OLD AND VERY OLD ASPEN – FIELD PRESENTATION

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PSP 588 - near Kananaskis, AB

OLD AND VERY OLD ASPEN – FIELD PRESENTATION

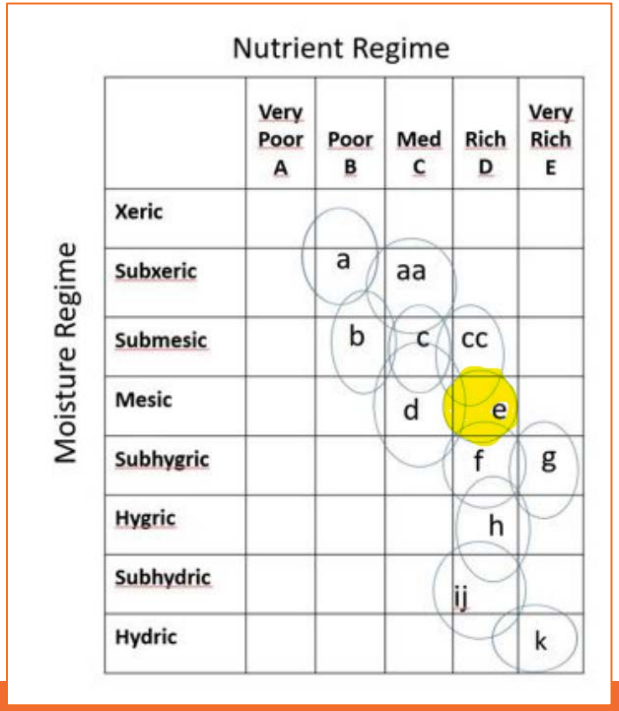
- Introduction - old aspen in the boreal forest – Alberta Gov't PSP 588
- Manitoba and Saskatchewan old aspen - learnings and models
- Successional pathways and yield curves for old and very old aspen
- Conclusions - forest management options and modeling options

PSP 588

Age 133 in 2023 - this is what the PSP we're standing in looks like

General Information				Stems/Ha		Other Compiled Variables			
Species	Meas #	Year	StandAge	1.3m+	9.1cm+	BA	VolMerch	TopHt	Site Index
Aspen	1	1989	99	800	800	34	209	18.1	12.3
Aspen	2	2001	111	630	630	34	205	16.6	12.3
Aspen	3	2017	127	1236	430	30	200	18.4	12.3
Poplar	1	1989	99	980	300	12	59	17.6	11.1
Poplar	2	2001	111	1530	240	12	59	17.2	11.1
Poplar	3	2017	127	3919	210	10	26	14.2	11.1

- Southwest Montane ‘e’ ecosite:
- mesic moisture / nutrients slightly above average
- seepage may occur
- transitions to white spruce dominance, but is often delayed by competition



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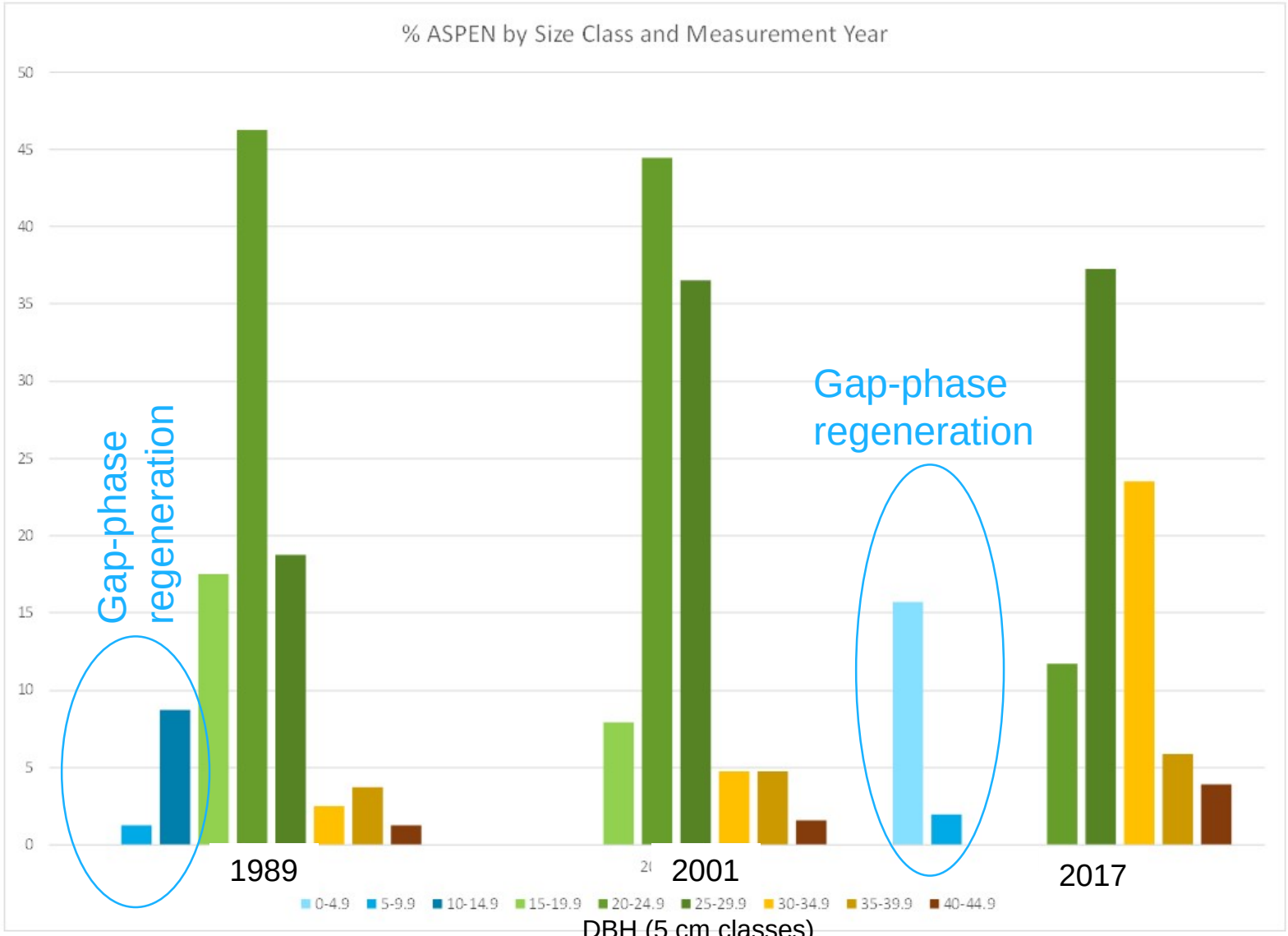
5 cm DBH classes over the 3 measurements (1989, 2001, and 2017)



