

Stand Development Monitoring (SDM)

So what's happened since we last met?

A component of the Forest and Range Evaluation Program (FREP)

Alex Woods, Wendy Bergerud, Harry Kope, Stefan Zeglen, Dave Weaver,
Steve Baumber, Michelle Cleary and Erin Havard

Business Driver for SDM?

- After Free-growing is declared, possibly as early as age 7, stands are not likely assessed again until after age 60 when they could be sampled under VRI.
- There currently is no formal re-evaluation of managed stands post Free-growing declaration in BC.

Greater reliance on and sensitivity to the productivity estimates of managed stands has been forced upon us.

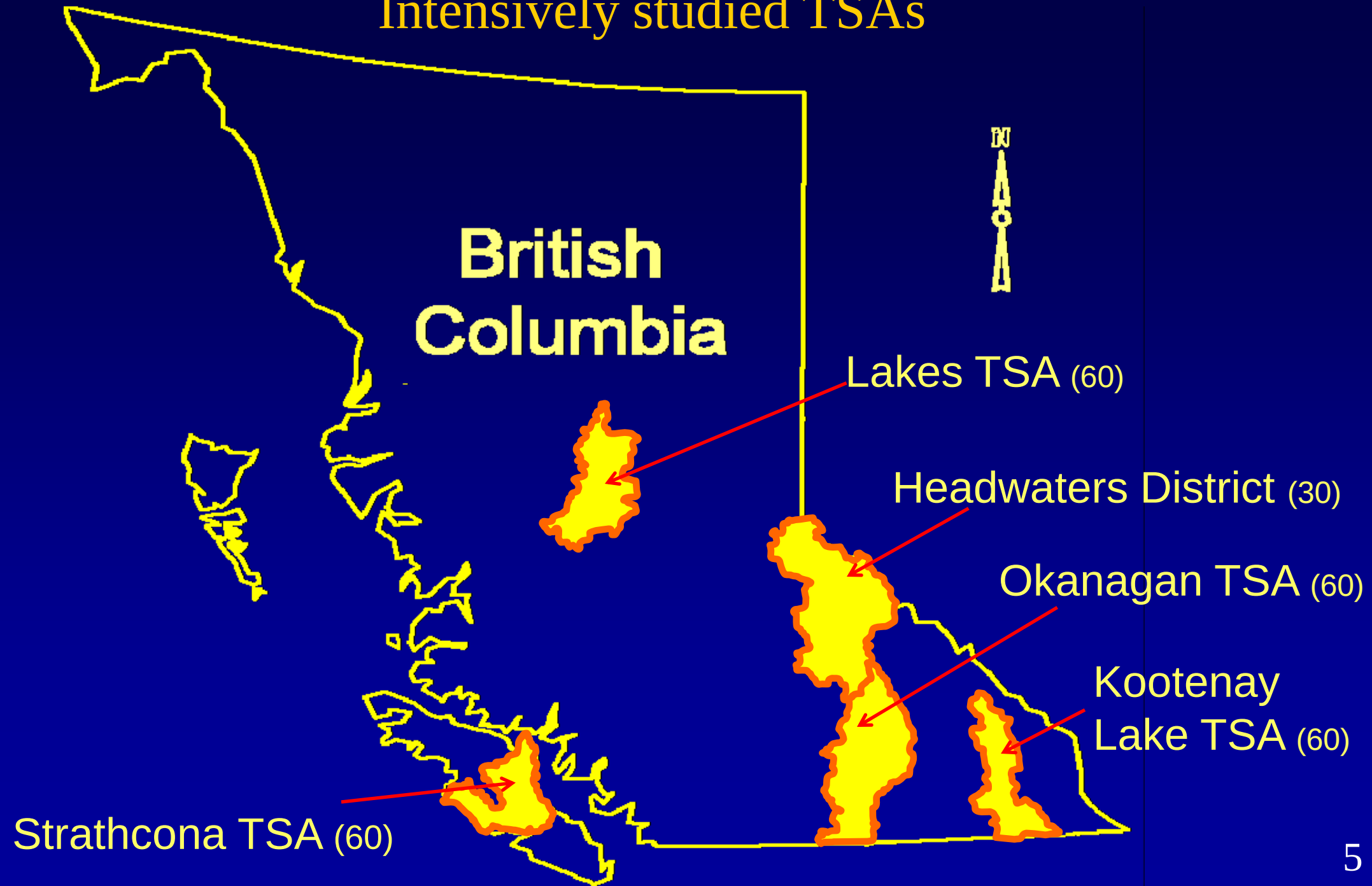


Post Free-Growing Monitoring

Overall Objectives of SDM:

- To test if the **Free-Growing** declaration point-in-time assessment is an accurate predictor of future stand productivity and if the assumptions of stand performance are valid.
- To build an inventory of managed stands filling the gap between free-growing and standard inventory (VRI)

