

Under what conditions are MPB treatments efficacious?

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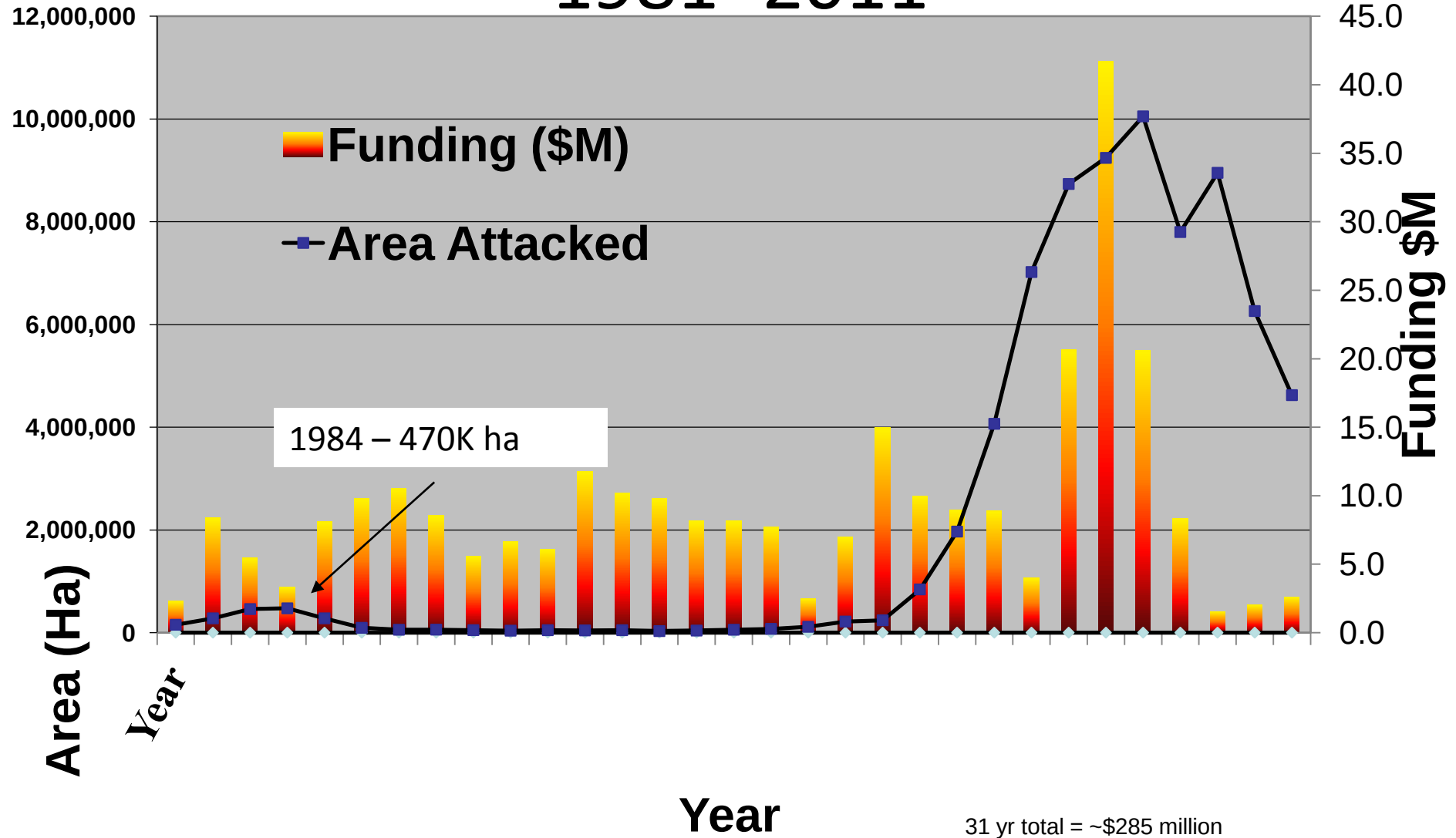
Forest Health Officer