PSP 588

Age 133 in 2023 - this is what the PSP we're standing in looks like

- reference site index for aspen = 11.6 m at 50 years (breast height age)
  - Density of regeneration/saplings is increasing, density of merchantable trees is decreasing
  - Basal Area and volume are declining
  - Clearly no longer an even-aged stand (*i.e.* multi-cohort)

DISCUSSION

- What is expected the future stand development?
- Will it follow a successional trajectory to white spruce?
- How should this be modelled for forest management purposes?
- What is the right growth (and yield) trajectory for these stands?

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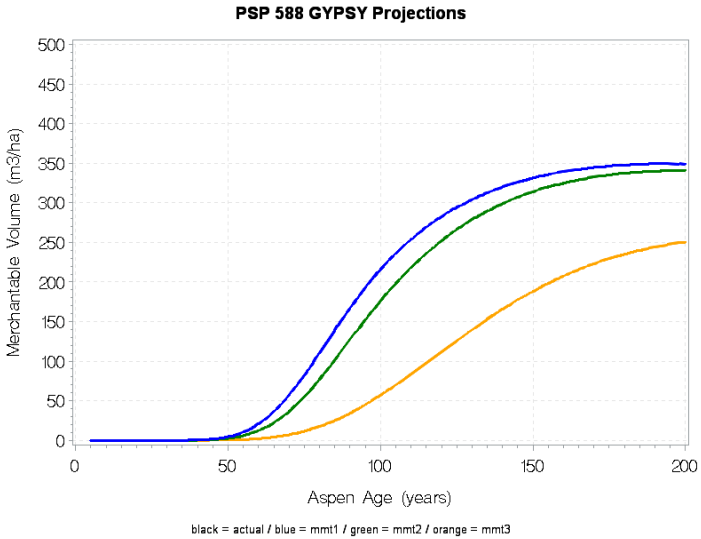
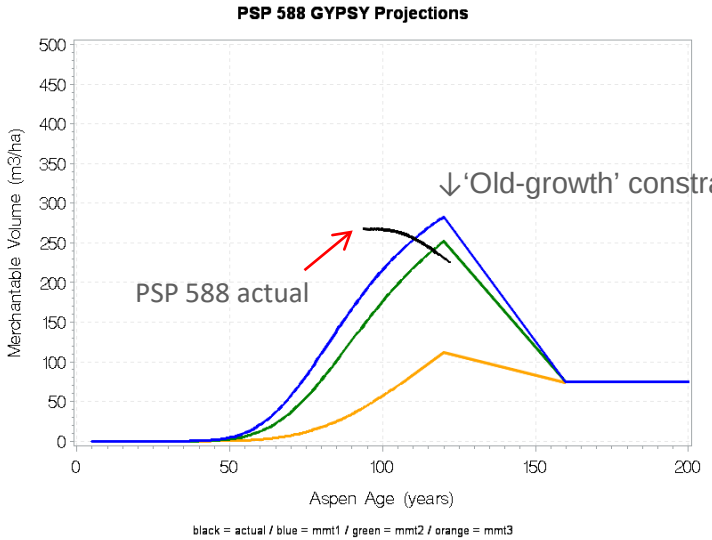
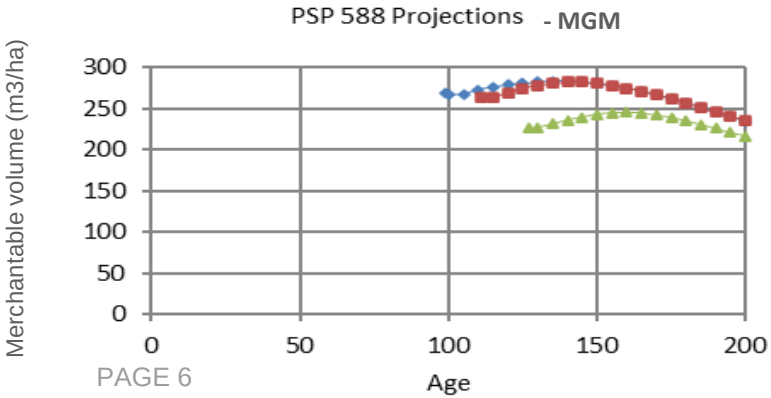
- Two different Alberta growth models estimate (left)… no-decline or slow decline
- Current Alberta practice with GYPSY model is to implement a decline to a steady state of 50-100 m^3/ha past a target age (right-side)