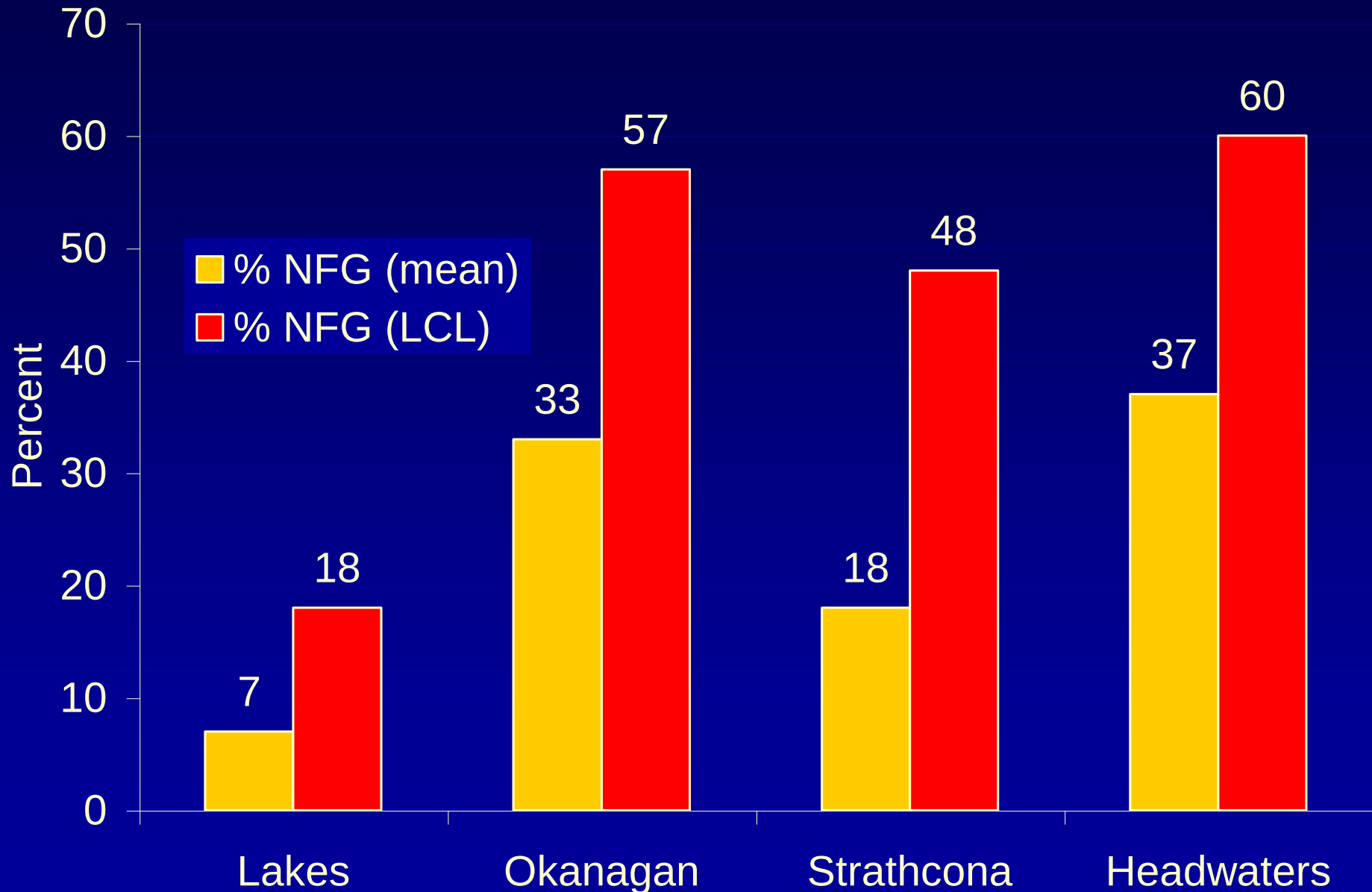
Intensively studied TSAs



Intensive study sampling design:

- Sample population includes all openings declared FG prior to 2002 in TSA,
- 60 stands randomly selected, 30 in period 1987-1994, 30 in period 1995-2001,
- 15, 3.99m radius plots established in each stand,
- Height and dbh measured for all well-spaced trees,
- Site Index determined using growth intercept method,
- Strict adherence to Free-Growing damage criteria.

Percent of stands falling below minimum stocking thresholds based on mean and LCL decision rules



The basic methods used in the intensive FREP evaluations in the Lakes, Okanagan, Strathcona and Kootenay Lake TSAs have now been adapted for use by Forest Districts under their FREP/Forest Health monitoring role as Stand Development Monitoring:

SDM

FREP

REPORT #13

May 2008

FOREST AND RANGE EVALUATION PROGRAM

ARE FREE-GROWING STANDS MEETING TIMBER PRODUCTIVITY EXPECTATIONS IN THE LAKES TIMBER SUPPLY AREA?

Alex Woods
Wendy Bergerud



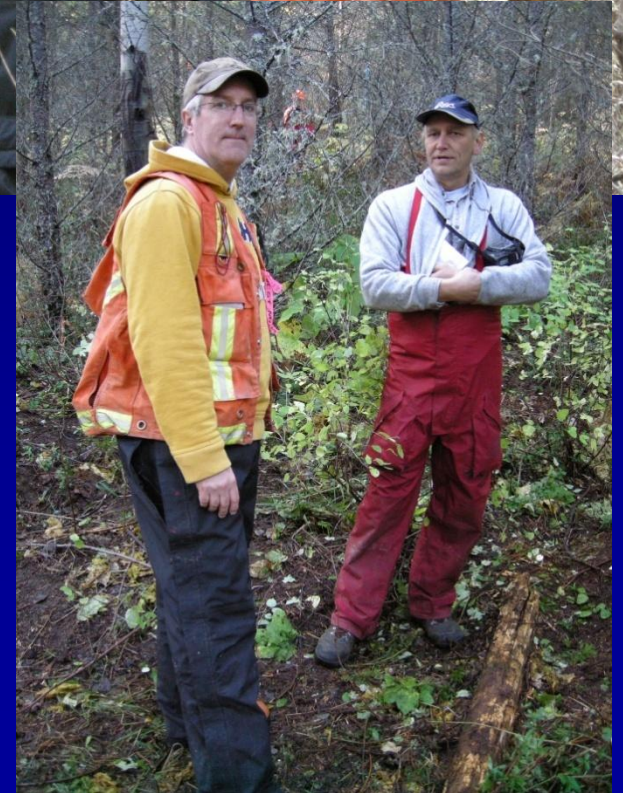
Sustainability of Forest and Range Resources Through Science and Stewardship

SDM training for District Forest Health staff, Salmon Arm BC, October 2008





SDM
Training
Salmon Arm
2008



SDM sampling design:

- Sample population includes all openings surveyed for Free-growing in period 1995-2001 in TSA,
- 60 stands randomly selected, from which 30 are surveyed over a 3-year period, prior to reporting out,
- 10, 3.99m radius plots established in each stand,
- Height, dbh and Ht to LC measured for all well-spaced trees,
- Site Index determined using growth intercept method,
- Strict adherence to Free-Growing damage criteria.

SDM data card, data collection piloted in 8 Districts in 2009

 BRITISH COLUMBIA 		STAND DEVELOPMENT MONITORING FIELD CARD										SURVEYOR NAME(S)				SURVEY DATE Y M D			PAGE OF				
MAPSHEET - OPENING NO.				POLYGON		LOCATION				DISTRICT				TSA			BEC						
POINT OF COMMENCEMENT/BEARING & DISTANCE TO THIS PLOT														UTM ZONE E N									
PLOT NO. (3.99m)								FOREST HEALTH DAMAGE AGENTS										DATA WELL SPACED TREE				GROWTH INTERCEPT SAMPLE (5.64m)	
TREE SPP	LAYER	TOTAL TREES	TOTAL CON.	DEAD TREES	DEAD CON.	WS	FG	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	SPP	DBH	HT	HLC	WS TREE?	
TOTALS >																							
	1																					SPP	
	2																					TOT HT	
	3																					DBH	
	1																					AGE @ 1.3m	
	2																						
	3																						
	1																						
	2																						
	3																						
	1																	NOTES:					
	2																						
	3																						
	1																						
	2																						
	3																						

