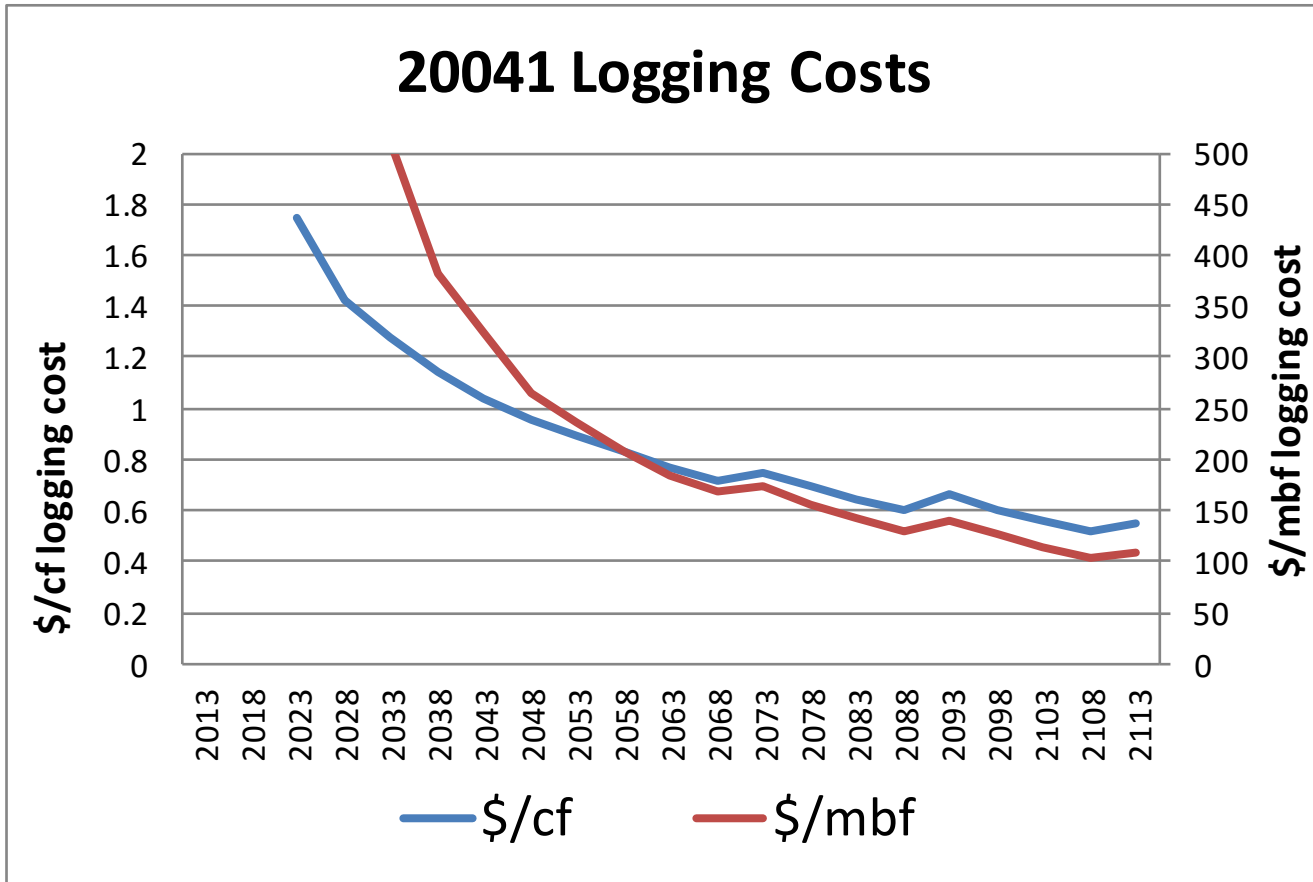
About Se

### Area 2

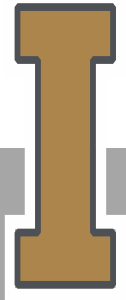
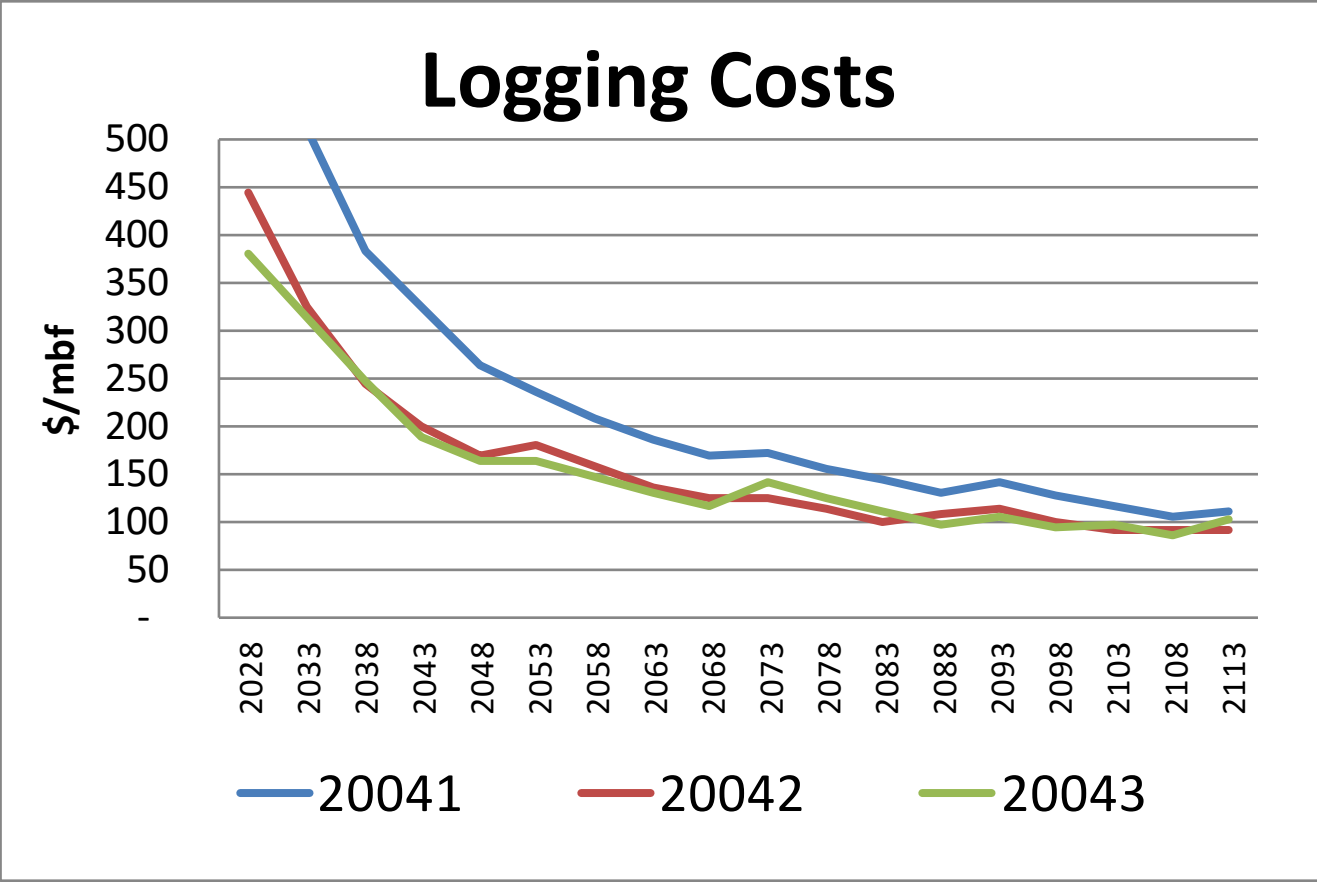
Benewah, Latah, Nez Perce, Whitman,  
Asotin, Columbia, Garfield and Port of  
Wilma

DF, WL	375-460	375-475
GF, WH	325-450	350-475
WP	325-390	325-400
PP	240-425	240-450
SP	325-450	325-425
RC	500-800	500-850
LP	325-450	330-465
pulp	34/ton	34/ton
Tonwood	50/ton	50/ton

# LOGGING COST DIFFERENCES



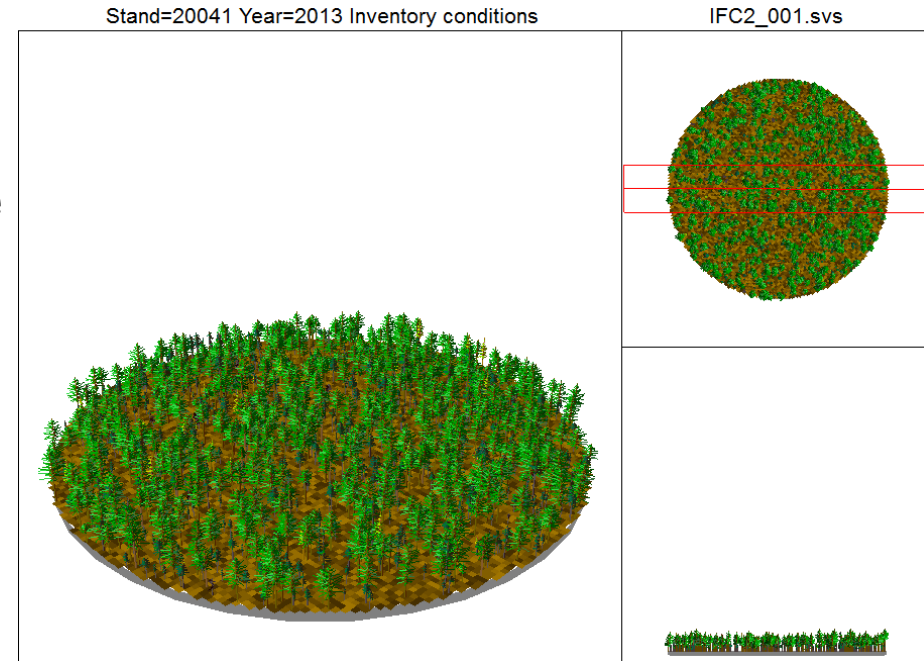
# LOGGING COST DIFFERENCES



# EXAMPLE BRINGING IT ALL TOGETHER

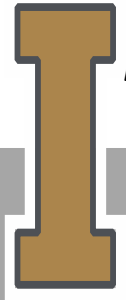
Using the same stand, log prices, harvest costs and 6% discount rate we will evaluate:

- No Density Control (20041)
- Thin to 14' spacing (20042)
- Thin to 18' spacing (20043)



## We use a Land and Timber Value (LTV) equation

$$LTV = \max_{age=0}^{Rotation} \frac{\sum_{age=0}^{Rotation} (Logprice * LogQuantity_{age} - Costs_{age}) (1 + DiscountRate)^{Rotation-age} + SEV}{(1 + DiscountRate)^{Rotation-current\_age}}$$



# LAND AND TIMBER VALUE (NPV \$/ACRE)

$$LTV = \max_{age=0} \frac{\sum_{Rotation}^{Rotation} (\text{Logprice} * \text{LogQuantity}_{age} - \text{Costs}_{age}) (1 + \text{DiscountRate})^{Rotation-age} + SEV}{(1 + \text{DiscountRate})^{Rotation-current\_age}}$$