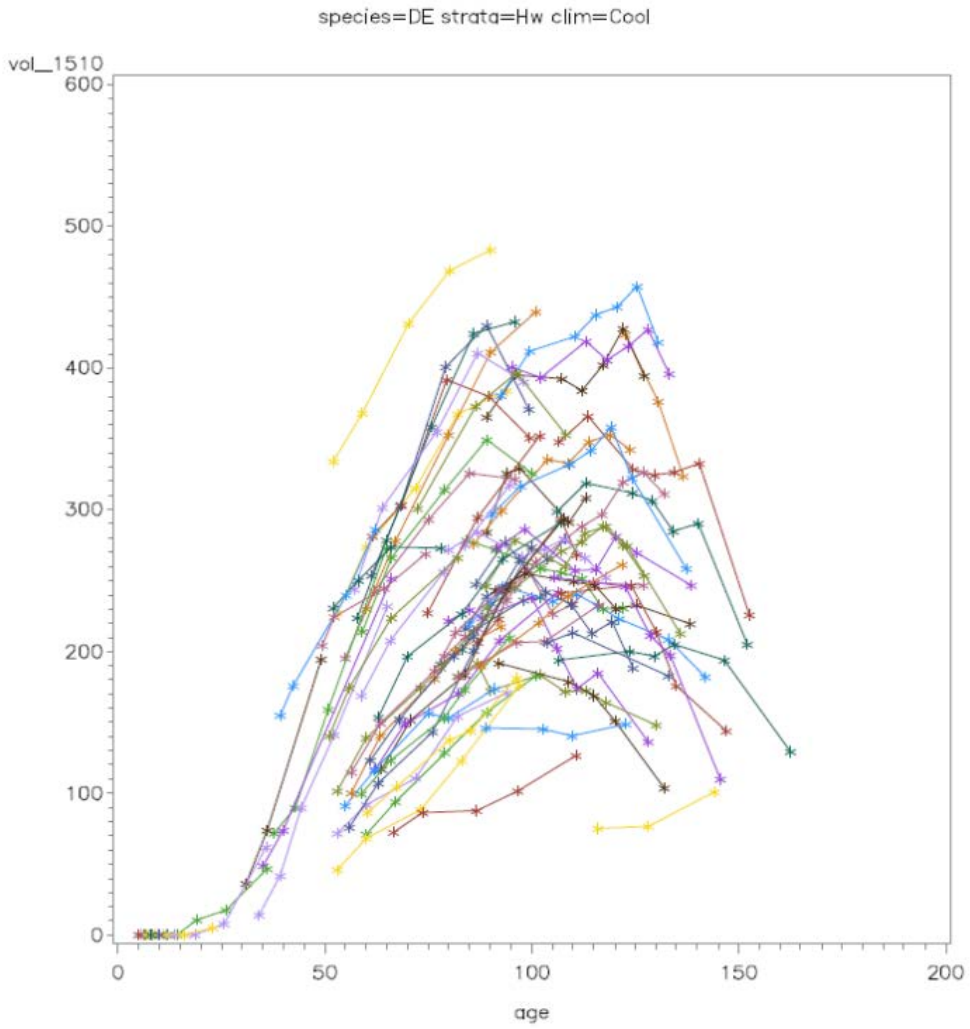






PSP 588

- This is what the Alberta PSP data say … peak, then rapid decline but no data beyond that point