ACCESS NOTES:										INVENTORY LABEL										
										Ldg. Spp.		2nd Spp.		Minor Spp.				Cr Cl		
										%	Age	Ht.(m)	%	Age	Ht.(m)	%	%	%	%	%

FS -SDM 2008/12/18

SDM in Ft St James, May 2009 (DJA, DVA)



SDM in Cranbrook, May 2009
(DRM (10), DAB (14), DCO (16))



DCH (15)



DCC (13)



SDM
progress
in the
Cariboo
September
2009



DMH (10)



Central Cariboo SDM example stand

Stand History

Harvested 1988
Planted 1989
Declared FG 1999

Free-growing density at
declaration 1200, Lower
CL 1056

DSS incidence at FG 3%
DSG incidence at FG 3%

LOCATION	TENURE	OPENING NO.	CP / BLK	STRATUM
Camp Creek Road	A20017	93B 060 - 016	522 / 4	A

ACCESS: 2WD 4WD ATV WALK

From Williams Lake follow Highway 97 north 45 km and turn right onto Beaver Lake Road. Follow Beaver Lake Road for 11 km and turn left onto Big Camp Creek Road. Follow Big Camp Creek Road for 6.4 km and keep right. Keep left in another 100 metres. The PoC is located in another 800 metres. (63.3 km from Williams Lake)

DESCRIPTION:

Stratum A dominates the majority of the block.
The stratum and block was clearcut harvested in 1988, disc trenched in 1989 and planted in 1990 with pine and a minor amount of spruce.
Natural balsam is present as advanced regen and residuals. These stems are scattered throughout the stratum with heavier concentrations located near the block boundaries (along the timber edge). A minor amount of natural Douglas-fir is also present within the stratum.
The terrain within the stratum is primarily flat with a slight downwards slope running to the eastern side of the block.
The aspect is relatively flat and also runs to the east along the eastern side of the block.
The planted pine are showing good form and vigour and average 11 years at 2.4 metres in height with an average leader of 38 cm.
Approximately 6% of the pine are infected by rust - both Western Gall Rust and Stalactiform Blister Rust. The point of infection on the pine stems is predominantly the lower 40 cm of the stems. This has resulted in many of these infected trees being girdled by rodents (eating the galls) or collapsing under the weight of snow accumulations. Stems with branch infections have shown no substantial loss of vigour.
The brush hazard is rated as low overall and is dominated by alder and willow. The brush does not restrict free growing achievement.
There are 7307 total stems per hectare, 7020 of which are conifers. There are 6847 countable conifers per hectare, well under the maximum of 10,000 sph and therefore juvenile spacing is not required.
Stratum A is stocked and free growing with 1200 well-spaced acceptable stems per hectare.

RECOMMENDATION:

Declare stratum A free growing with 1200 stems per hectare (LCL = 1056 sph).

BRUSH HAZARD:	Low	Willow	10% @ 1.3 m
		Alder	6% @ 1.5 m
		Saskatoon	4% @ 0.6 m

PESTS & DISEASE:	Stalactiform Blister Rust	3%
	Western Gall Rust	3%
	Snow Damage	2%
	Pitch Twig Moth	<1%
	Frost Damage	<1%

Central Cariboo SDM example stand

Plot Number	WS/FG
1	6
2	1
3	3
4	5
5	4
6	5
7	2
8	5
9	3
10	6
Average:	4
Avg. WS/FG Stems/ha	800
variance	2.888889
Standard Error of Mean	0.537484
T-stat 90	1.383
LOWER CL WS/FG	651
UPPER CL WS/FG	949



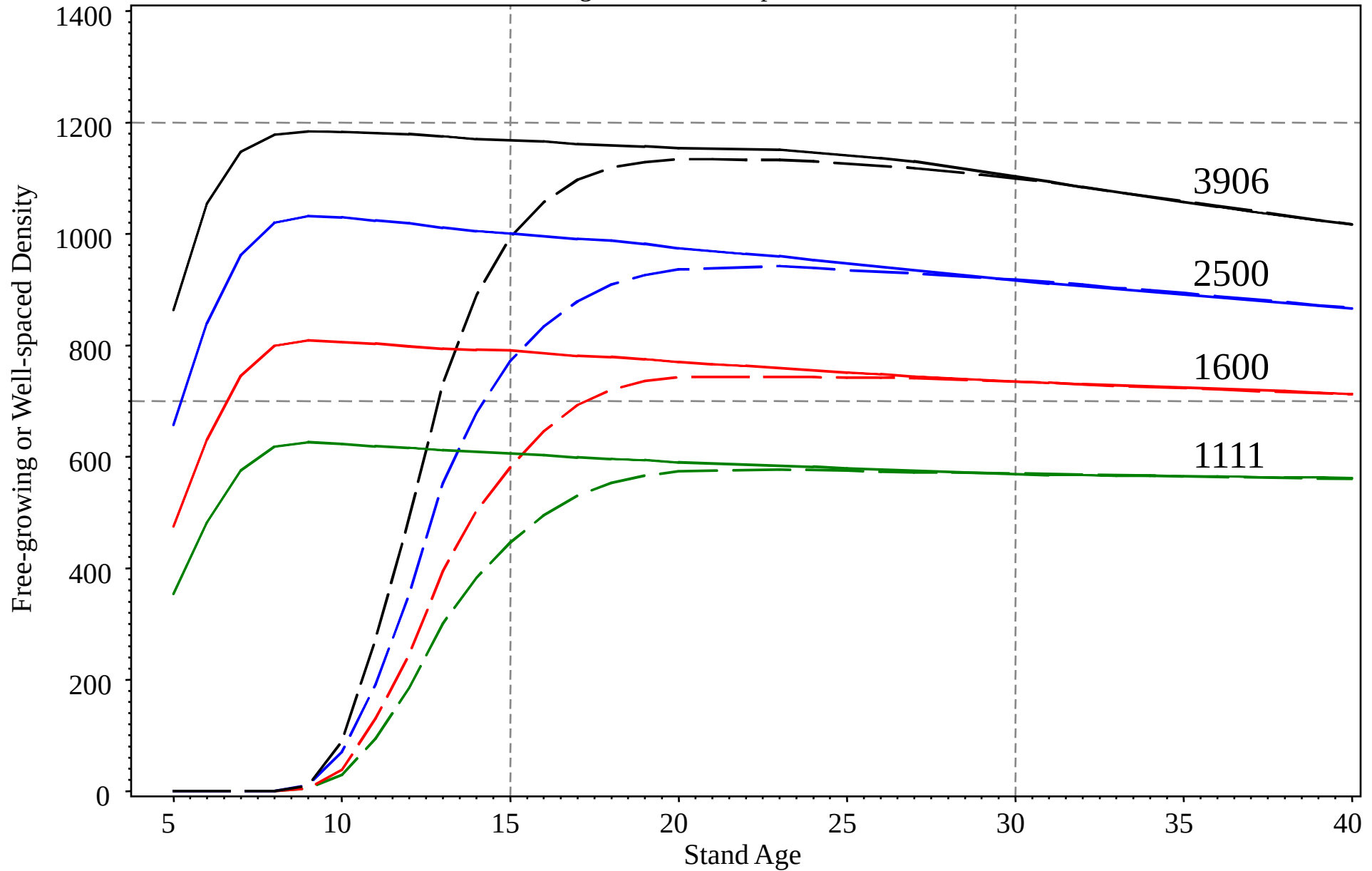
Questions generated through SDM Development

