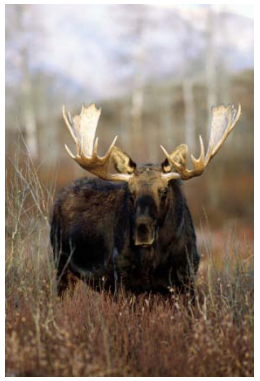


Moose Harvest Management in BC: Managing for Sustainable Use

Presented at GOABC Wildlife Stewardship Series IV

Royal Road University, Victoria, BC

Ian Hatter
Fish and Wildlife Br.
17 Nov. 2009

Outline

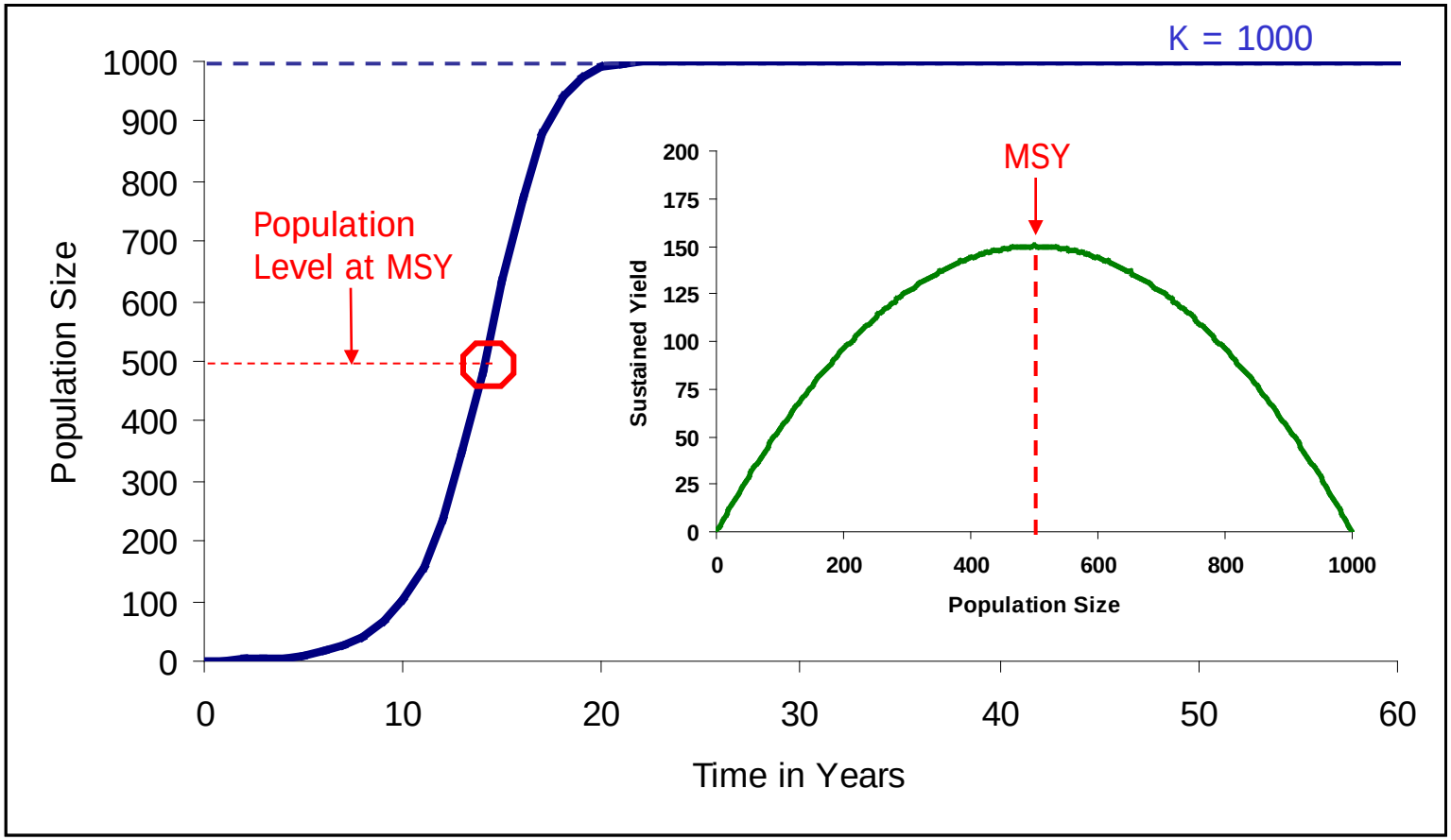
- Wildlife Program Plan - Goals
- Moose Harvest Management Theory
- Moose Harvest Review - 1999
- Moose Harvest Management in BC today
  - Moose Management System
  - Moose Harvest Management Procedure
  - SDM – Finding a Balance…
  - 4 “Tests” for Hunting Regulation Proposals

Wildlife Program Plan

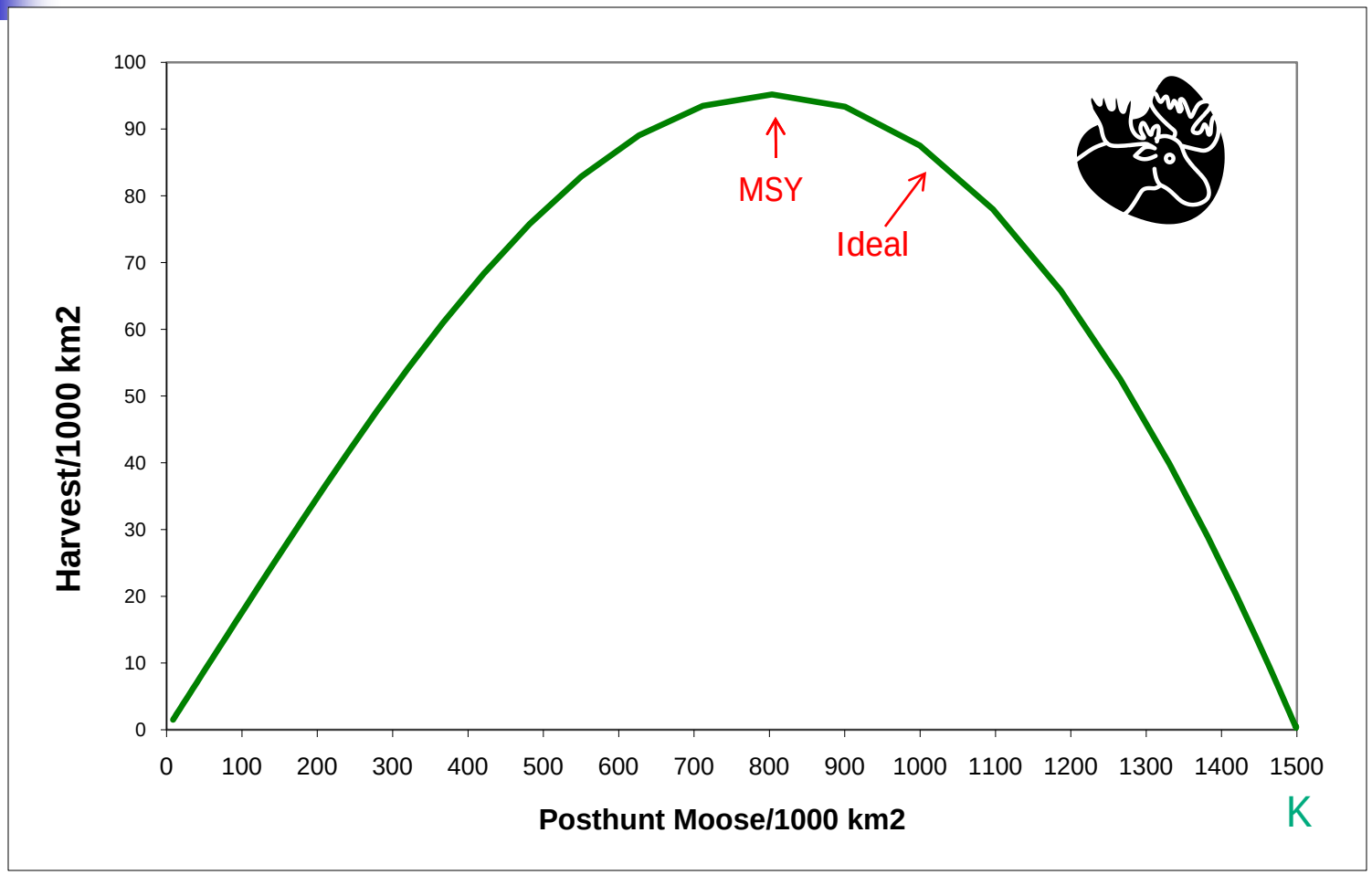
- Goals:
  1. Deliver a coordinated and proactive Wildlife Program
  2. Conserve species and maintain the health of wildlife populations in collaboration with our partners.
  3. Provide a variety of opportunities for the use, enjoyment and appreciation of wildlife.