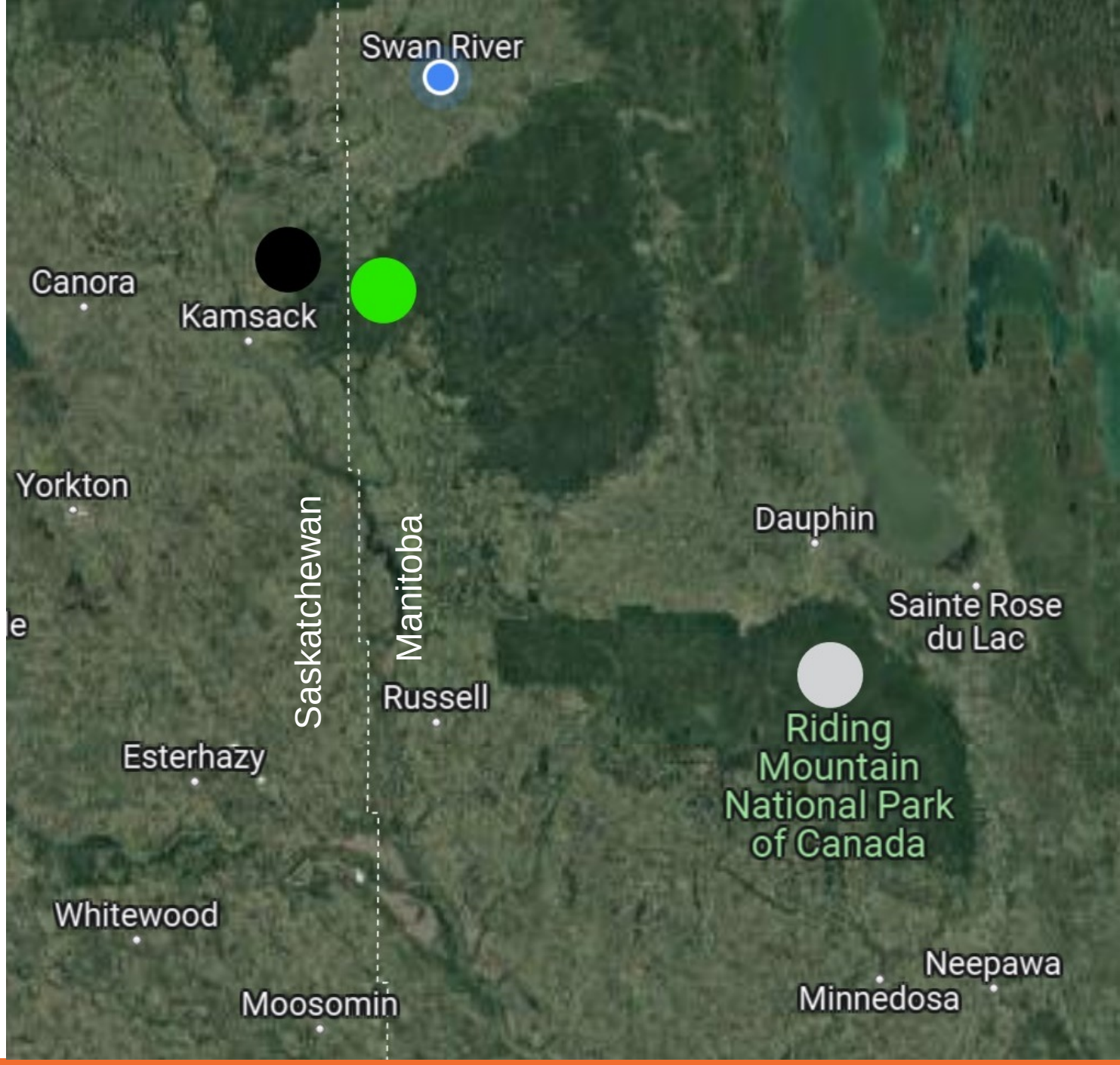
PSP 588

- We need a way to represent these stands, because with the introduction of caribou areas (locked down for 100 years at a time)
  - representing aspen that is old now 100 years into the future will be important to timber supply determination
  - **Discussion** – what do you think this PSP 588 old aspen (aged 133 years) will look like 50 years from now?

INTRODUCTION

- Even-aged aspen is common in the boreal forest, but…
- Due to successful fire prevention, many areas of the boreal forest have old and very old aspen
- These stands are uneven-aged multi-cohort 120 - 180 year old stands – which is a paradigm shift
- Introduction of constraints (e.g. caribou management zones with deferred harvest), will continue this paradigm
- Yield curves and modeling old multi-cohort stands is challenging (but there are solutions!)

MANITOBA AND SASKATCHEWAN OLD ASPEN

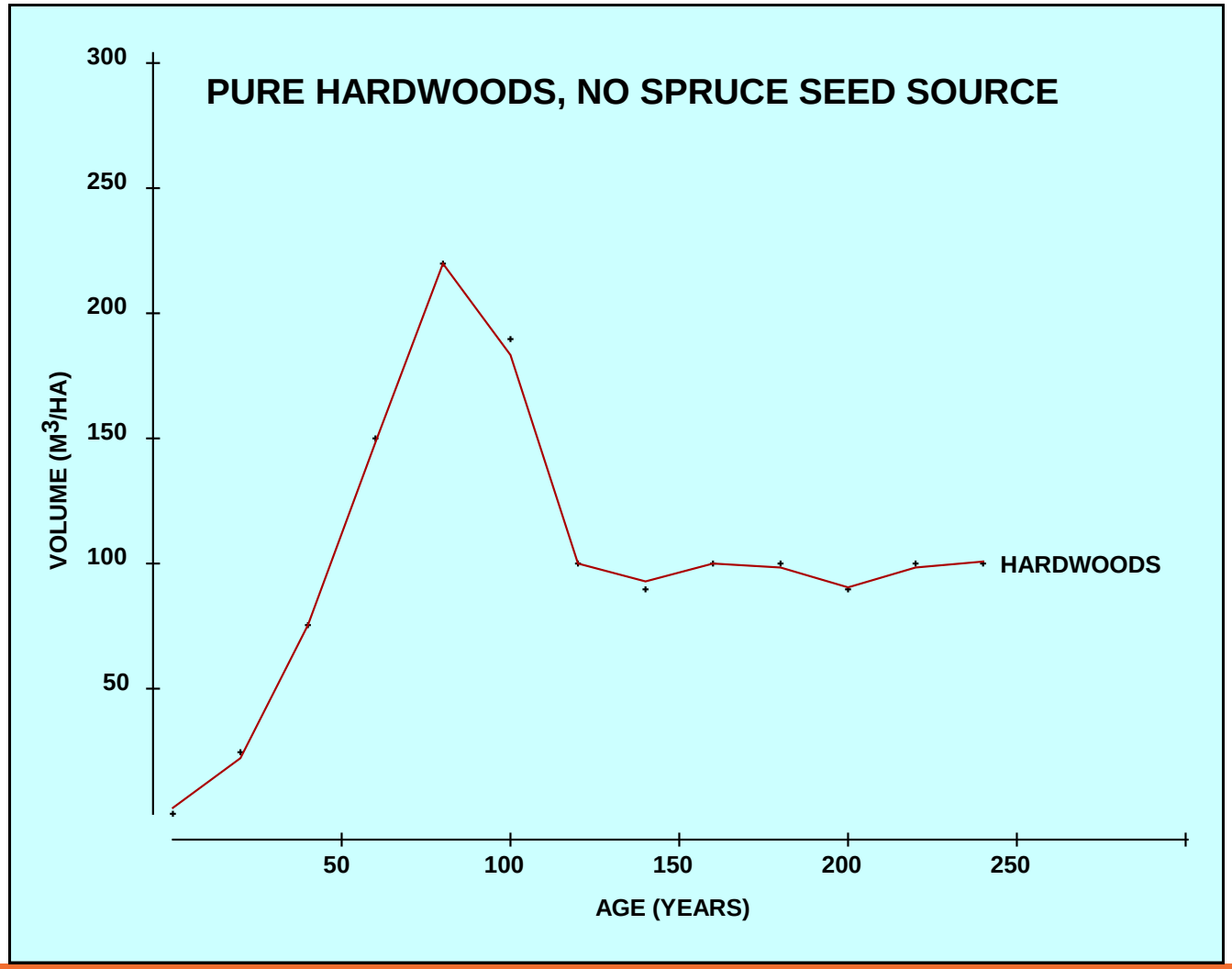

Swan River
Canora
Kamsack
Yorkton
Saskatchewan
Manitoba
Dauphin
Sainte Rose
du Lac
Russell
Esterhazy
Riding
Mountain
National Park
of Canada
Whitewood
Neepawa
Minnedosa
Moosomin