1. Maybe we don't expect stands to maintain a minimum stocking density of 700 fgph at age 30?

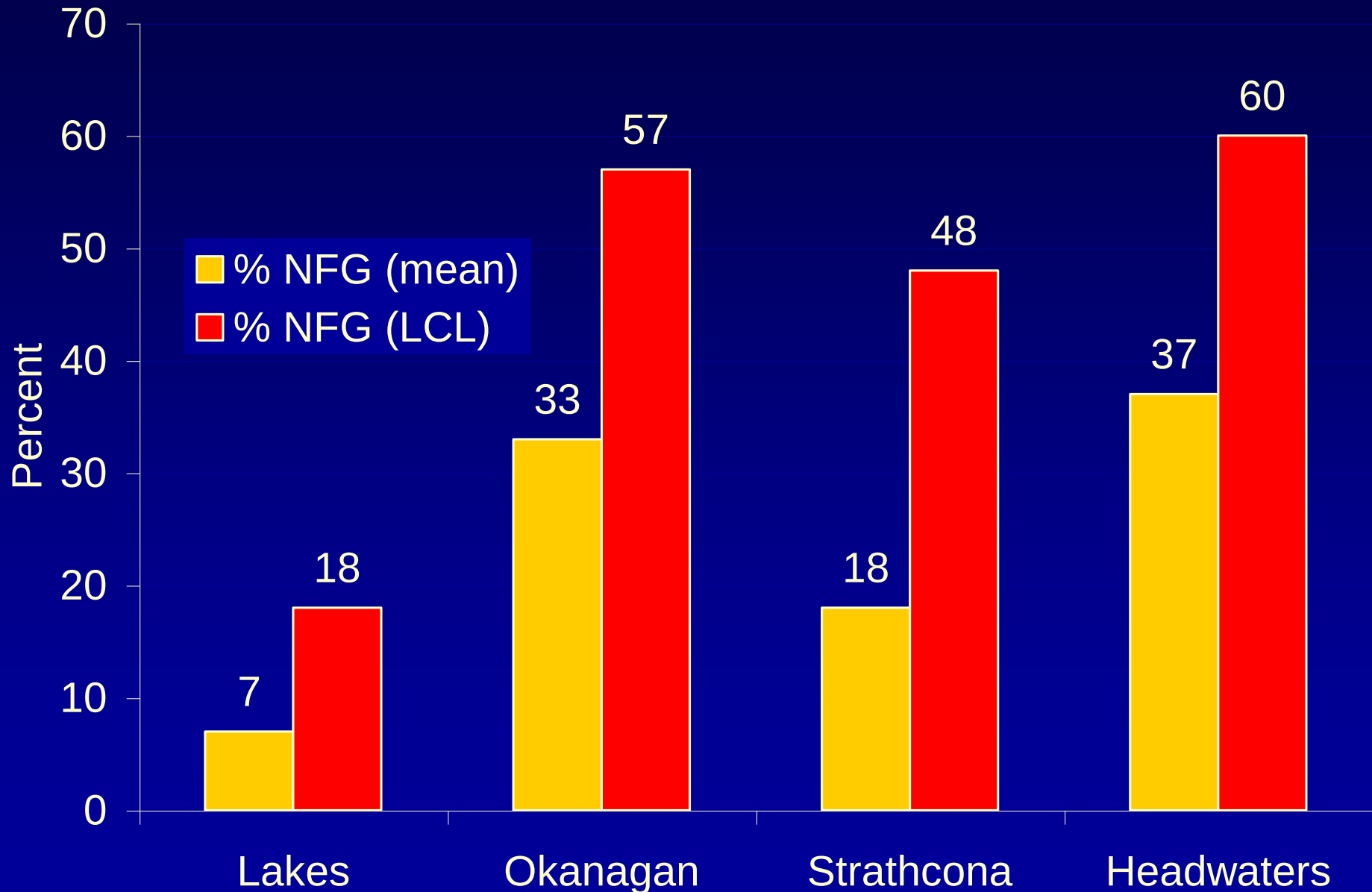
But what is an appropriate stocking threshold for stands of that age and what is expected in TASS/TIPSY?

Lodgepole Pine at Site Index of 23

OAF1 15% OAF2 5%
TIPSY using the "Natural" Spatial Distribution



Percent of stands falling below minimum stocking thresholds based on mean and LCL decision rules