Vision: Naturally diverse and sustainable wildlife supporting varied uses for current and future generations.

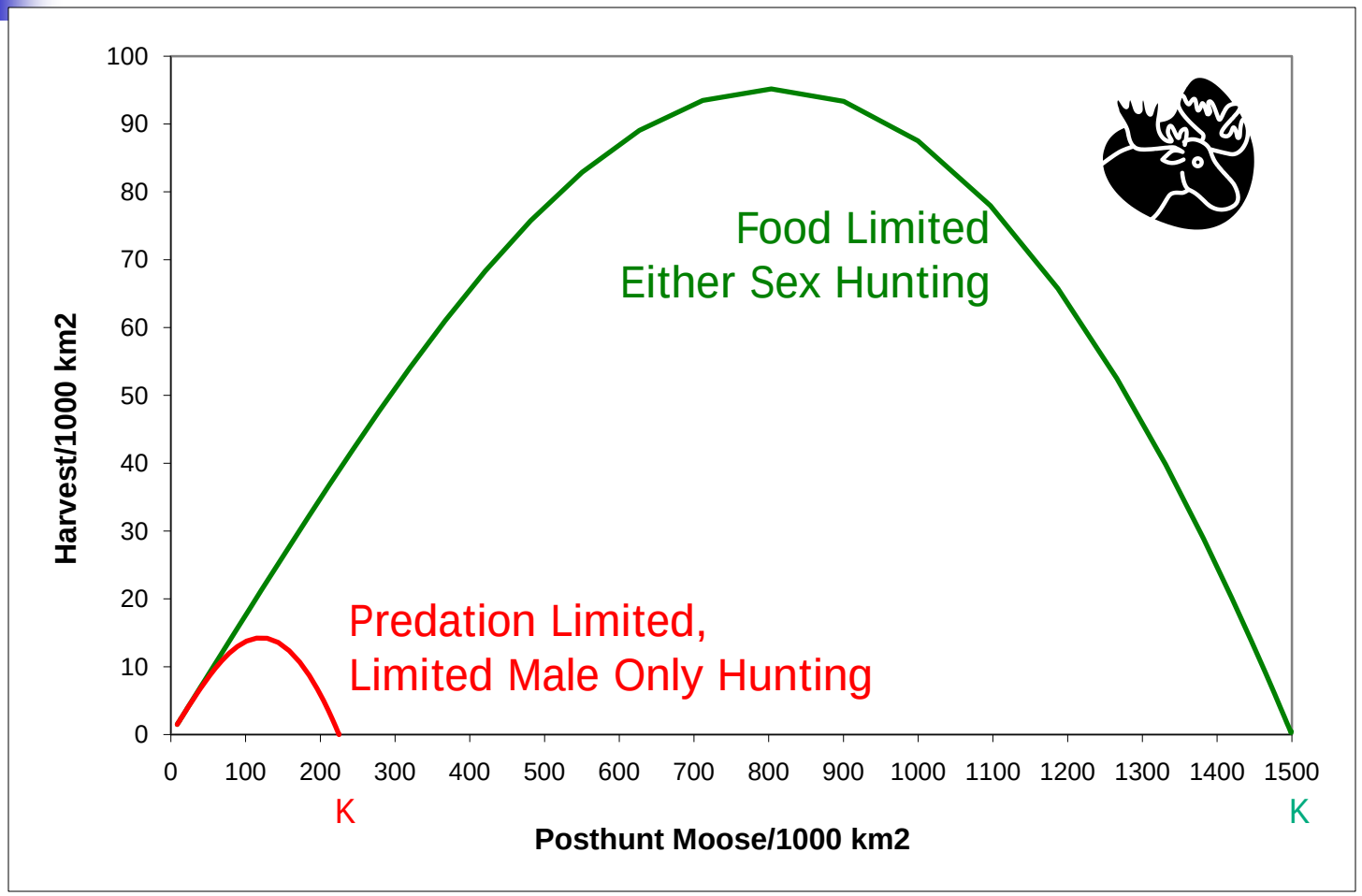
Harvest Management Theory