Riding Mountain National Park, Manitoba

- 1,481 Permanent Sample Plots (PSPs) were established by the federal government from 1946 to 1967
- All species, all sizes (1-inch dbh classes – no minimum size)
- PSP stand ages were 120-150 years old in 1947
- Stand ages 170-200 years old in 2002 (3rd or 4th remeasurement)
- 50 years of **growth** data on 284 PSPs

Riding Mountain National Park, Manitoba

- Dr. Norm Kenkel (U of M) analyzed the Riding Mountain PSP data



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Riding Mountain National Park, Manitoba

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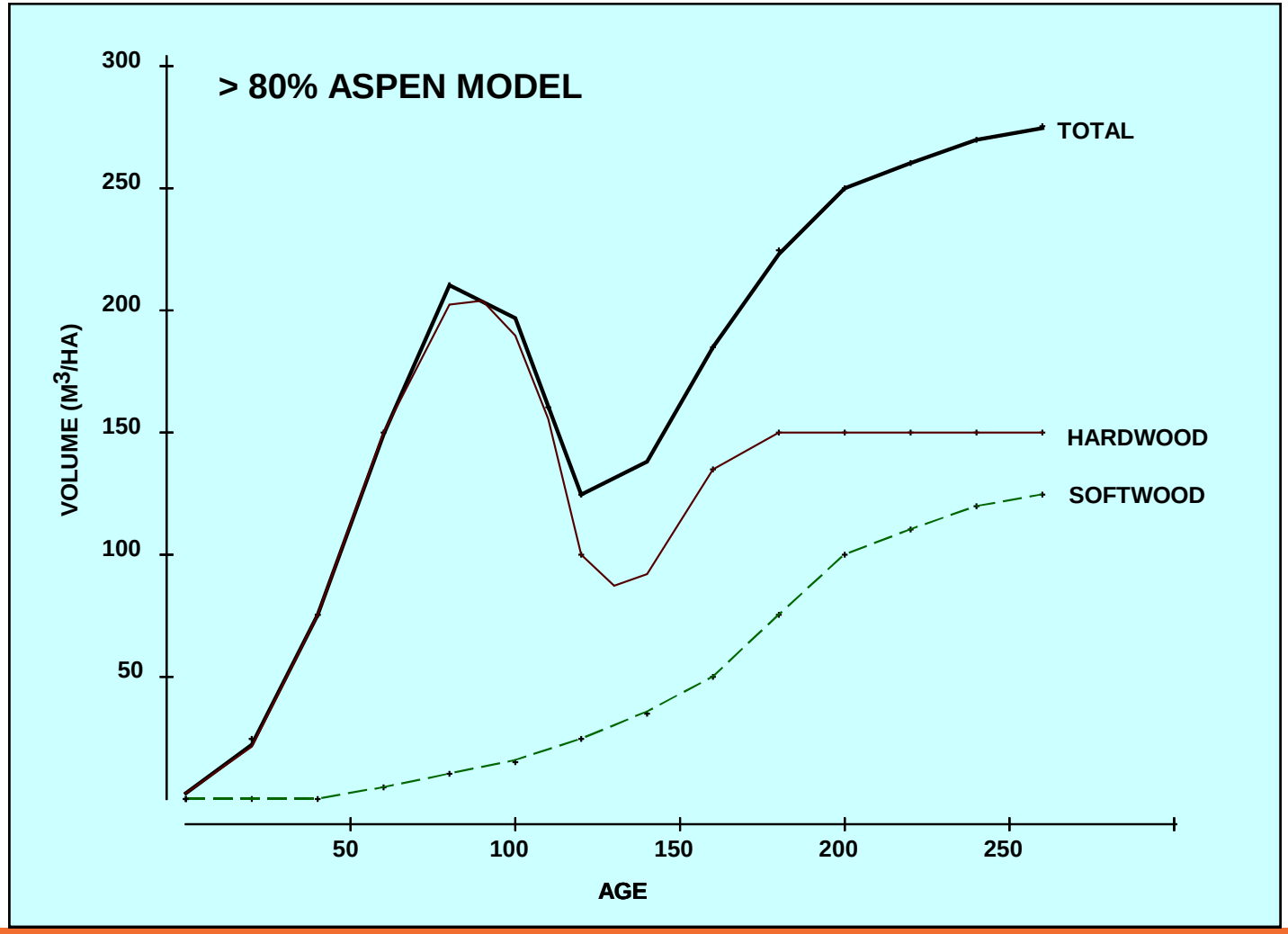