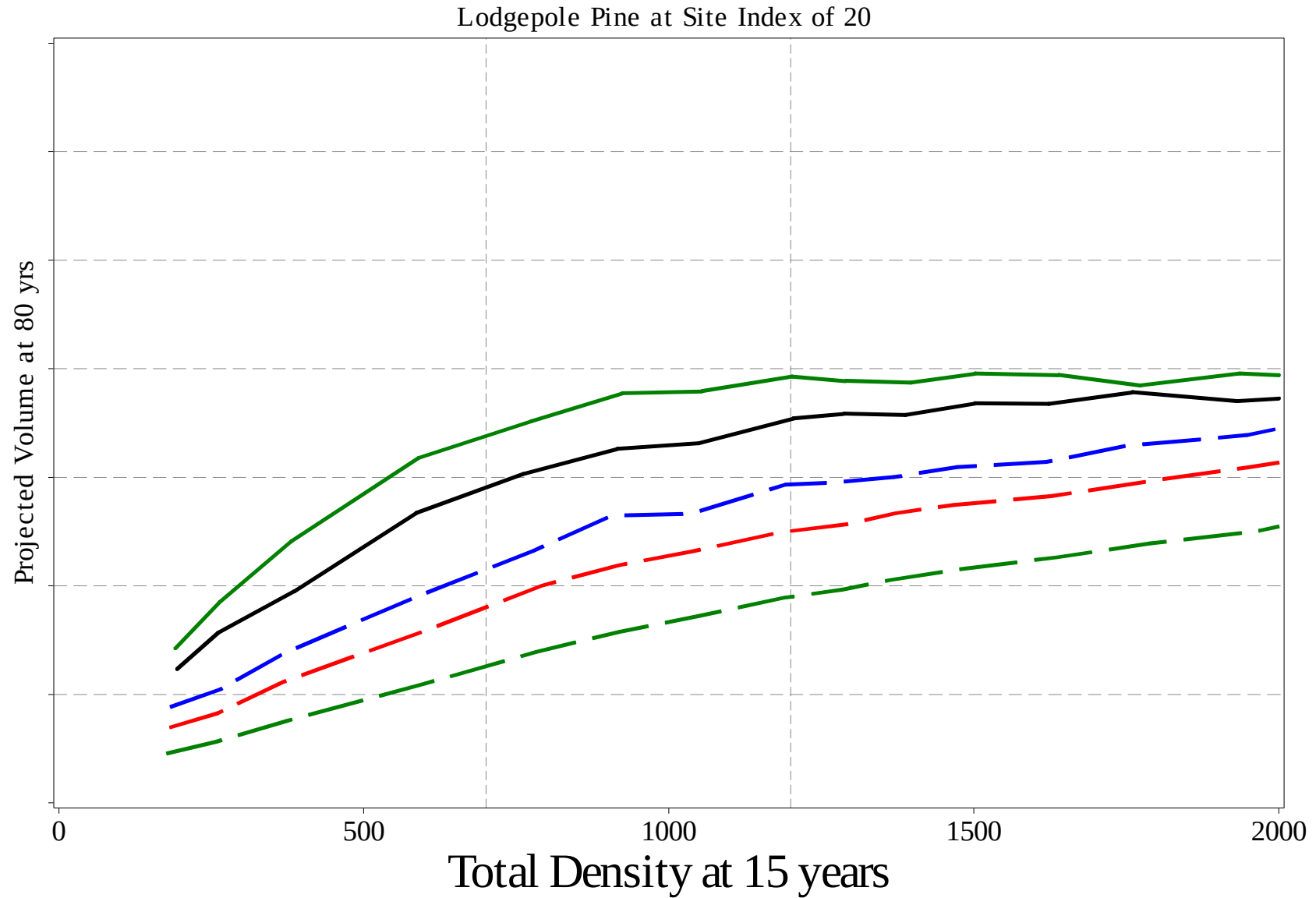


Questions generated during SDM Development

2. Maybe it is more important to have total stems above a minimum threshold?

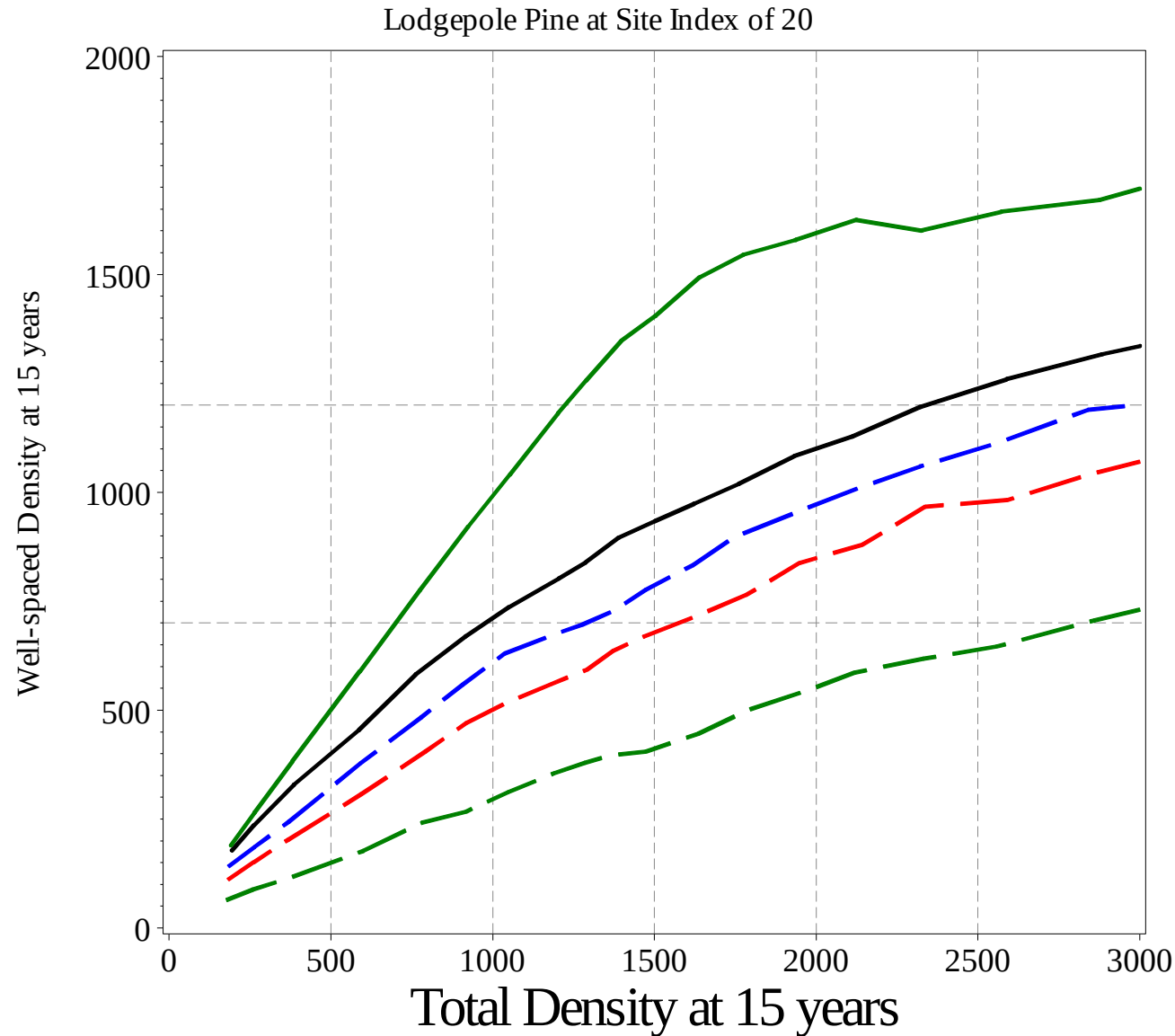
But what is an appropriate total stem stocking threshold for 30+ year old stands, and what role does spatial distribution play?