BC MFLNRO, Victoria, BC

Western Canada Forest Health Workshop, Golden, BC

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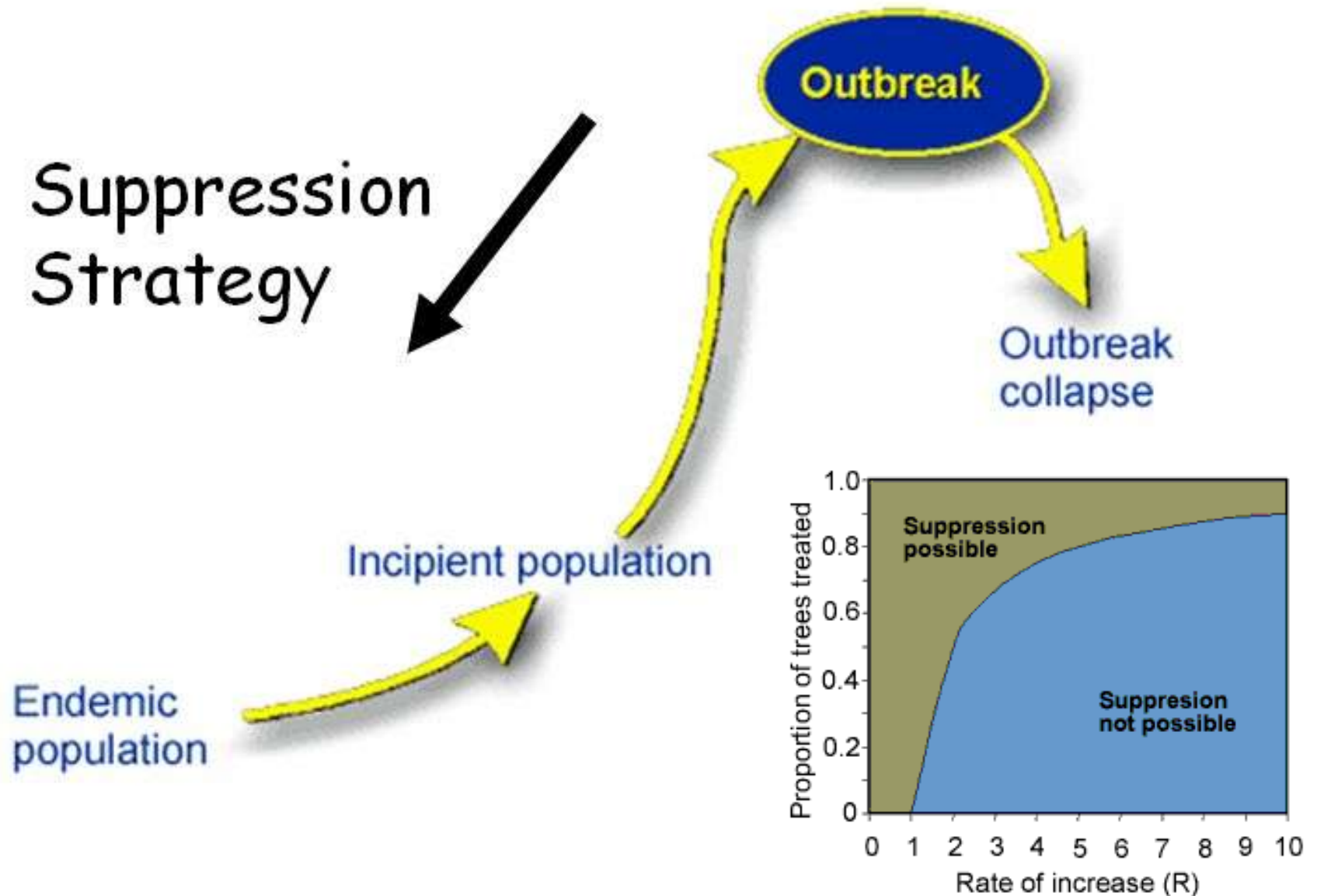
Area Attacked vs Suppression Funding 1981- 2011



What have we learned in 31 years?

- You can't treat everything - but maybe you don't have to
- You can't detect everything but good detection is vital
- Financial cycle is always out of synch with the beetle
- Giving up is hard to do
- We have a system that seems to work
“Know when to hold, Know when to fold”

Why do we treat?