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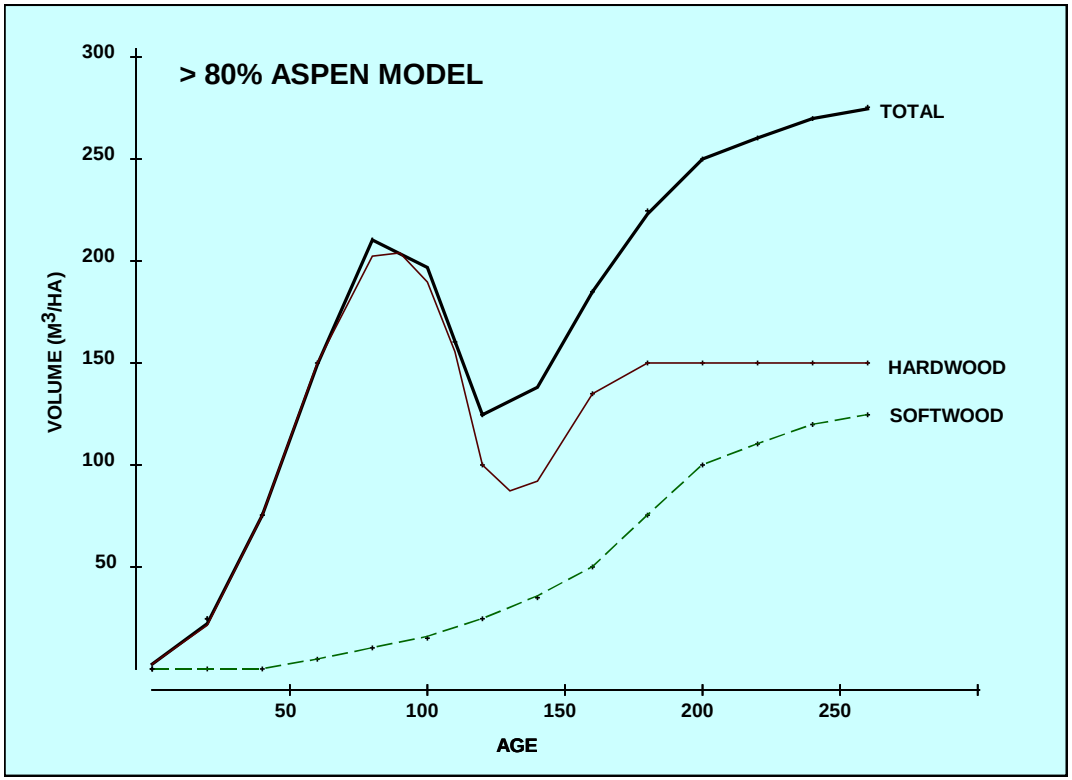
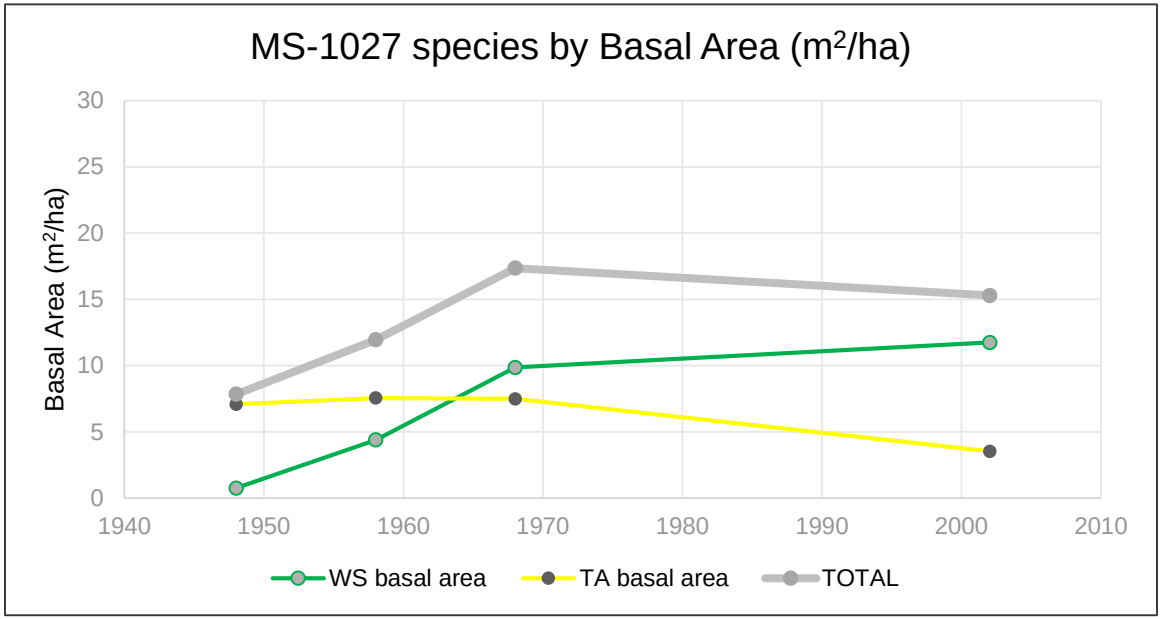
Riding Mountain National Park, Manitoba

- Example PSP 1027
- In 1946 had 80% aspen, 20% spruce
- In 2002 35% aspen (2017 20% aspen)



Riding Mountain National Park, Manitoba

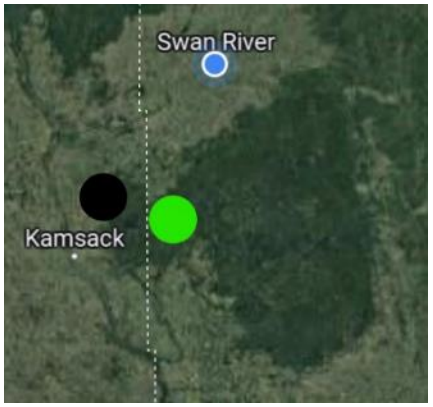
- In 1946 had 80% aspen, 20% spruce
- By 2002, aspen declined and spruce dominated the stand



						DBH CLASS (inches) - live only																								
lot Number	erement N	Date (YR	(Mo)	(Day)	Species	0-05	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	# trees per plot (live)
1027	1	1948	7	30	TA			2							2	2				1											7
1027	2	1958	8	6	TA				1	1					1		2					1									6
1027	3	1968	6	13	TA		45	2	1	1							1	1				1									52
1027	4	2002	7	7	TA						3	4		1																	8
1027	1	1948	7	30	WS	2	4	8			1																				15
1027	2	1958	8	6	WS		1	6	4	8			2	1																	22
1027	3	1968	6	13	WS		1	1	2	2	5	5	3		1	2															22
1027	4	2002	7	7	WS						1	2	1	1	3	1	2	1													12

Aerial view of very old area with mostly shrubs (Dr. Norm Kenkel U of M) – common over 1,000's of hectares

Duck Mountain Provincial Forest – in Manitoba



- In the Duck Mountain we realized that the majority of our aspen and aspen mixedwood stands were two-cohort or even three-cohort)
- These stands were much older than we realized (71% were 100 years to 180 years old!)
- our Forest Management Plan required we model 200 years in the future (some stands 180 yrs old at time zero – now add 200 years!)