Year	With 6% Discount Rate			Year	With 4% Discount Rate			Year	With 8% Discount Rate		
	20041	20042	20043		20041	20042	20043		20041	20042	20043
2013				2013				2013			
2018				2018				2018			
2023		(106.31)	(143.74)	2023		6.50	(38.79)	2023		(111.34)	(142.40)
2028	(358.46)	(69.80)	(26.91)	2028	(365.96)	18.17	75.24	2028	(286.58)	(68.50)	(36.09)
2033	(210.63)	15.23	35.09	2033	(217.02)	113.57	142.63	2033	(155.66)	(0.25)	13.42
2038	(78.23)	157.43	148.33	2038	(50.92)	328.47	313.83	2038	(56.32)	91.36	85.66
2043	18.71	245.13	256.48	2043	94.79	495.74	515.84	2043	5.71	134.94	141.42
2048	111.24	295.78	282.34	2048	267.35	626.81	600.61	2048	54.44	150.38	143.39
2053	148.17	255.71	253.62	2053	359.10	589.50	585.02	2053	67.85	118.77	117.78
2058	164.29	255.50	238.64	2058	421.39	636.31	596.60	2058	69.28	108.61	101.34
2063	166.85	244.53	222.33	2063	460.61	661.96	604.40	2063	64.46	94.97	86.25
2068	154.07	213.47	200.77	2068	462.39	631.73	595.53	2068	54.39	75.63	71.09
2073	123.91	179.40	149.71	2073	407.58	581.58	488.47	2073	39.87	57.95	48.28

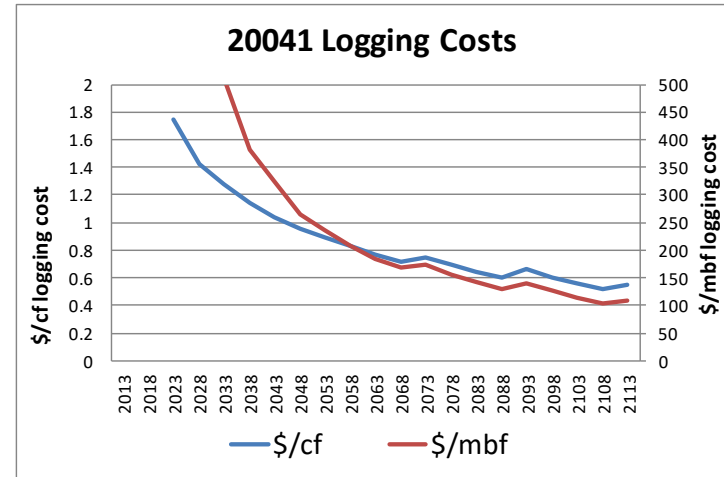
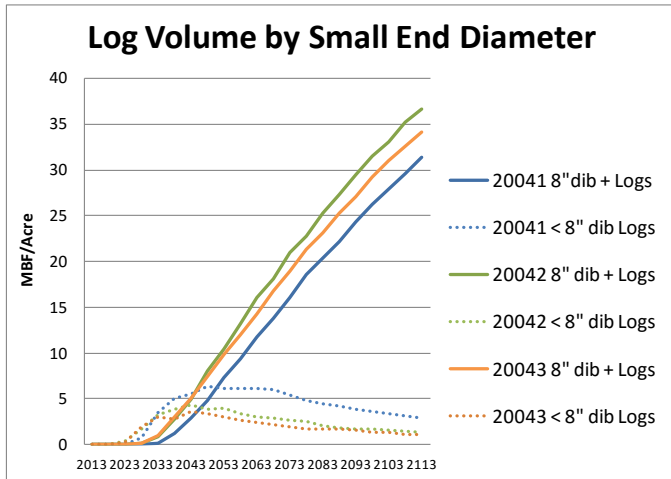
Year you would harvest



**Opportunity Cost: At 6% not reducing density costs you \$129/acre**



# ROTATION LENGTHENERS



**GUY BENNETT LUMBER COMPANY LOG PRICES**

Date: 08/01/08      Expiration: 09/15/08

**Guy Bennett**  
Lumber Company

P.O. Box 976  
Clarkston, Washington 99403  
Office (203) 753-2333 • Sales (203) 875-1121

SFI  
Sustainable Forestry Initiative

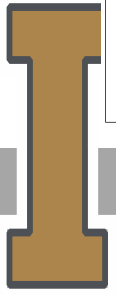
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P. Pine 6"-7"	225	200	DF/L 6"-7"	225	200
P. Pine 8"-12"	300	275	DF/L 8"-24"	350	325
P. Pine 13"-19"	350	325	DF/L 25"+	350	325
P. Pine 20"+	450	425	GF 6"-7"	225	200
Blued Pine or Spruce	125	125	GF 8"-24"	300	275
LP 6"-7"	225	200	GF 25"+	250	225
LP 8"-12"	300	275			
LP 13"+	350	325			
Spruce 6"-7"	225	200			
Spruce 8"-12"	300	275			
Spruce 13"-19"	350	325			
Spruce 20"+	425	400			