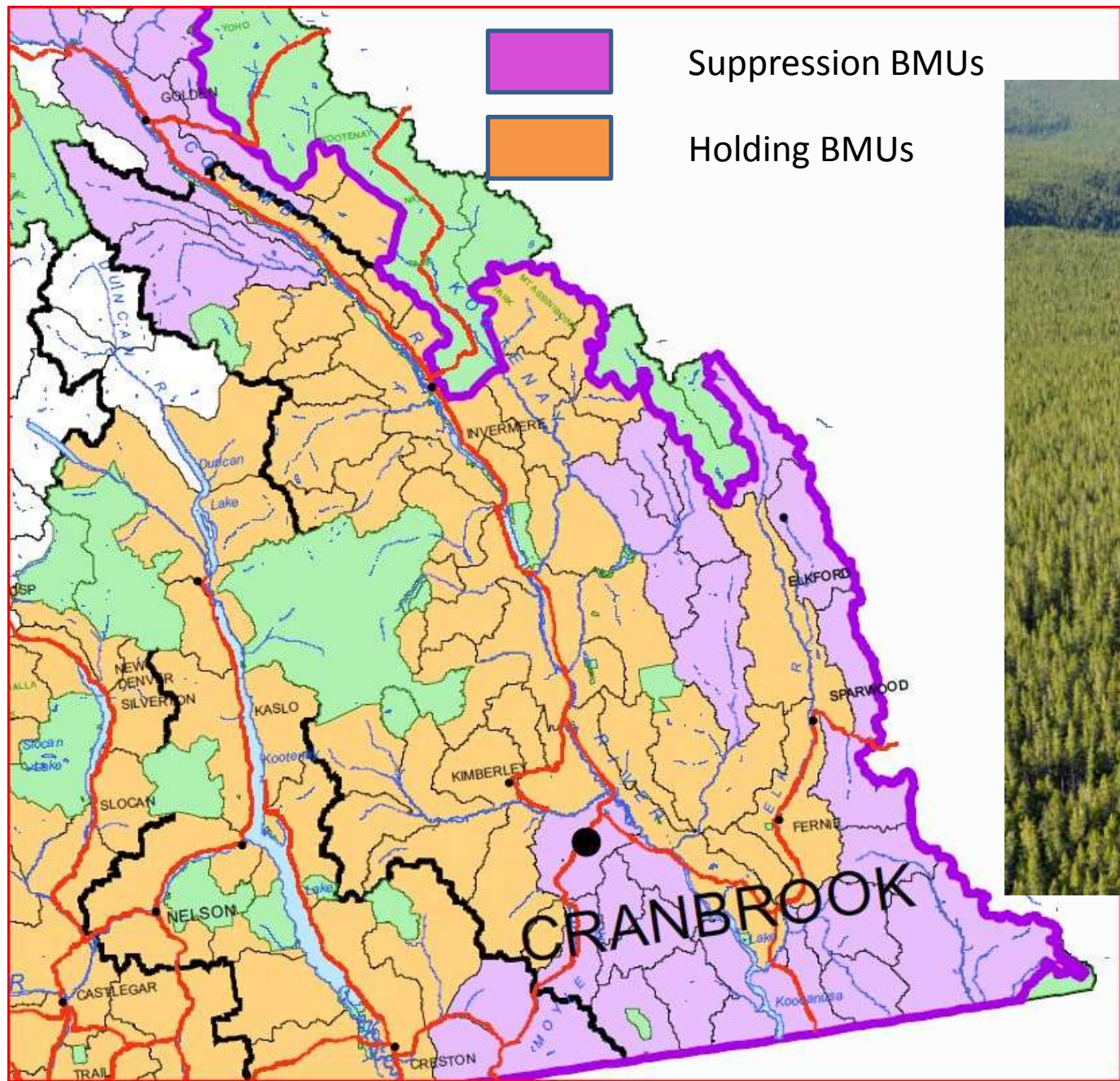


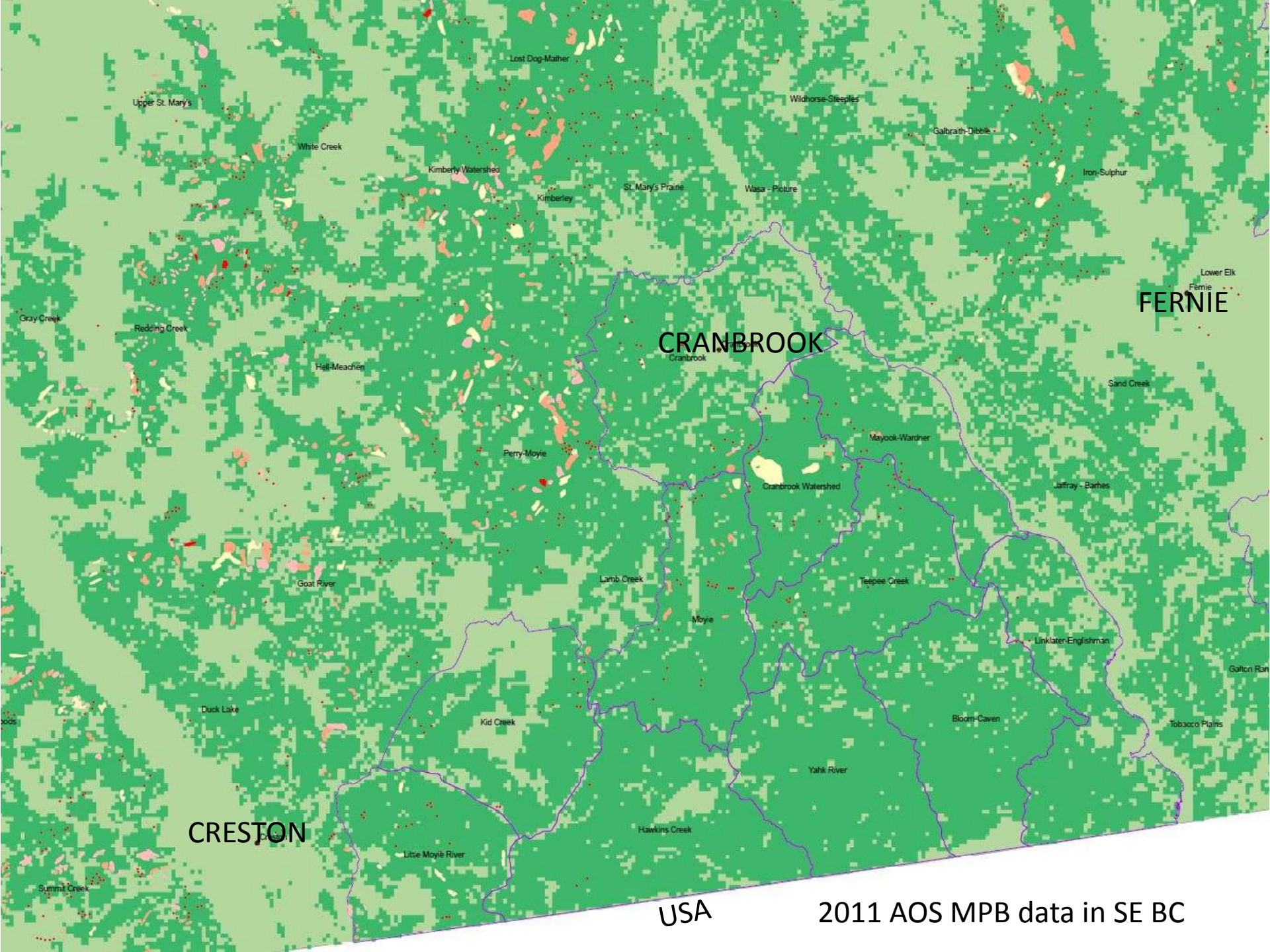
Suppression Target

- Research indicates that by treating >80% of a MPB population/yr, "suppression" of the population down to endemic levels is possible.
- This target is considered achievable in most areas where expansion rate ($G:R$) is low
- E.g., Normal $G:R$ was about 2 or less

Strategy Setting a.k.a. “know when to hold, know when to fold”

- Landbase divided into “Beetle Management Units” - assigned strategies (Suppression, Holding, Salvage)
- Each unit described by susceptible pine volume, number of attacked trees, ratio of spots: patches (points: polygons), green:red, harvest capacity – all factors that affect achievement of 80% target
- See *Provincial Bark Beetle Implementation Guidelines*





CRESTON

USA

2011 AOS MPB data in SE BC

Conditions for Success

- Low G:R (<3) (minimal immigration)
- Small , isolated patches; very few large patches (low patch to spot ratio)
- Good access for harvesting
- Fragmented susceptible host
- Good aerial and ground detection
- Aggressive licensees
- Sustained funding & effort