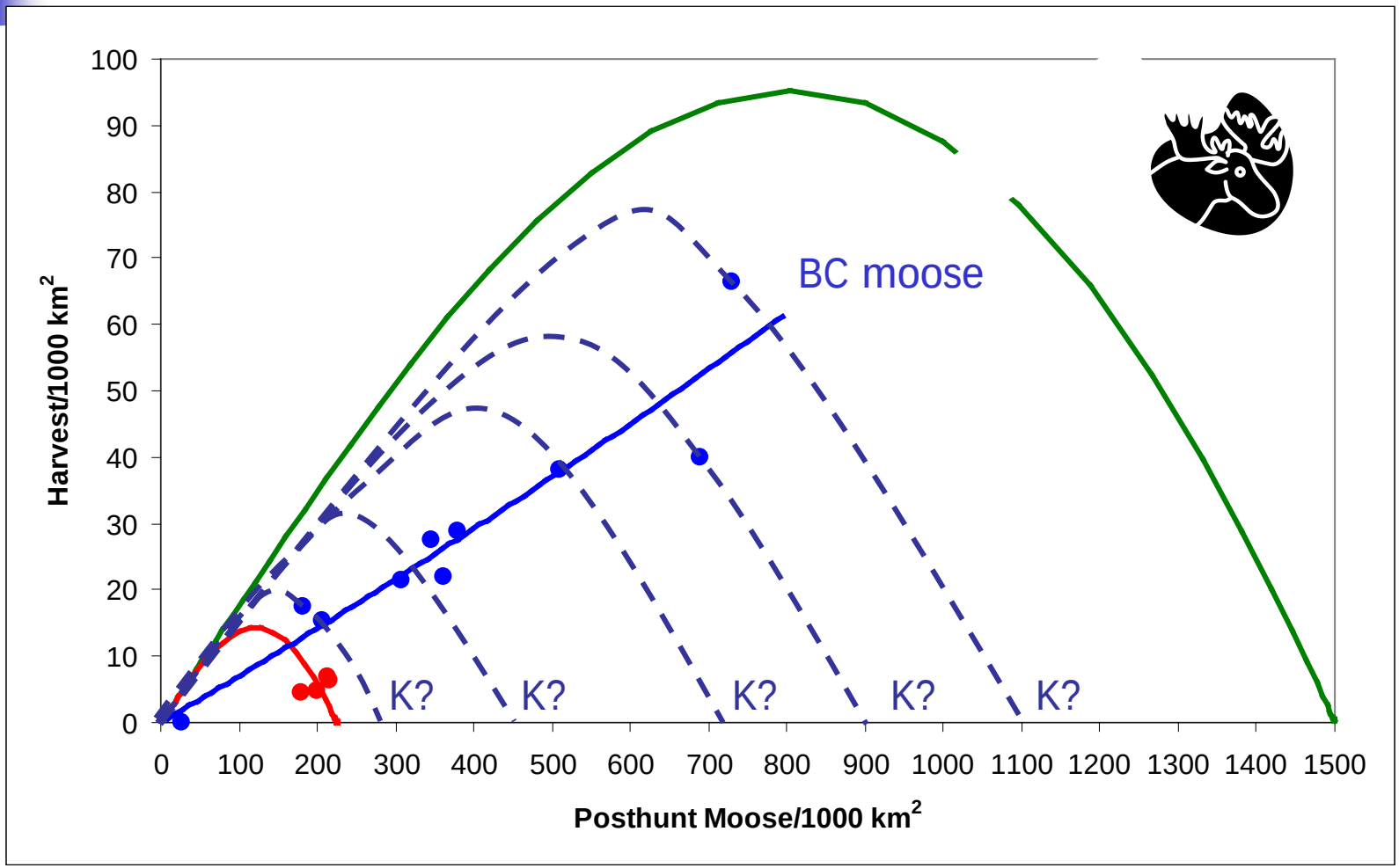
Theoretical SY Curve for Moose



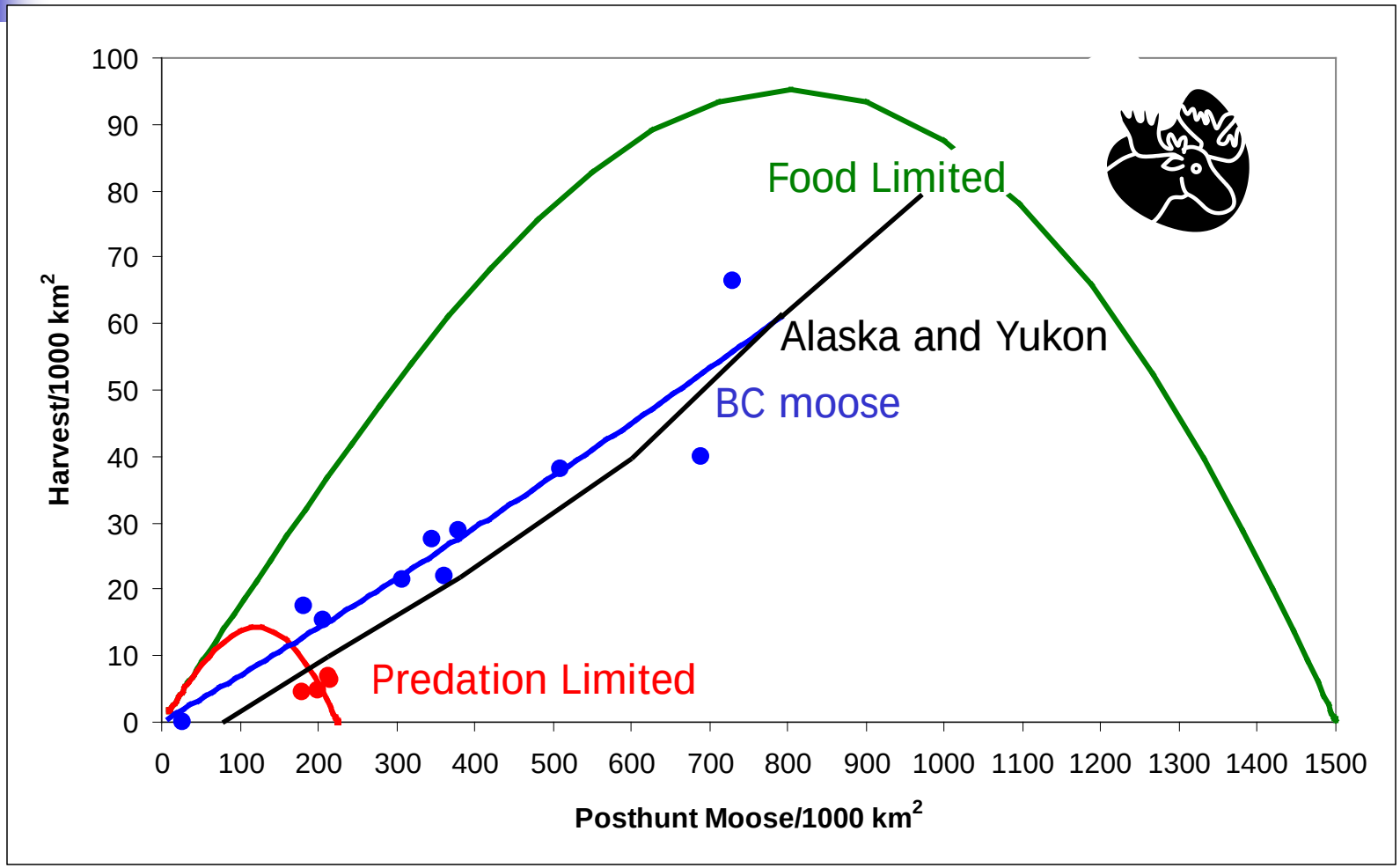
Theoretical SY Curves for Moose



Sustained Yield Curves for BC Moose