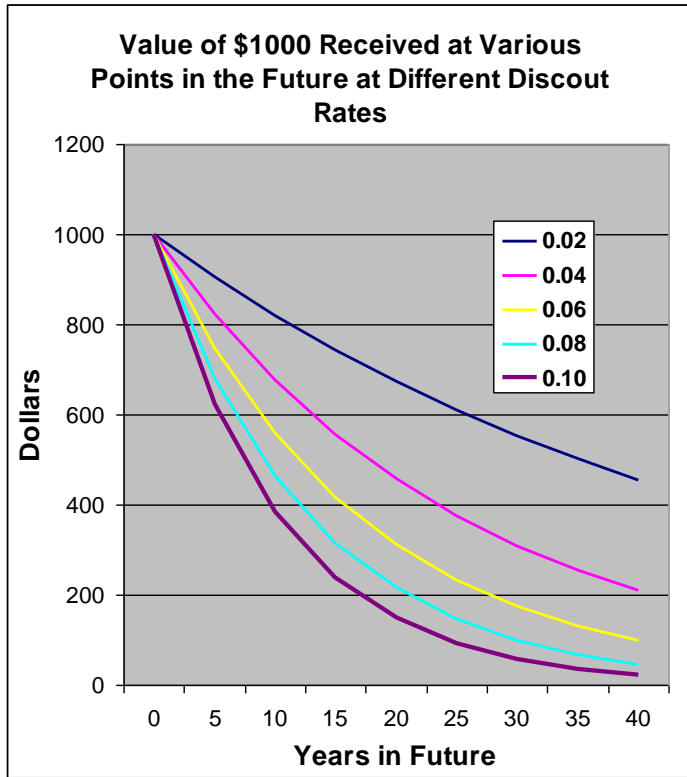
FOR VIEWING PURPOSES ONLY - PLEASE VISIT OR CALL OUR OFFICE TO COMPLETE AUTHORIZED FORMS.

*The longer we wait to harvest... The more volume, concentrated in higher value products, that can be removed at a lower per-unit cost.*

**Rotation** ↑



# ROTATION SHORTENERS



**Consideration of Future Rotations  
rather than a single rotation value.  
(SEV)**

*The sooner the harvest...*

We have our money in hand and can use it for other things or start the next rotation

**Rotation** ↓

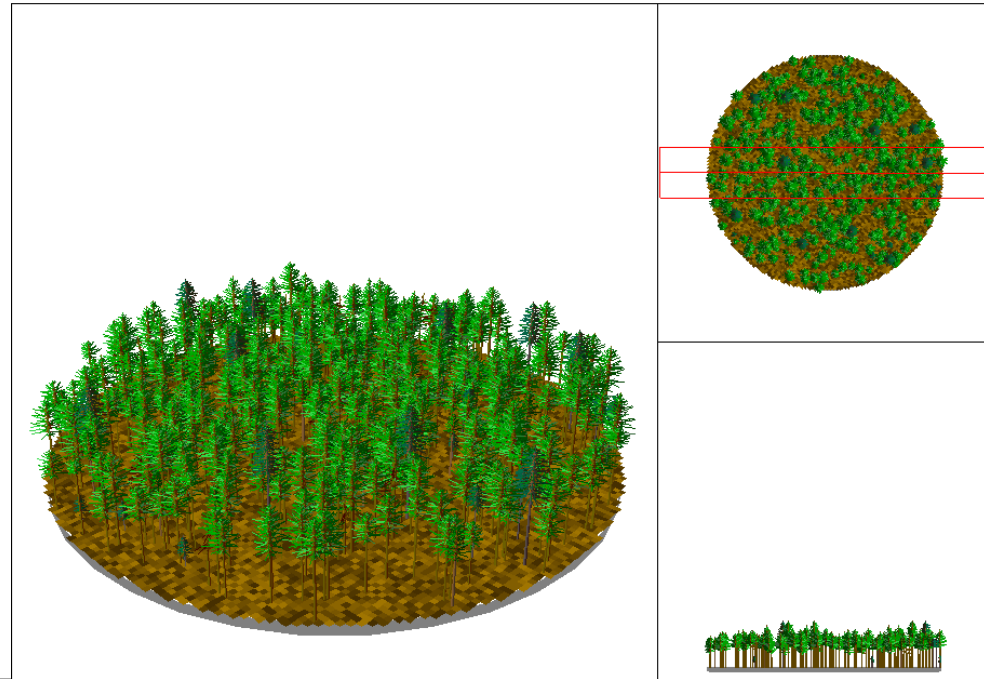


# EXAMPLE: INSTALLATION 6001

- About 45 miles northeast of here
- 430 trees-per-acre mostly Douglas-fir
- 6.8 inches Quadratic Mean Diameter
- 50-year DF Site Index 127
- 230 Stand Density Index
- 1473 Cubic Feet per Acre
- 200 Board Feet per Acre