Spatial distribution affects projected volume



Spatial distribution can be inferred from the relationship between WS and Total stems

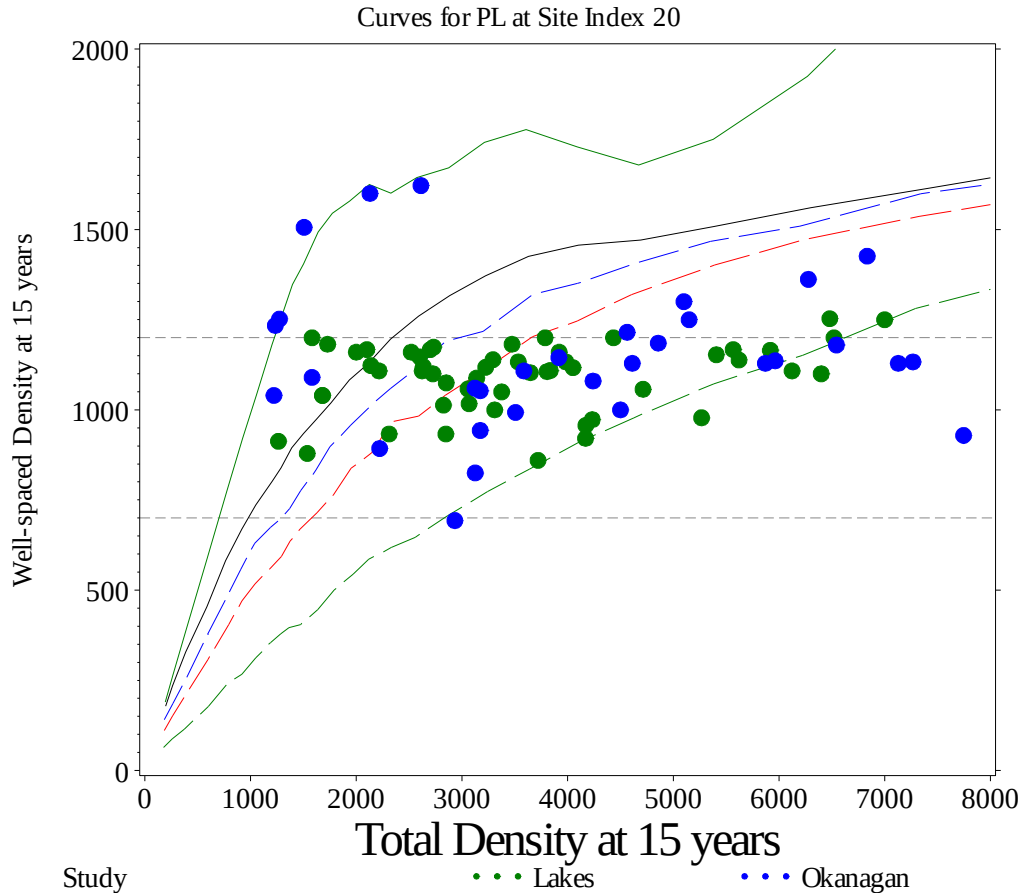
W. Bergerud



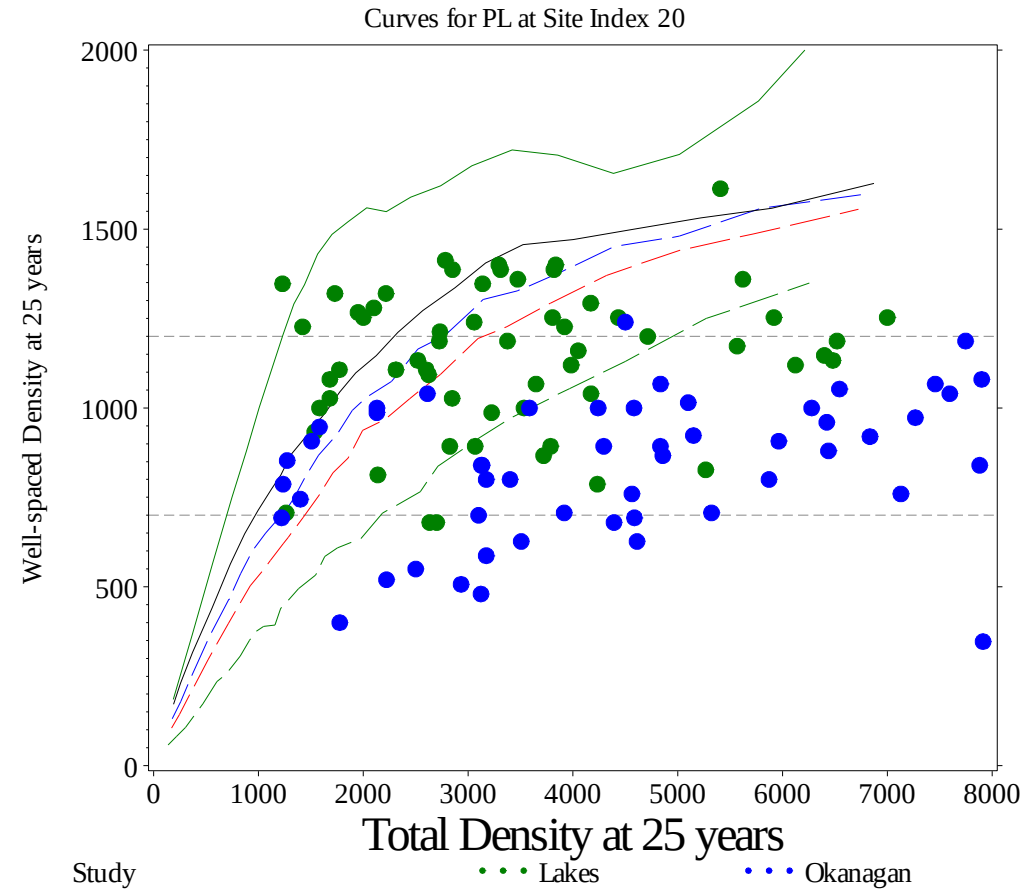
WS Density vs Total Density

Lakes & Okanagan Data

At Declaration



At Post FG Survey



https://www.for.gov.bc.ca/hre/Research_Seminars/index.htm

3. What are appropriate damage standards for 30-year-old stands?

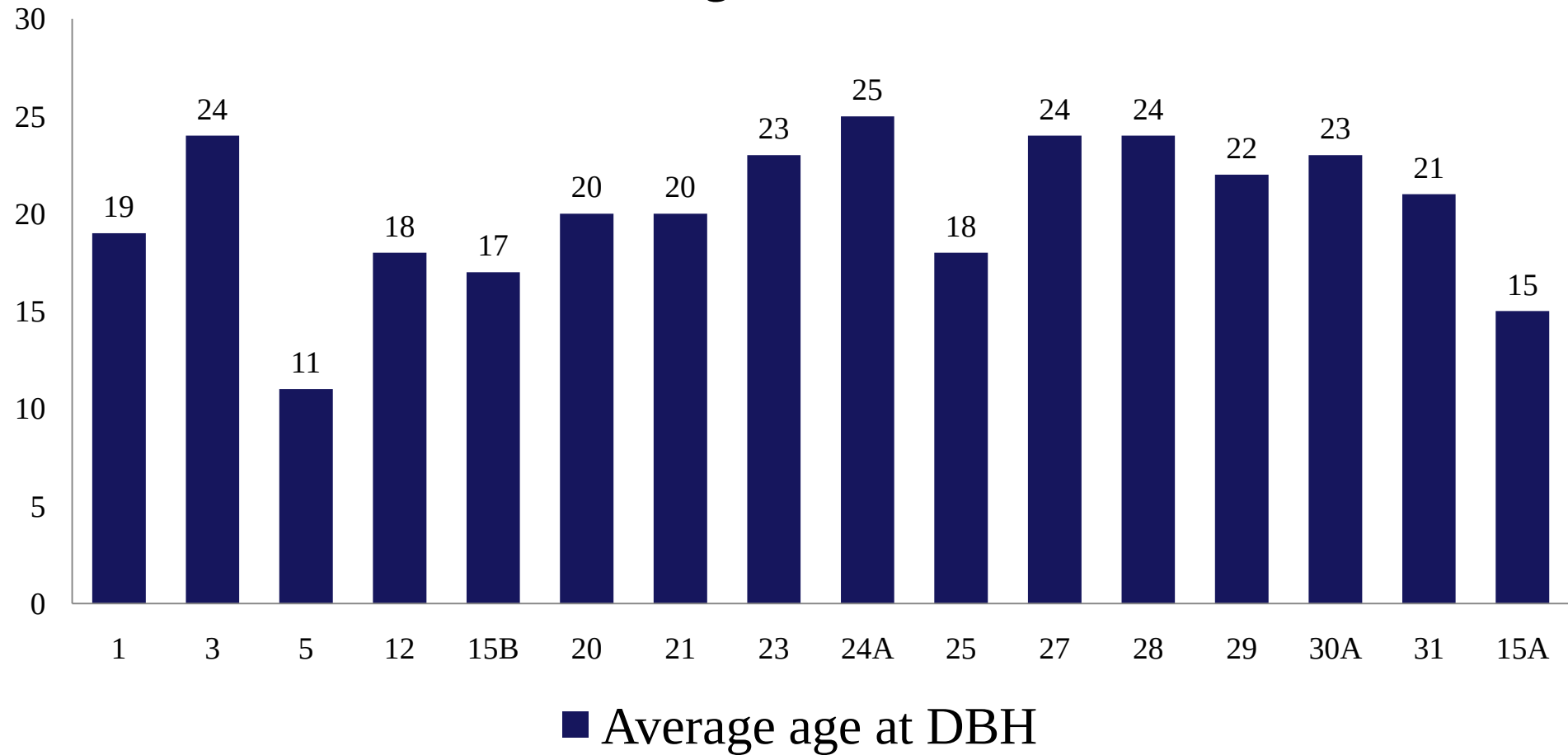