Efficacy Studies

- Nearly impossible to do a proper controlled trial
- Modeling used to simulate treatment effects
- Examples
 - MPB Sim / SELES studies – Lakes & Kamloops TSAs
- Retrospective studies using survey data
 - Nelson, Boots, White and Smith JEMS 2006
 - Ebata and Drummond (1994 unpublished internal rpt)
 - Stock (ongoing work)

Nelson et al., 2006

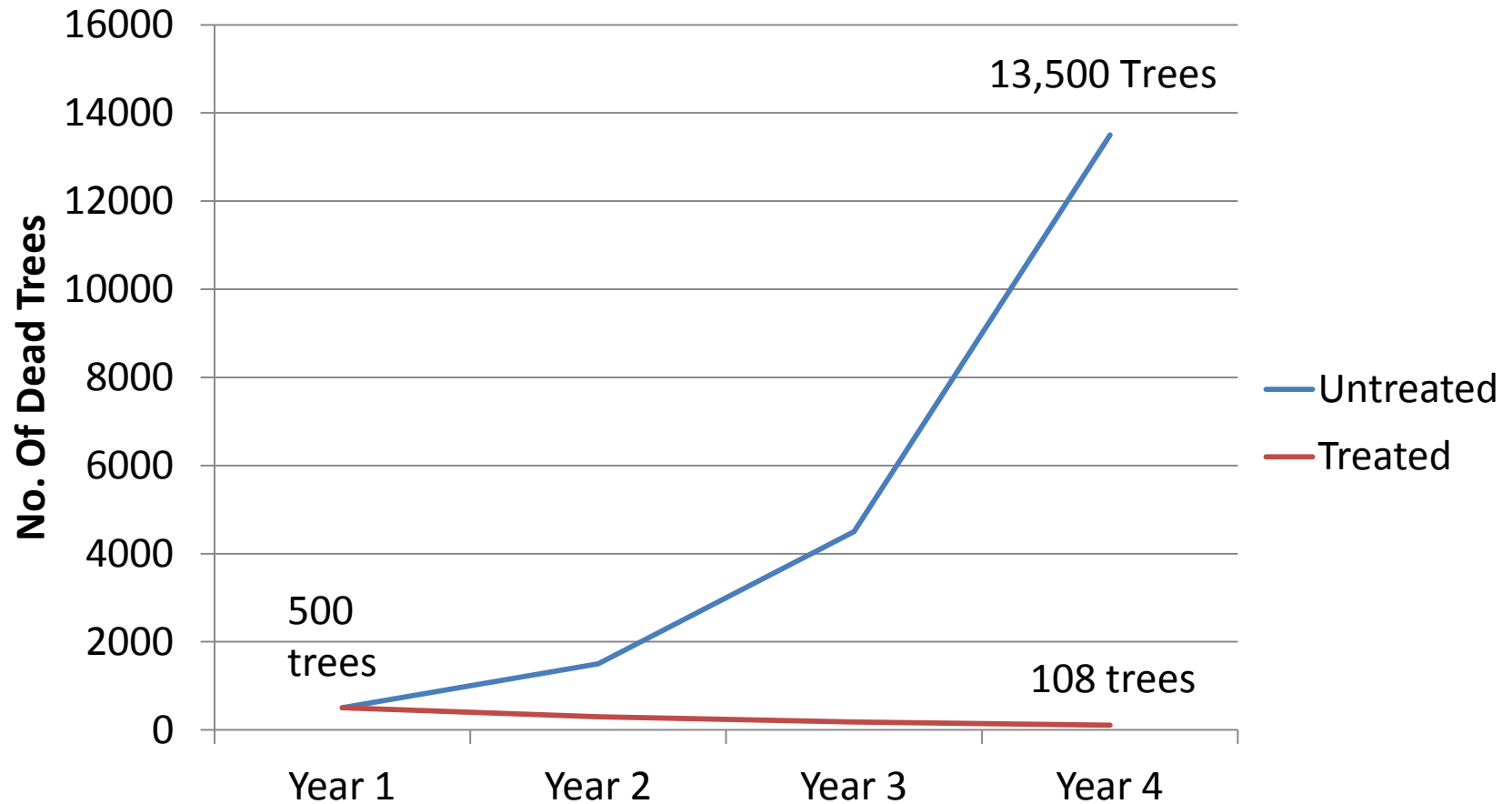
- Spatial analysis (kernel density estimator) of heli-GPS data from 2001-02 and treatment data from Morice TSA (just prior to outbreak)
- Compared change in number of infestations after treatment to areas with no treatment
- Concluded that treatments were effective but some of the specific efficacy questions re: STTs were confounded by immigration