Stand=6001 Year=2013 Inventory conditions

IFC2\_127.svs

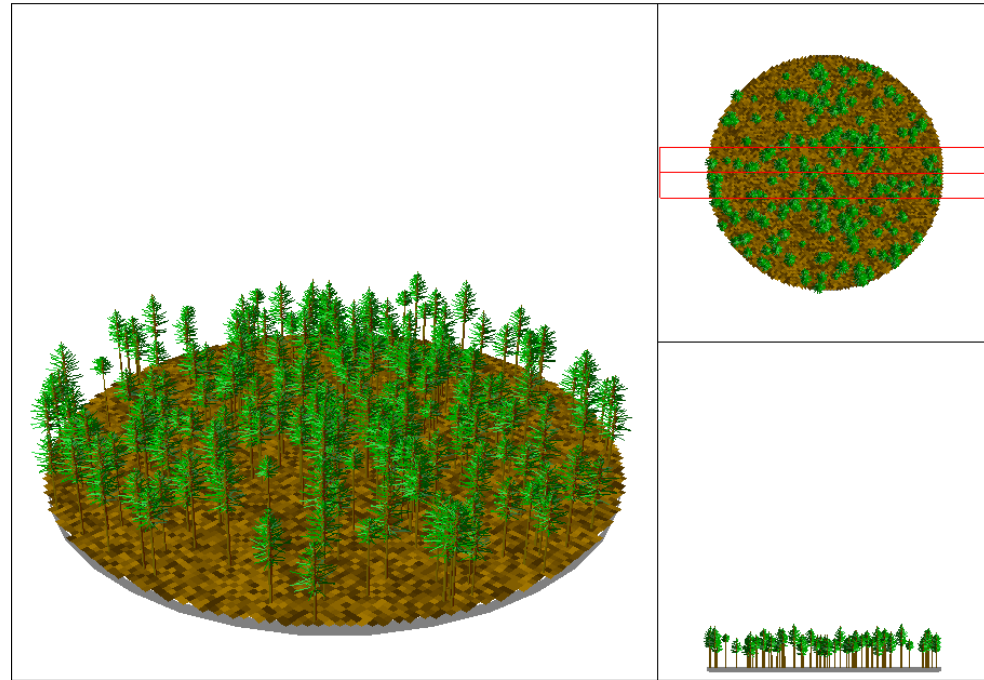


# EXAMPLE: INSTALLATION 6002

- About 45 miles northeast of here
- 220 trees-per-acre mostly Douglas-fir
- 7.0 inches Quadratic Mean Diameter
- 50-year DF Site Index 127
- 123 Stand Density Index
- 792 Cubic Feet per Acre
- 0 Board Feet per Acre