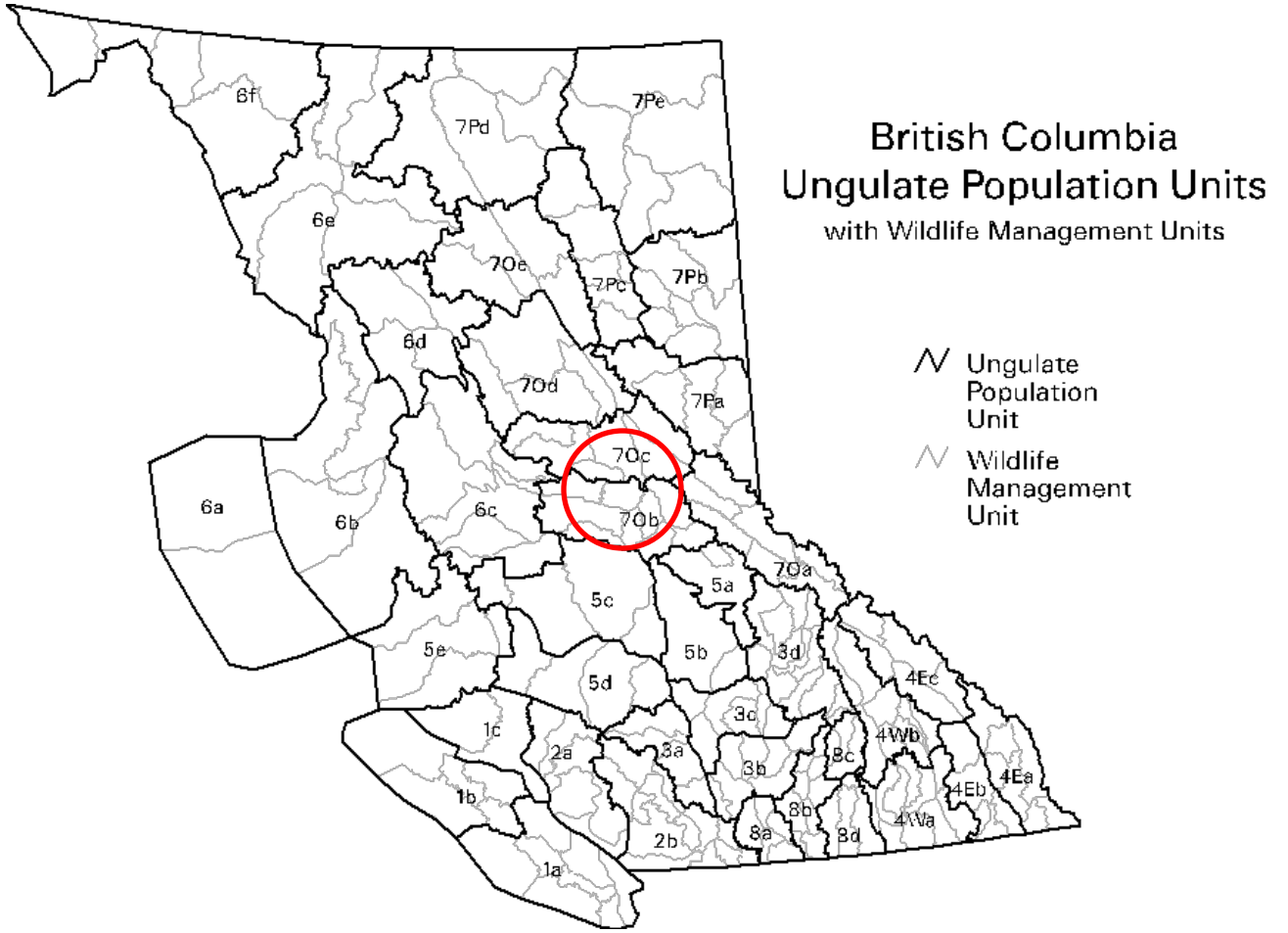
Approximate SY for Moose



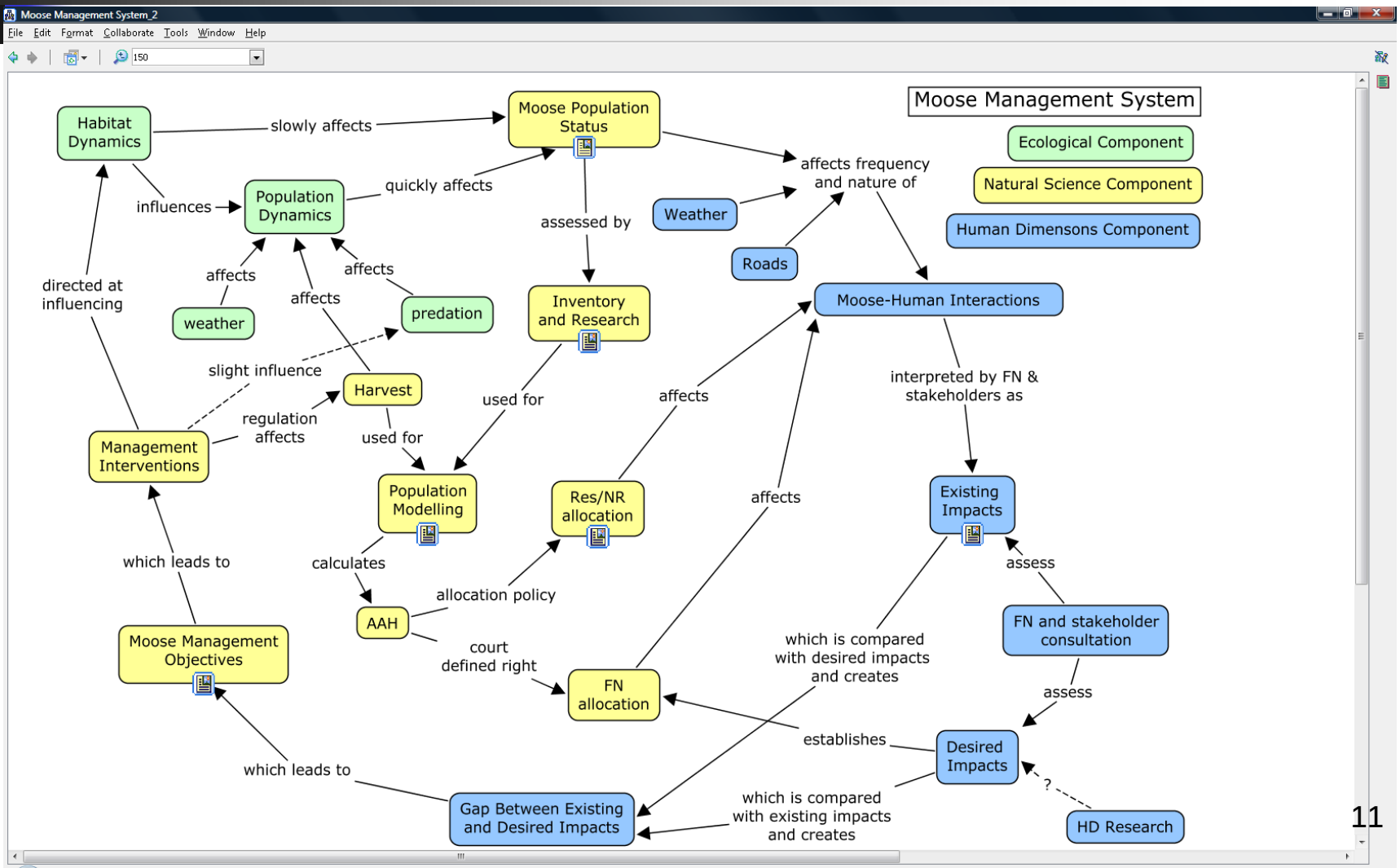
Hatter, I. 1999. An Evaluation of Moose Harvest Management in Central and Northern BC. Alces 35:91-103