Ebata & Drummond 1994

- Simple analysis of probe data and Fall and Burn and MSMA records hand drawn on 1:20,000 maps. For a given area:
- Control:
 - # infested trees in yr 1 x avg G:R = est'd # trees in yr2
- Treatment:
 - # infested trees in yr 2
 - Where G:R are averaged from all probed sites for the year for the BMU

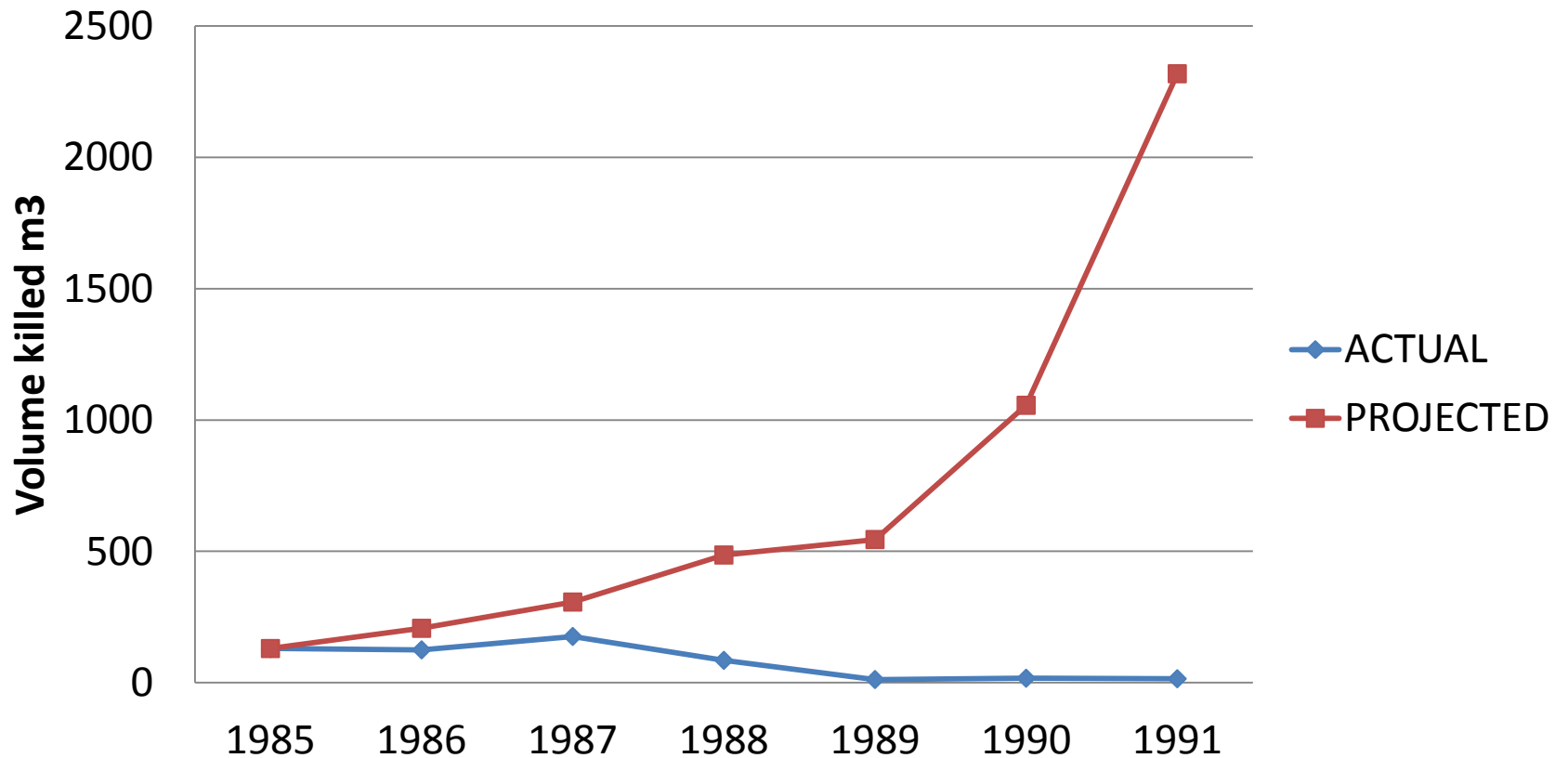
Theoretical Example of Treatment Effect

$G:R$ 3:1, 80% treatment



Results

Walcott Rd, Morice TSA Fall & Burn Efficacy



Similar trends seen in 4 other sites

Stock (ongoing work)

- More sophisticated analysis using spatial data collected from the Kootenay Lake District
- Study could be a more definitive analysis of efficacy of STT than Nelson et al (2006) because of lack of immigration
- Still in data collection and cleaning phase

Volumes killed comparison

BMU Strategy	1999 PI Vol m3	PI Vol killed by 2009	% of 1999 Vol killed by 2009
Arrow/Bdy			
Not Suppression	43,117,280	9,408,730	21.8%
Suppression	12,299,824	79,685	.65%
Kootenay Lake			
Not Suppression	17,044,720	4,665,403	27.4%
Suppression	7,004,000	233,004	3.3%
Okanagan/Shu			
Not Suppression	76,632,880	15,138,840	18.0%
Suppression	16,999,264	271,266	3.9%
Rocky Mtn			
Not Suppression	50,319,264	9,082,633	13.3%
Suppression	37,115,200	1,461,109	6.1%

Benefits

	Pine Volume at Risk in Suppression BMUs (m3)	Approximate Value of Stumpage (\$/m3)	Total Stumpage Value at Risk	Total Stumpage Value at Risk (@60% max mortality)	Total Stumpage Value recovered (@60% max mortality and \$.25/m3)	Lost Stumpage Revenue
Kootenay Lake TSA	5,500,000	9.81	\$53,955,000	\$32,373,000	\$825,000	\$31,548,000