Stand=6002 Year=2013 Inventory conditions

IFC2\_148.svs

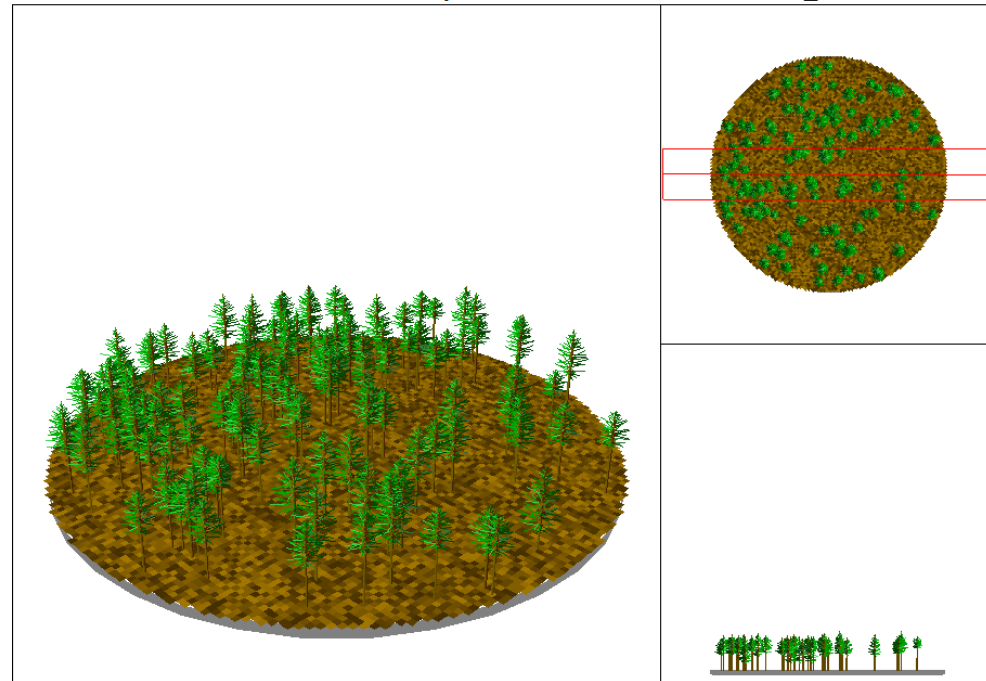


# EXAMPLE: INSTALLATION 6003

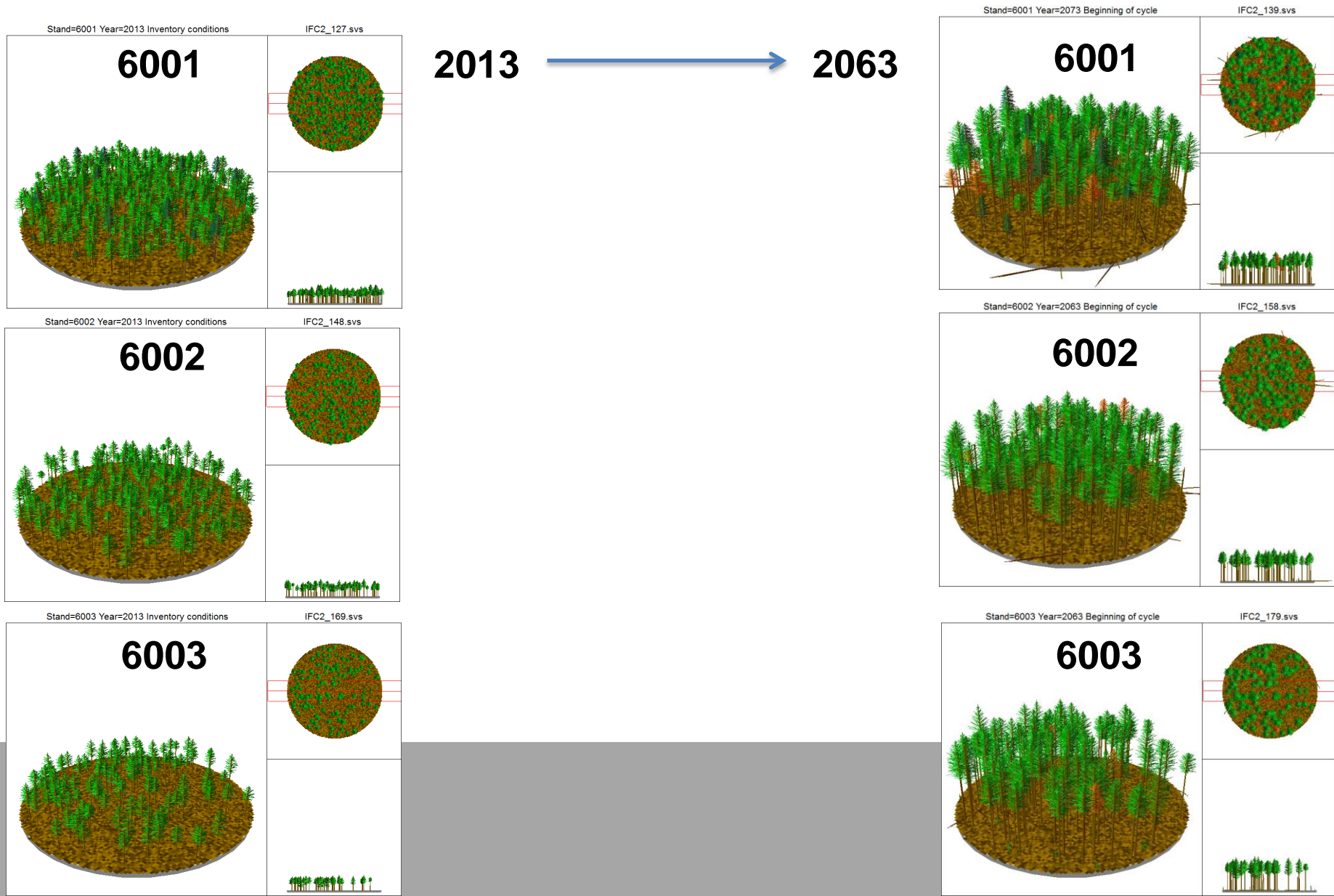
- About 45 miles northeast of here
- 130 trees-per-acre mostly Douglas-fir
- 7.0 inches Quadratic Mean Diameter
- 50-year DF Site Index 127
- 73 Stand Density Index
- 450 Cubic Feet per Acre
- 0 Board Feet per Acre