- 4 regional moose strategies (19 GMZ's) were reviewed in 1999 against common evaluation criteria.
- Overall, the harvest strategy employed in R7A, (GMZ's 7Ob, 7Oc) sustained the highest hunting pressure, harvest density, and harvest rates, while meeting provincial guidelines for hunter days/kill and post-season bull/cow ratios
- Harvest strategies employed in other regions generally had lower bull/cow ratios and required more frequent changes to moose hunting regulations.

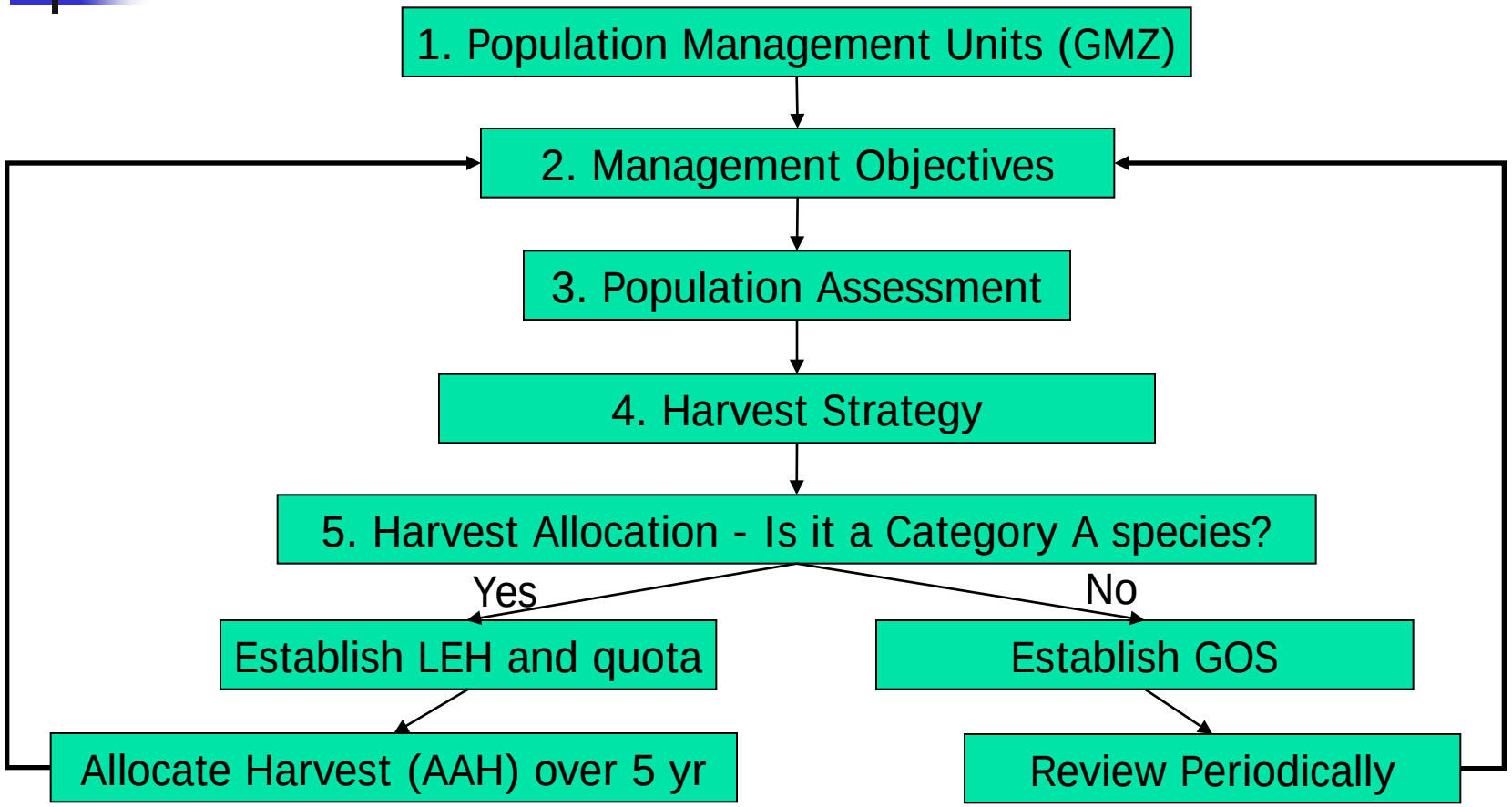
Game Management Zones (GMZ's)