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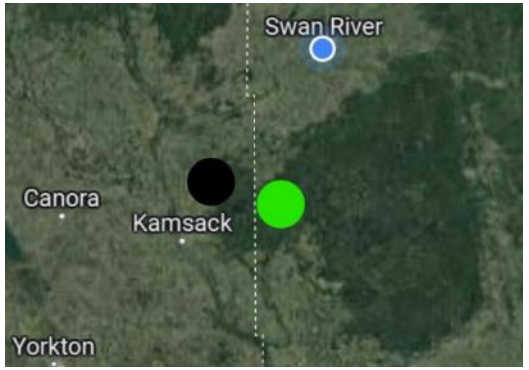
Duck Mountain Provincial Park – in Saskatchewan



- unnaturally old, and unfortunately is not regenerating!
- due to a lack of primary stand-replacing forest disturbances such as fire
- The Park's 1995 management plan warned of the significant age class imbalance, and strongly advocated wildfire, prescribed burns, and harvesting disturbances to trigger regeneration and balance seral stages
- Recent attempts at prescribed crown fires did not work, due to the low density of the stands
- In 2016 we began ecological restoration harvesting

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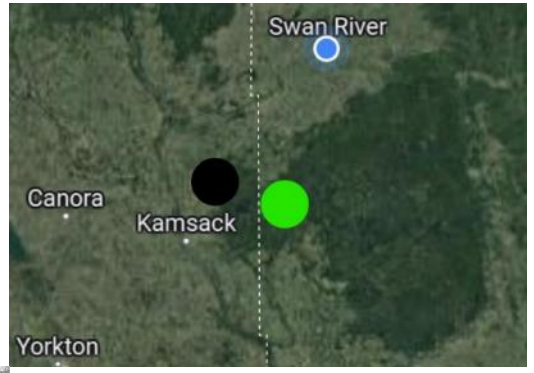
Duck Mountain Provincial Park – in Saskatchewan



Hazel shrubland with scattered aspen trees (as far as 40 m between trees – as low as 6 trees per ha)

- We couldn't harvest this

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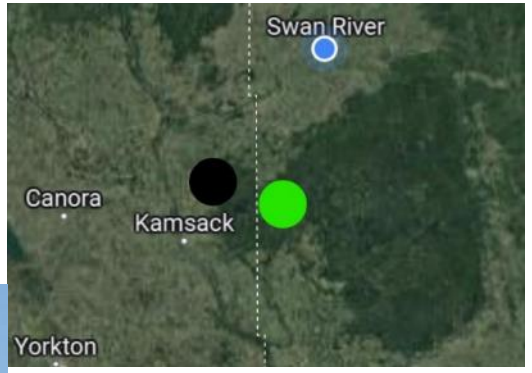
Duck Mountain Provincial Park – in Saskatchewan



Areas we have harvested have regenerated well!
(despite the very old ages)

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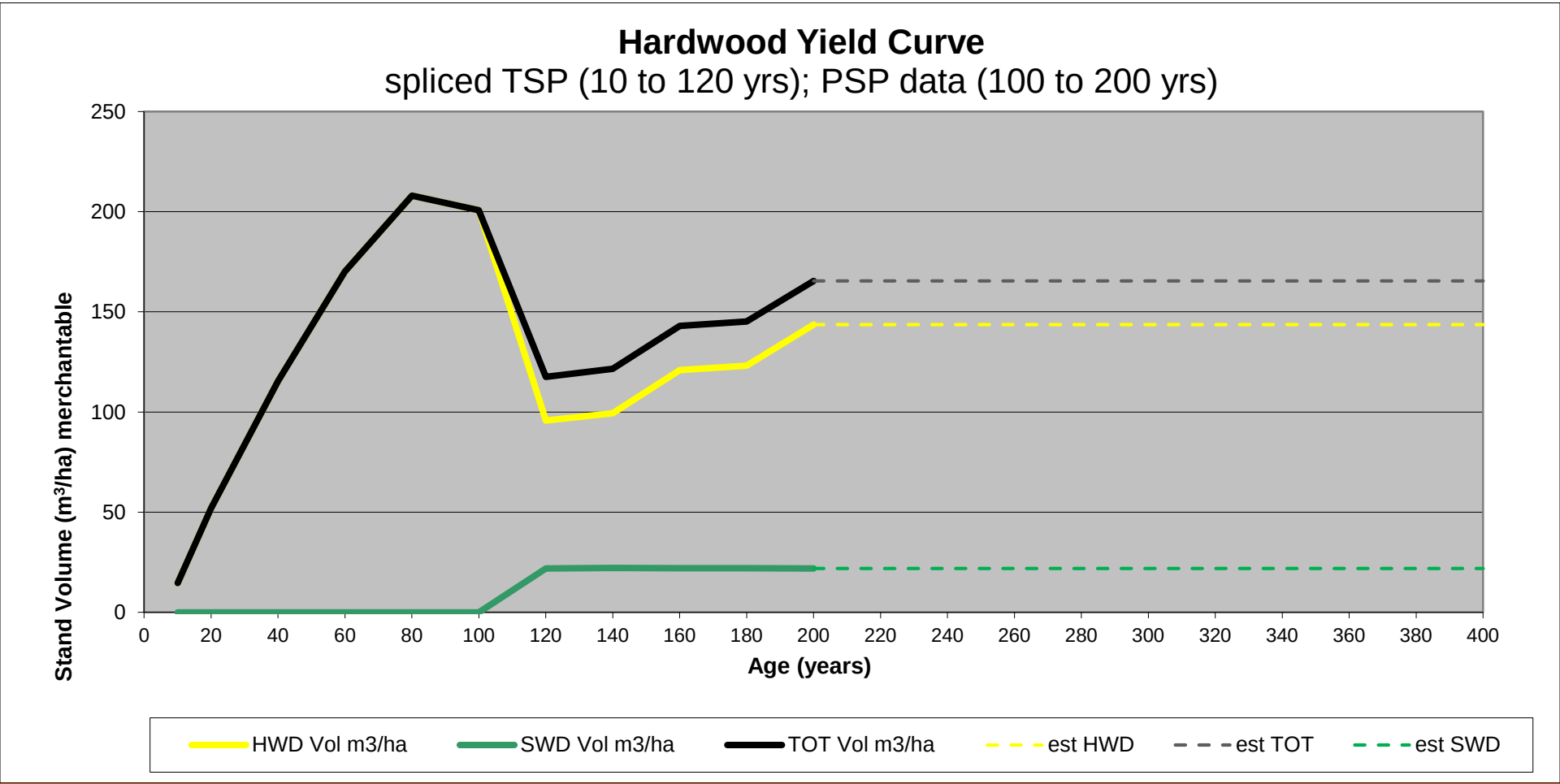
SUCCESSIONAL PATHWAYS FOR OLD ASPEN