Stand=6003 Year=2013 Inventory conditions

IFC2\_169.svs

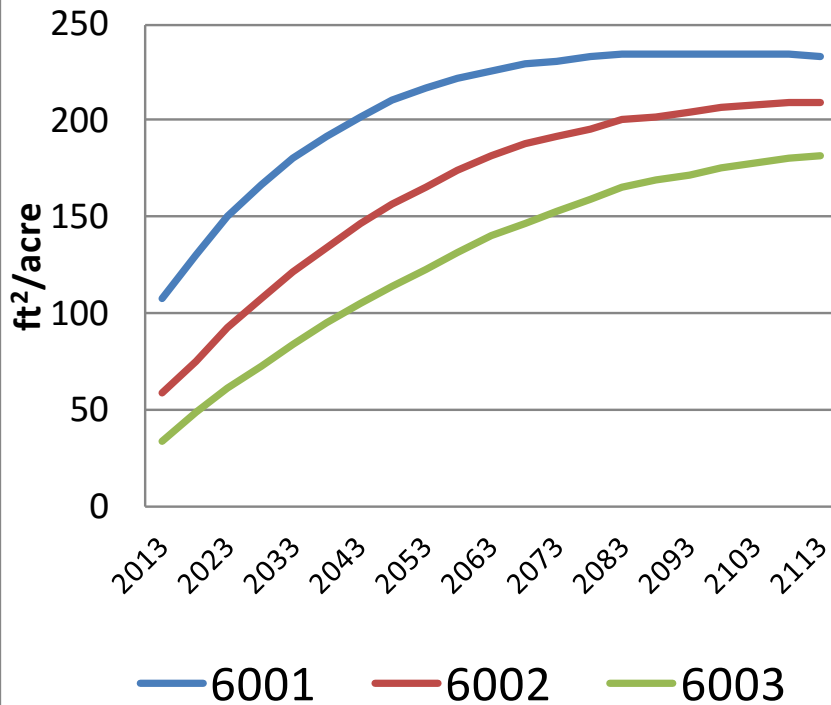


# DENSITY CONTROL: GROWTH & YIELD

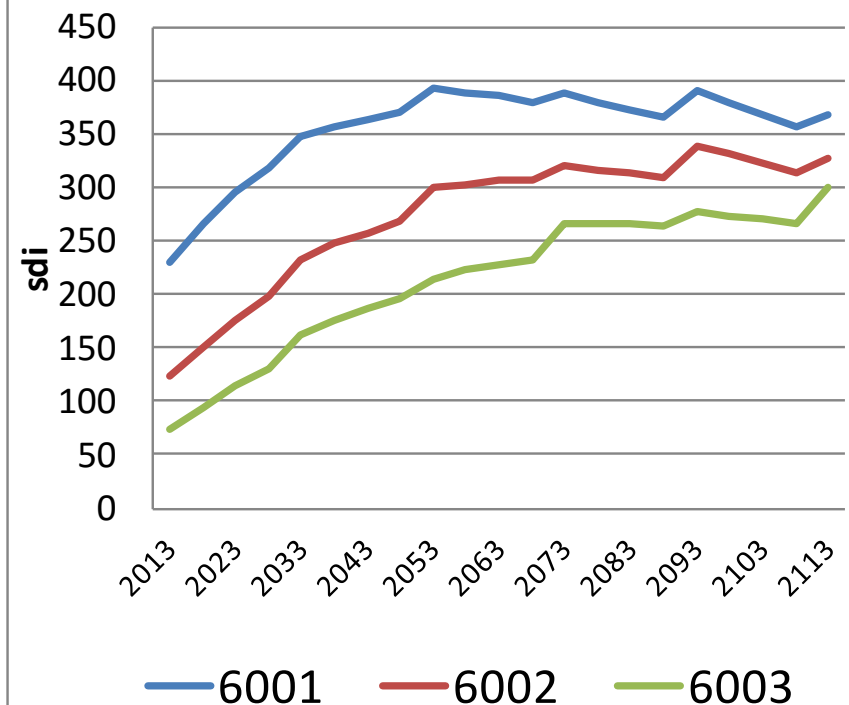


# DENSITY METRICS

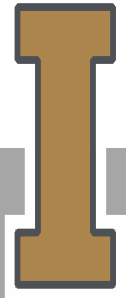
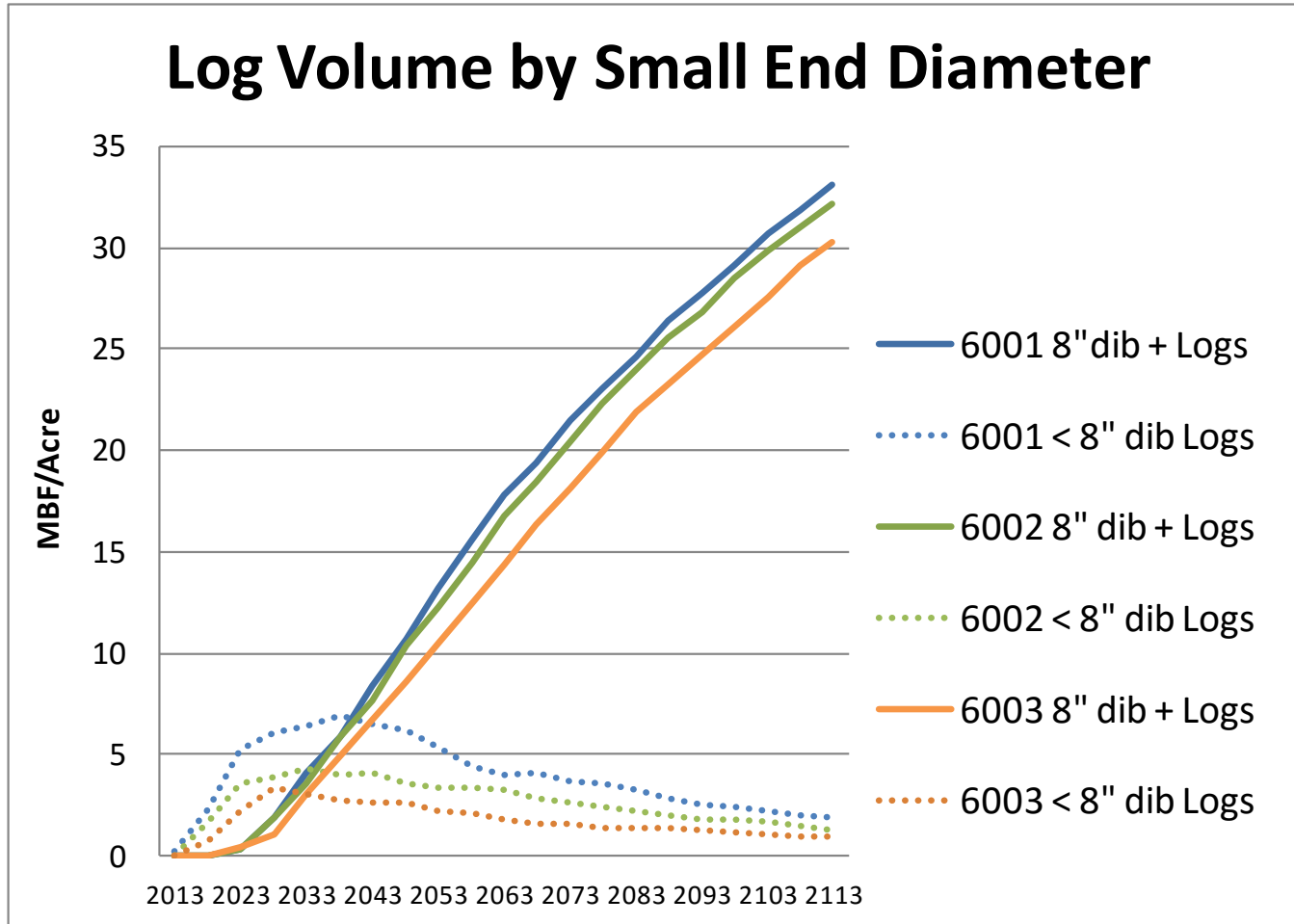
## Basal Area