SDM Team along with District staff input from SDM pilots have developed Damage Standards for age class 2 & 3 stands that can be used in other applications such as FFT treatment decisions.

4. What does the diameter class distribution look like for 30-year-old stands?

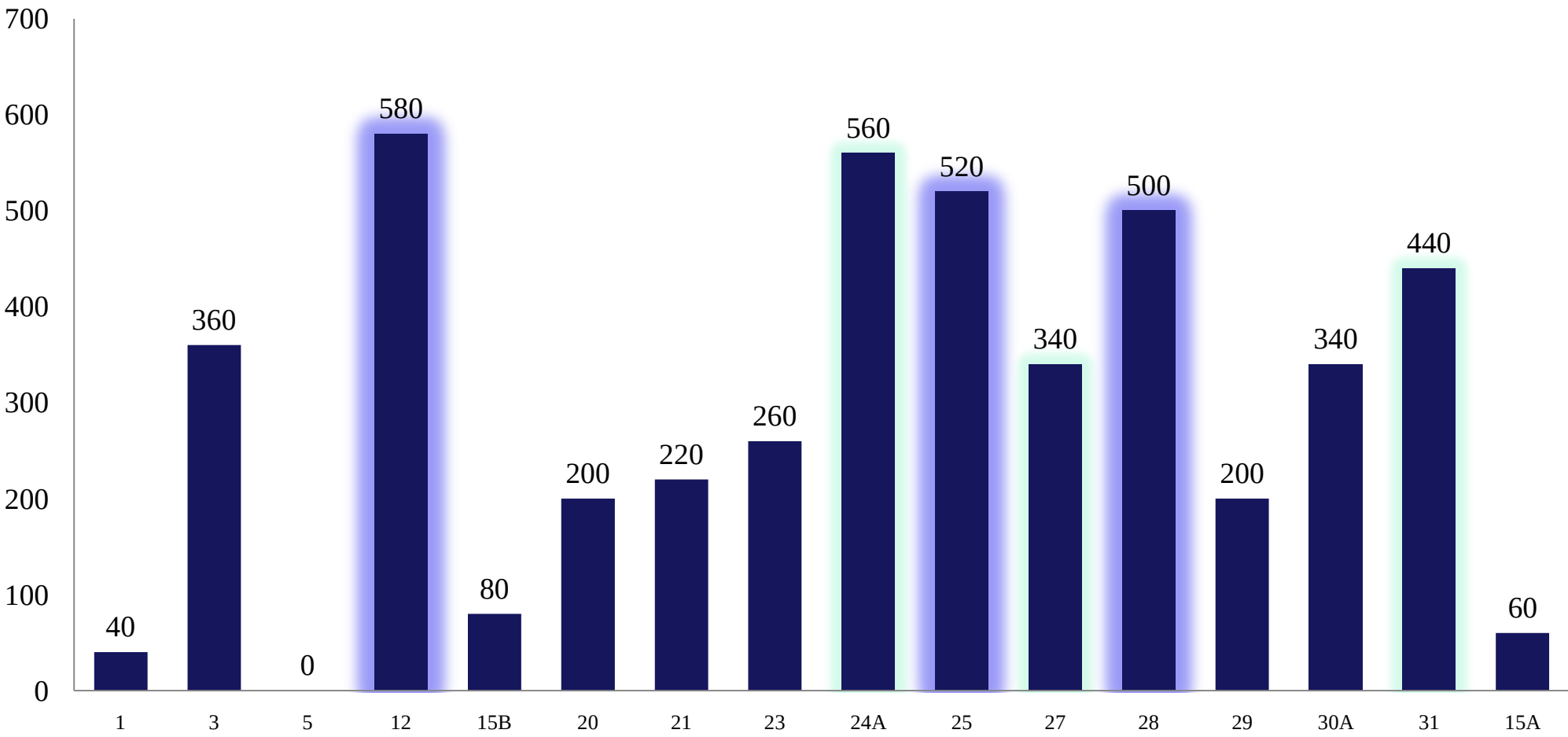
Barb Wadey in DCO piloted SDM in 2009 and has analyzed the diameter class distribution of the 16 stands they assessed and compared that to TASS/TIPSY.