- In the LP Swan River Forest Management Plan, we needed successional pathways for forest modeling over 200 years, while starting at time zero with old stands.



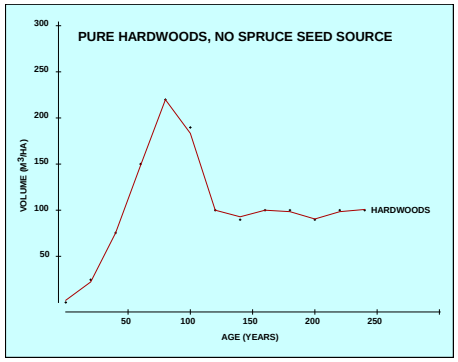
SUCCESSIONAL PATHWAYS FOR OLD ASPEN

- Three (3) observed and very different successional pathways starting from old aspen getting older

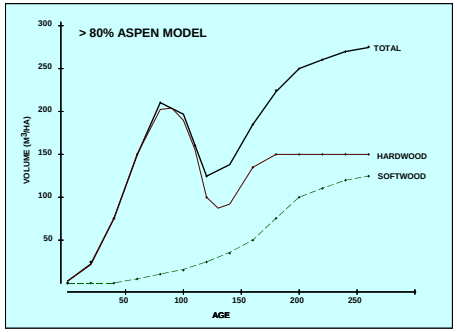
START
Old aspen

Time ->

1. Gap-phase regeneration continues



2. Spruce takes over as aspen breaks up



3. SHRUBS take over (non-forested!)
Hazel

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SUCCESSIONAL PATHWAYS FOR OLD ASPEN

- Three (3) old aspen successional pathways
- **?... is there a way to tell which you will get?**
  1. Gap-phase regeneration continues
  2. Spruce takes over as aspen breaks up
  3. SHRUBS take over (non-forested!) Hazel
- In the Manitoba Duck Mountain, #1 (aspen gap-phase) is occurring in pure aspen, but #2 (white spruce increase) happens in aspen-white spruce mixedwoods
- Note: white spruce germinates on nurse logs on forest floor – see picture to right
- **your forest inventory (white spruce 20-30%+) could guide you**
- #3 - SHRUBS occurs when aspen is not regenerating, and white spruce is not regenerating (*lack of nurse logs?)*

SUCCESSIONAL PATHWAYS FOR OLD ASPEN

- Note: white spruce germinates on nurse logs on forest floor (aspen or conifer nurse logs)
- Log must be touching the ground to stay moist, forming a suitable germination microsite

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SUCCESSIONAL PATHWAYS FOR OLD ASPEN

- This 2 - 4 m tall Mountain maple and hazel shrubland with scattered white spruce may not be able to carry a much-needed wildfire that would allow regeneration

CONCLUSIONS

Forest management options

- **Disturbance** (harvest or fire) typically results in a fully-stocked even-aged aspen stand (reset!)
  - *Note: very low-density old aspen may not carry a crown fire*
  - *Intensive treatment of bulldoze flat then prescribed burn?*

- **No disturbance** – with gap-phase regeneration in aspen there will be multi-cohort forest canopy
  - Expect lower volumes (50% to 70% of peak volume)
  - Potentially higher biodiversity and wildlife habitat due to multiple stories, abundant shrubs

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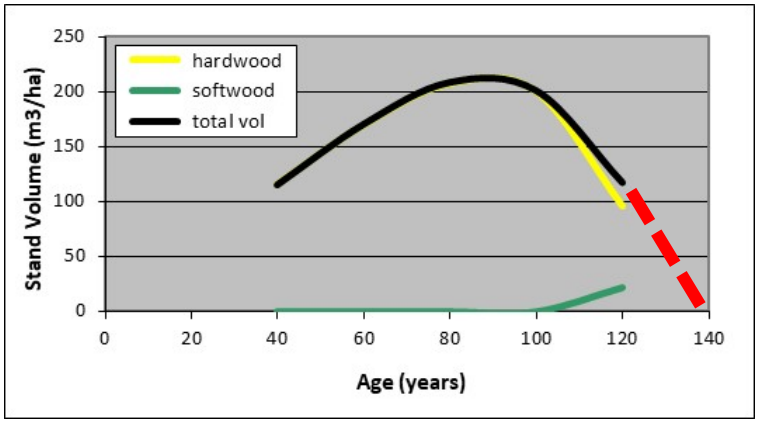
CONCLUSIONS

Modeling options

- remeasure your oldest Permanent Sample Plots
- Don't abandon old PSPs – remeasure them
- Reject the 'death-age' assumption
  (*volume crashes to zero*)



- Consider multi-cohort yield curves, stratified by:
  - pure aspen
  - Aspen with spruce
  - Spruce mixedwoods
  - Or whatever is appropriate for your landbase
- Consider funding more PSP remeasurements in Riding Mountain National Park – it's now **75 years** of **growth** intervals (joint projects anyone?)

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