## Stand Density Index

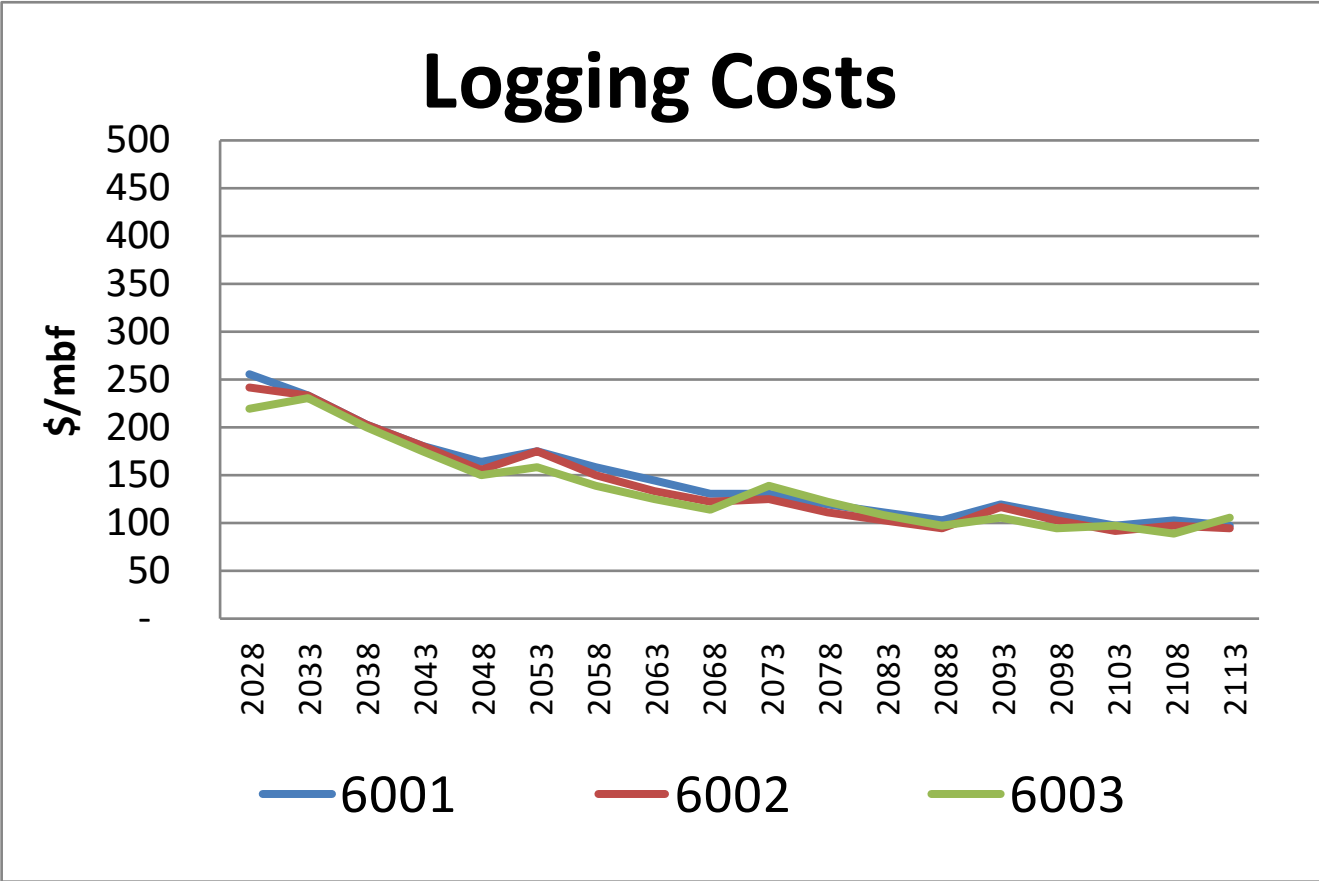


# LOG PRODUCT DIFFERENTIATION





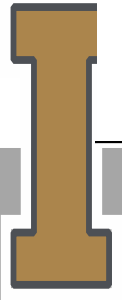
# LOGGING COST DIFFERENCES



# LAND AND TIMBER VALUE (NPV \$/ACRE)

$$LTV = \max_{age=0} \frac{\sum_{Rotation}^{Rotation} (\text{Logprice} * \text{LogQuantity}_{age} - \text{Costs}_{age}) (1 + \text{DiscountRate})^{Rotation-age} + SEV}{(1 + \text{DiscountRate})^{Rotation-current\_age}}$$

With 6% Discount Rate				With 4% Discount Rate				With 8% Discount Rate			
Year	6001	6002	6003	Year	6001	6002	6003	Year	6001	6002	6003
2013	(695.63)			2013	(495.63)			2013	(745.63)		
2018	(450.19)	(182.91)	(198.07)	2018	(330.79)	(36.80)	(53.48)	2018	(444.05)	(200.62)	(214.43)
2023	(8.84)	71.39	57.87	2023	124.41	221.49	205.13	2023	(30.50)	36.06	24.85
2028	238.27	238.05	226.17	2028	428.12	427.83	412.03	2028	164.25	164.08	155.11
2033	344.34	278.74	235.46	2033	595.29	499.26	435.92	2033	226.21	181.07	151.29
2038	422.27	353.62	294.51	2038	754.86	644.34	549.18	2038	257.33	214.31	177.27
2043	441.20	364.39	313.83	2043	842.95	706.94	617.41	2043	246.86	203.02	174.16
2048	417.82	382.62	321.30	2048	864.50	795.94	676.50	2048	213.82	195.52	163.64
2053	338.58	298.22	266.36	2053	767.03	680.57	612.30	2053	158.00	138.90	123.81
2058	301.89	283.53	249.42	2058	745.64	702.36	622.00	2058	128.61	120.69	105.99
2063	269.01	259.69	221.23	2063	725.41	701.24	601.57	2063	104.59	100.92	85.82
2068	227.89	217.38	193.47	2068	672.84	642.88	574.71	2068	80.79	77.03	68.48
2073	184.80	175.56	144.09	2073	598.50	569.55	470.85	2073	59.71	56.70	46.45



# OPPORTUNITY COST

In our particular case the density reduction options yield mixed results.

If you do not choose to reduce installation 20041 down to a 14x14 stocking the opportunity cost would be **\$129/acre** at a 6% discount rate

If you do choose to reduce installation 6001 down to a 14x14 stocking the opportunity cost would be **\$59/acre** at a 6% discount rate



# OTHER THINGS TO CONSIDER

- Stumpage vs. Delivered Log Price
- Future Log Price Expectations
- Defect and Breakage
- Taxation
- We looked at Discount Rate, but MaxSDI / MaxBA is similarly important