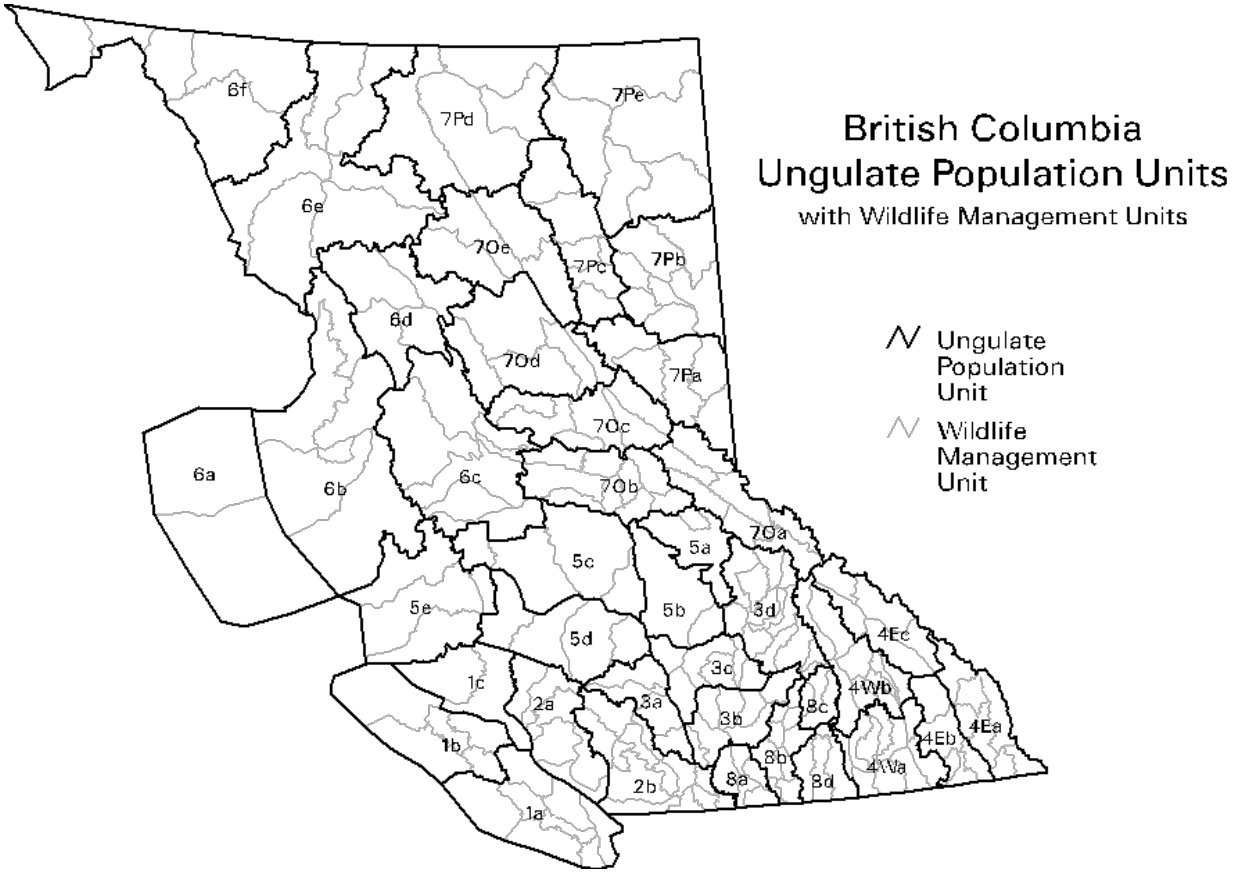
Moose Management System in BC



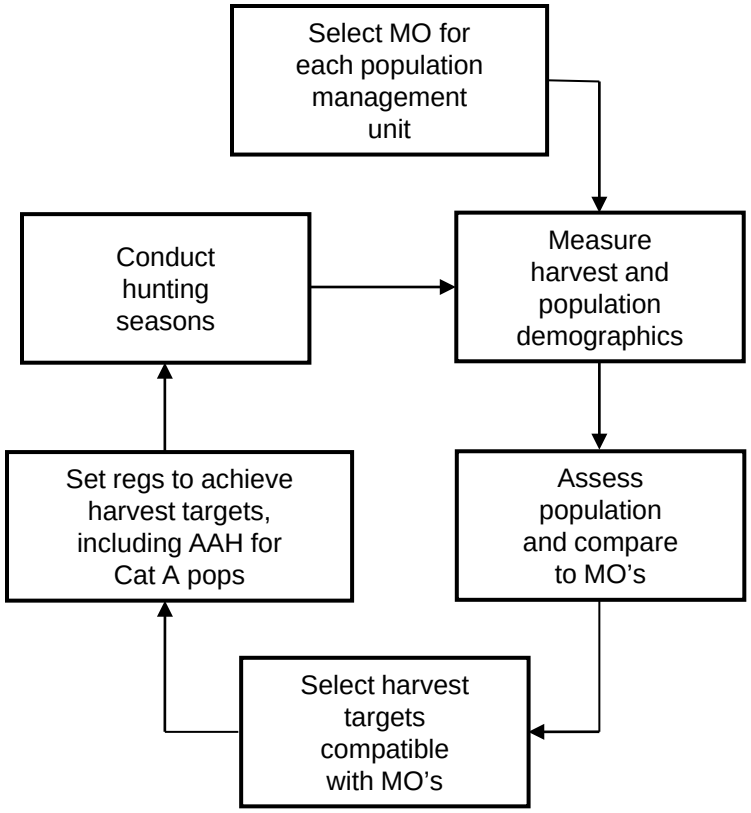
Moose Harvest Management Procedure



Game Management Zone's



Moose Management by Objectives

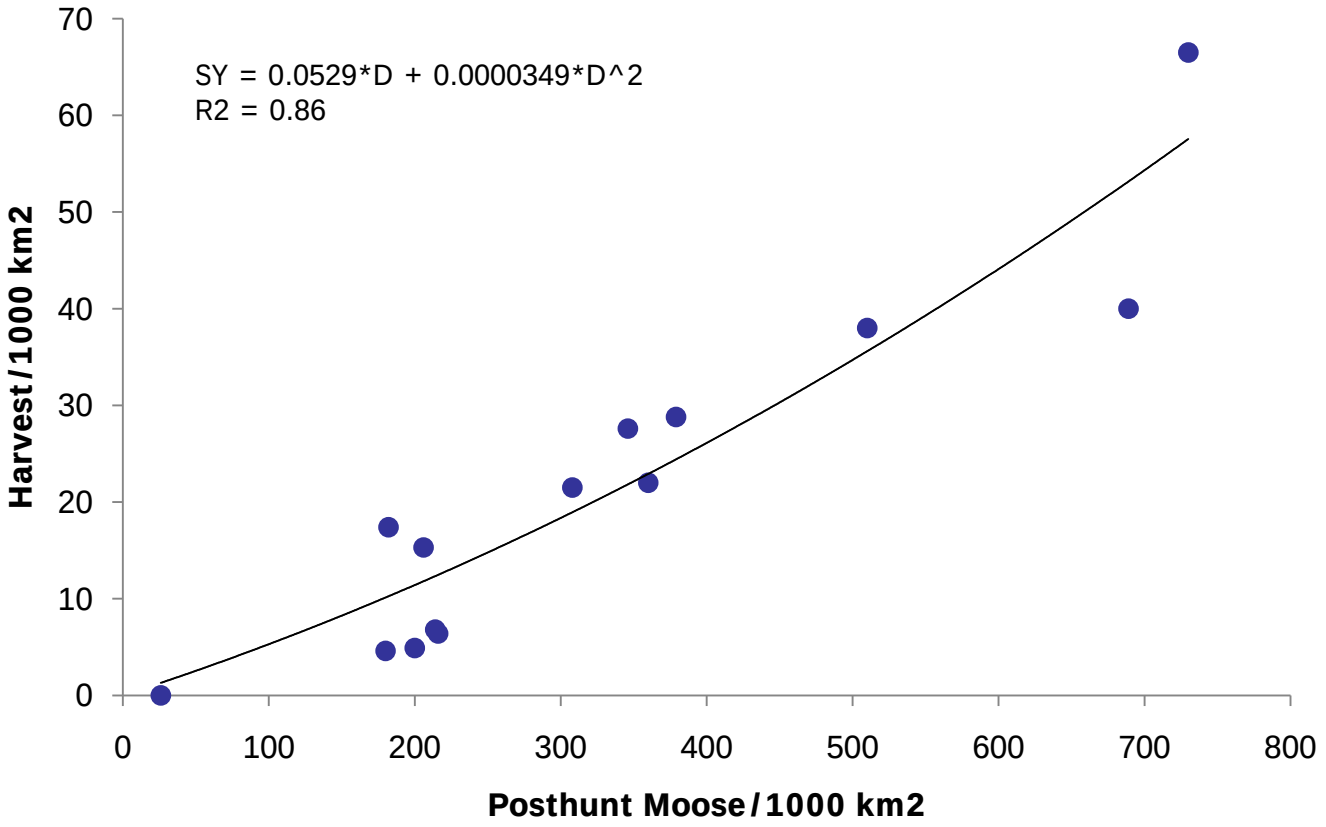


Default Objectives:

1. Maintain sustainable harvests on broad spatial scales

2. Ensure bull/cow ratios remain above 30 bulls/100 cows (50/100 for low density pops)

1. Maintain sustainable harvests



Population Modelling to estimate SY's

spreadsheet model for fitting models to data (JWM).xls [Compatibility Mode] - Microsoft Excel

Time-Specific Fawn Survival, Linear Trend Age Ratios, Constant Adult Survival

Key	
Red = Field Estimate (data)	
Green = Means	
Blue = Fitted Model Estimate (parameter)	
Black = Computed Value (model derived)	

Assumptions	
Sex Ratio(% Males)	50%
Sightability Factor:	1.5

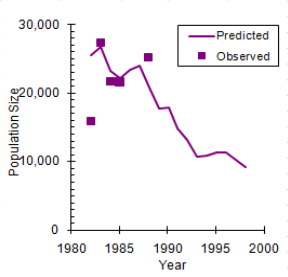
Parameters	Intercept	Slope
Recruitment	0.7946	-0.025
Fawn Survival	Time Specific	
Adult Survival	0.8820	
Initial Buck Pop.	2532	
Initial Doe Pop.	18821	

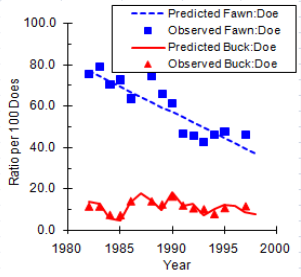
Model Fitting	
Sum Penalties	104.36
Sum Lack of F	40.01
Total =	144.4

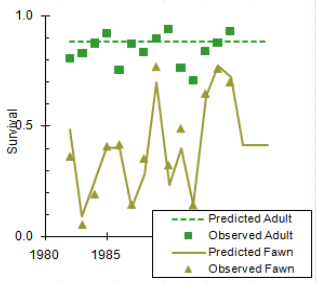
Model Selection	
n	66
K	20
AICc	203.03

Model

	Bucks:Doe		Fawns:Doe				Fawn Survival Rates				Adult Survival Rates				Harvest		Population Est.		Predicted Post-Hunt Population				Buck:Doe Ratio		Population	
Year	Field Est	Field SE	Model	Field SE	Field Est	Penalty	Estimate	Field SE	Field Est	Penalty	Estimate	Field SE	Field Est	Penalty	Bucks	Does	Field SE	Field Est	Bucks	Does	Fawns	Total	Model	eviance	Model	eviance
1981	13.8	1.95	79.5	5.78	77.7	0.09	0.4827	0.0682	0.4817	0.00	0.8820	0.0491	0.8600	0.20	2293	19	3591.7	21103	2532	18821	14954	36307	13.5	0.03	24205	0.75
1982	11.4	1.34	77.0	4.34	75.5	0.11	0.4853	0.0442	0.3632	7.61	0.8820	0.0481	0.8076	2.39	3072	10	2425.3	16004	2770	20199	15544	38513	13.7	2.99	25675	15.90
1983	11.4	1.45	74.5	4.83	78.8	0.81	0.0934	0.0212	0.0535	3.55	0.8820	0.0451	0.8301	1.32	3512	64	3128.8	27309	2703	21522	16024	40250	12.6	0.64	26833	0.02
1984	7.4	1.16	72.0	4.49	70.2	0.15	0.2518	0.0390	0.1917	2.38	0.8820	0.0401	0.8761	0.02	2017	12	2387.4	21723	1115	19719	14188	35022	5.7	2.26	23348	0.46
1985	7.2	1.38	69.5	5.57	72.5	0.30	0.4039	0.0390	0.4092	0.02	0.8820	0.0381	0.9207	1.04	1849	30	2822.3	21657	921	19148	13299	33368	4.8	3.00	22245	0.04
1986	14.0	1.62	66.9	4.11	63.5	0.70	0.4000	0.0379	0.4184	0.24	0.8820	0.0676	0.7555	3.51	931	21			2567	19553	13091	35211	13.1	0.29	23474	
1987			64.4				0.1302	0.0330	0.1450	0.20	0.8820	0.0827	0.8750	0.01	1326	24			3556	19839	12786	36182	17.9		24121	
1988	13.9	2.04	61.9	3.76	74.2	10.62	0.2836	0.0642	0.3535	1.18	0.8820	0.1076	0.8333	0.20	1449	585	2517.0	25248	2520	17746	10993	31259	14.2	0.02	20839	3.07
1989	12.4	1.90	59.4	2.72	65.7	5.29	0.6966	0.0494	0.7702	2.22	0.8820	0.0514	0.8959	0.07	2227	1512			1555	15698	9332	26585	9.9	1.72	17724	
1990	16.2	2.09	56.9	3.32	61.2	1.64	0.2331	0.0692	0.3234	1.70	0.8820	0.0345	0.9400	2.83	1822	1691			2800	15405	8772	26977	18.2	0.89	17985	
1991	11.9	1.45	54.4	2.26	46.4	12.67	0.4012	0.0719	0.4901	1.53	0.8820	0.0519	0.7651	5.07	1917	1238			1575	13371	7280	22225	11.8	0.01	14817	
1992	10.5	1.74	51.9	2.85	45.5	5.11	0.1443	0.0291	0.1415	0.01	0.8820	0.0476	0.7064	13.61	1310	1296			1539	11957	6211	19707	12.9	1.85	13138	
1993	10.1	2.30	49.4	3.04	42.6	5.06	0.6366	0.0383	0.6488	0.10	0.8820	0.0378	0.8405	1.21	1041	777			764	10217	5052	16033	7.5	1.30	10689	
1994	7.8	1.67	46.9	2.86	46.1	0.09	0.7742	0.0337	0.7625	0.12	0.8820	0.0346	0.8778	0.01	1210	221			1072	10398	4881	16352	10.3	2.26	10901	
1995	10.7	2.24	44.4	3.03	47.6	1.09	0.7235	0.0384	0.7000	0.38	0.8820	0.0293	0.9324	2.97	1489	182			1346	10879	4834	17059	12.4	0.56	11373	
1996			41.9				0.4168				0.8820				1631	206			1305	11138	4671	17114	11.7		11409	
1997	11.5	1.80	39.4	3.00	46.1	4.93	0.4168				0.8820				1194	442			931	10355	4084	15369	9.0	1.95	10246	
1998			36.9				0.4168				0.8820				922	467			750	9517	3515	13782	7.9		9188	
						48.67				21.23				34.46										19.76		20.25