Boundary TSA	7,900,000	9.81	\$77,499,000	\$46,499,400	\$1,185,000	\$45,314,400
Cranbrook TSA	15,300,000	9.81	\$150,093,000	\$90,055,800	\$2,295,000	\$87,760,800
Invermere TSA	6,600,000	9.81	\$64,746,000	\$38,847,600	\$990,000	\$37,857,600
TFL 14	5,800,000	9.81	\$56,898,000	\$34,138,800	\$870,000	\$33,268,800
Golden TSA	2,281,500	9.81	\$22,381,515	\$13,428,909	\$342,225	\$13,086,684
TOTAL	43,381,500		\$425,572,515	\$255,343,509	\$6,507,225	\$248,836,284

Costs

	Requested annual investment	Desired Yrs of delay of full outbreak	Total Investment
Kootenay Lake TSA	\$1,000,000	8	\$8,000,000
Boundary TSA	\$500,000	8	\$4,000,000
Cranbrook TSA	\$2,300,000	8	\$18,400,000
Invermere TSA	\$430,000	8	\$3,440,000
TFL 14	\$700,000	8	\$5,600,000
Golden TSA	\$250,000	8	\$2,000,000
TOTAL	\$4,980,000		\$39,840,000

Benefit : Costs

	Lost Stumpage Revenue Avoided	Total Investment (8 yrs)	Benefit : Cost
Kootenay Lake TSA	\$31,548,000	\$8,000,000	3.9
Boundary TSA	\$45,314,400	\$4,000,000	11.3
Cranbrook TSA	\$87,760,800	\$18,400,000	4.7
Invermere TSA	\$37,857,600	\$3,440,000	11.0
TFL 14	\$33,268,800	\$5,600,000	5.9
Golden TSA	\$13,086,684	\$2,000,000	6.5
TOTAL	\$215,567,484	\$39,840,000	6.0

Nb: If stumpage rates increase, the benefit:cost will also increase

Take Home Message

- Maintaining MPB populations at endemic levels is possible if efforts are sustained
- Even at low MPB expansion rates, consequences of reducing management effort are huge and occur very quickly – i.e., endemic or incipient stage progress to a full outbreak over a short period
- Keep good records! Data talks.