Average Age of stands at Breast Height

Average of all blocks = 20

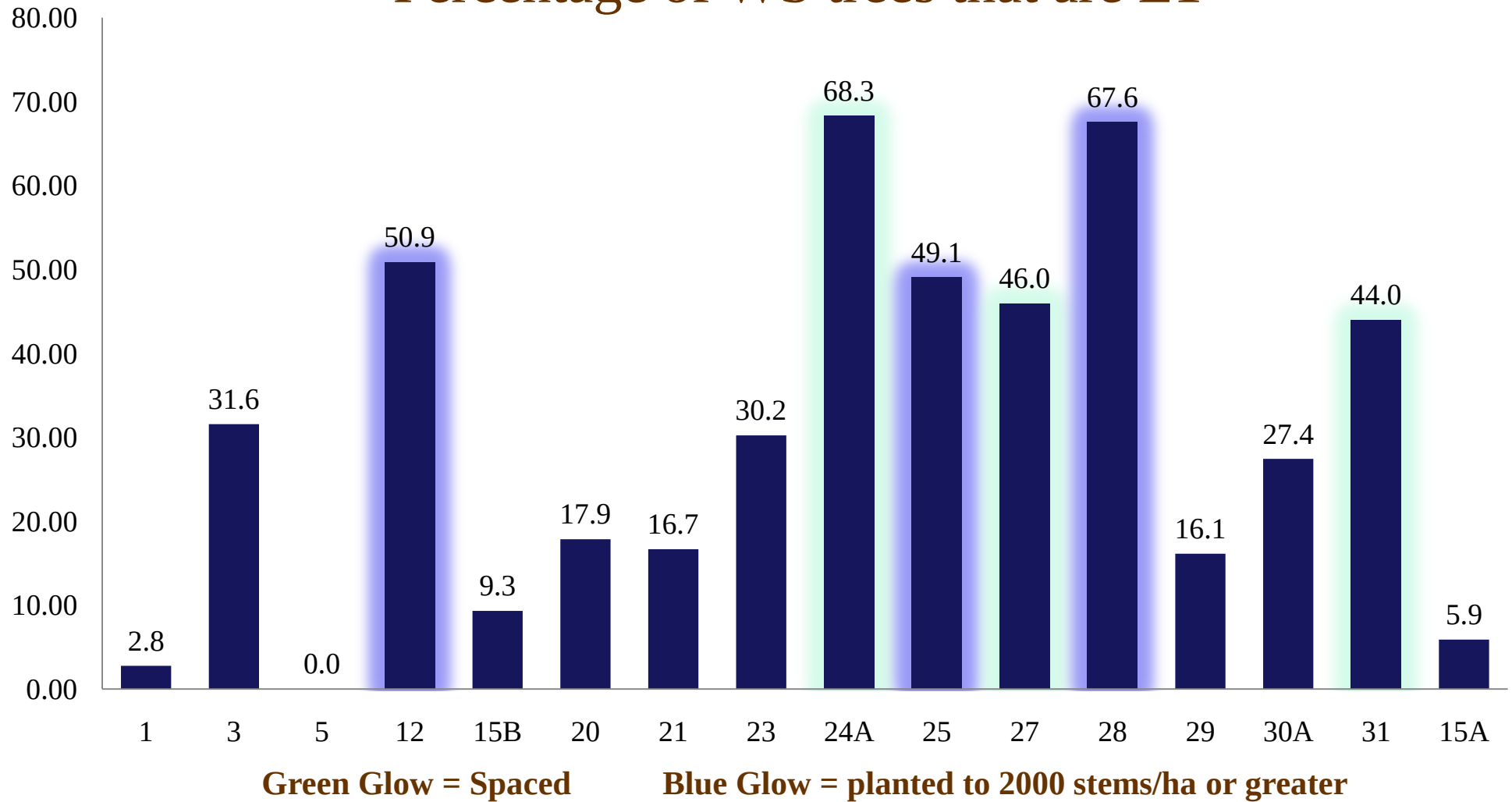


Number of Layer 1, Well-Spaced Trees



Green glow = Spaced Blue Glow = planted to 2000 or greater stems/ha

Percentage of WS trees that are L1



Reviews from SDM Pilots 2009

“SDM highlights the dynamics of Forest Health Issues, Stand Development Issues, Climate Change Issues and though our concepts may be correct, our timing is off.

As stewards/managers of the land we cannot sit back and ignore the shifts/changes that are taking place in our stands that will have profound impacts on our long term estimates of productivity.”

Barb Wadey (DCO) 2009 11 19

Purpose of SDM

- The direct and indirect effects of Climate Change on our forests will demand more on the ground monitoring.
- This FREP protocol will help fulfill the District Forest Health monitoring role while at the same time building an inventory of managed stands,
- The SDM protocol will build on connections between Forest Health, Silviculture, Inventory and **Timber Supply Reviews**.

Purpose of SDM

Sent: Fri 2009-12-18 10:55 AM

Hi Alex,

Let's pick this up in January when everyone is back from holidays. I'm interested in including this (SDM) as a standard factor in TSR where the work exists.

Barry Snowdon, RPF

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