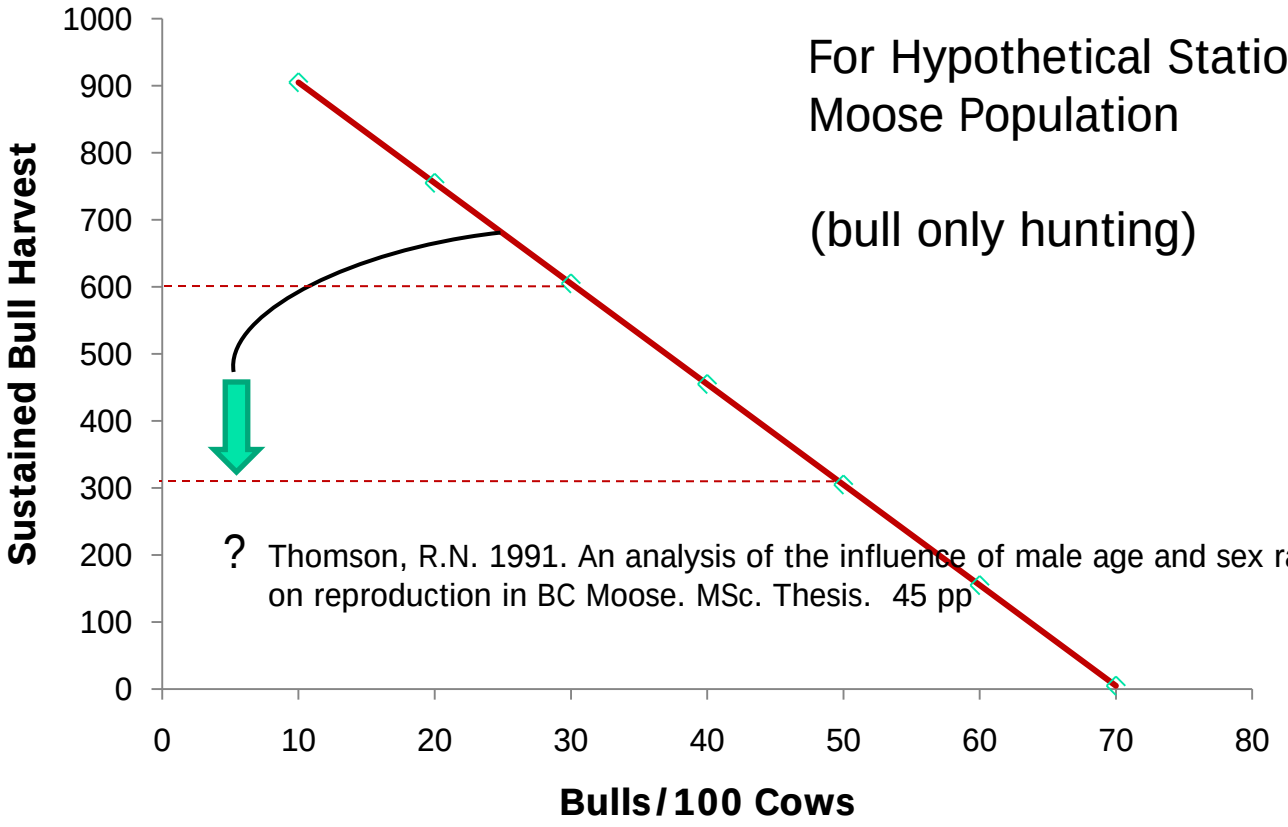




GMU 22 Data | Naive | Constant | LinearTrendAge | FawnSTime | LinAgeFawnSTime | AdultSTime | AgeFawnSTime | All Time Specific | AICc Summary

PopTools: Library loaded 1

2. Maintain ≥30 bulls/100 cows post-hunt



Calculation of AAH

1. Determine Maximum Allowable Mortality
2. Deduct FN harvest (SCF) from Maximum Allowable Mortality
3. If substantive, deduct other sources of human-caused mortality
4. Allocate remainder (AAH) through Wildlife Allocation Policy
5. Under Review!! – For LEH/GOS (spike-fork hunts), include all bull moose in AAH.

Wildlife Allocation Policy - Moose

Region	Sex / Age Class	Resident	Commercial
3	Bull	90	10
4	Bull	77	23
5	Bull	79	21
6 South	Bull	77	23
7A	Bull	82	18
8	Bull	85	15
Provincially	Cow	98	2

Recommended Hunting Season Structure for Moose

Class	Season Type	Season Bounds
Spike-fork Bull	GOS	Aug 15 – Nov 30
Tripalm Bull	GOS	Aug 15 – Nov 30
10-Point Bull	GOS	Aug 15 – Nov 30
Any Bull	GOS	Aug 15 – Nov 30
Any Bull	LEH Shared Hunt	Aug 15 – Nov 30
Cow/Antlerless	GOS	Oct 1 – Dec 10
	LEH Shared Hunt	Oct 1 – Dec 10

SDM - finding a balance...

- Biological Objectives
  - Population abundance (e.g. moose/1000 km^2)
  - Population composition (e.g. bulls/100 cows)
- Social Objectives
  - FN social, ceremonial and food requirements
  - Achievement of AAH and allocation split
  - Resident hunting opportunities
- Economic Objectives
  - Guide-outfitting hunting opportunities

Wildlife Management and Professionalism

"Many of my colleagues in wildlife management believe that they should have a free hand in managing wildlife – a position I find a little uncomfortable. After all, we are public servants, and if we are not satisfying the public interests with our deer management programs, just what is it we are managing deer populations for? I agree that the public often does not realize the consequences of what they want but I see if as the job of our profession to give the public not only what it asks for but more – an accurate prediction of the consequences."

Dale McCullough 1984

Hypothetical Consequence Table for Moose

Objective	Evaluation Criteria	What's Better?	Alt #1 Status Quo	Alt #2 Maximize Harvest	Alt #3 Keep it Simple	Alt #4 Maximize Pop Size
Conservation	Post-hunt Population	higher	10,000	7,000	12,000	15,000
Conservation	Post-hunt Bull/Cow Ratio	higher	30	20	35	60
Conservation	Prob of exceeding AAH	lower	5%	20%	10%	0%
FN Harvest	Ensure harvest needs met	higher	200	200	200	200
Hunting Satisfaction	Expected annual harvest	higher	500	1000	400	200
Hunting Satisfaction	Total hunting days in season	higher	50	90	50	20
Hunting Satisfaction	Regulation Complexity Index	lower	3	4	1	2
Hunting Satisfaction	Quality Hunt Index	higher	2	1	3	4
Management Costs	Administrative Costs ($1000/yr)	higher	$5K	$10K	$2K	$2K
Management Costs	Inventory Costs ($1000/yr)	lower	$50K	$200K	$100K	$50K

The consequence table is presented to stakeholders for review and comment. A series (up to 3) workshops may be held in order to reach a consensus on a recommended alternative (includes trade-off analysis).

4 “Tests” for Hunting Regulation Proposals

The Ministry has adopted some key drivers or "tests" for regulatory change including:

1. Hunting regulation simplification;
2. Harmonization of hunting regulations within and between regions;
3. Increased hunting opportunity and
4. Program delivery within existing resources.

Questions?