
Public Benefits and Private Costs of Protected Natural Areas

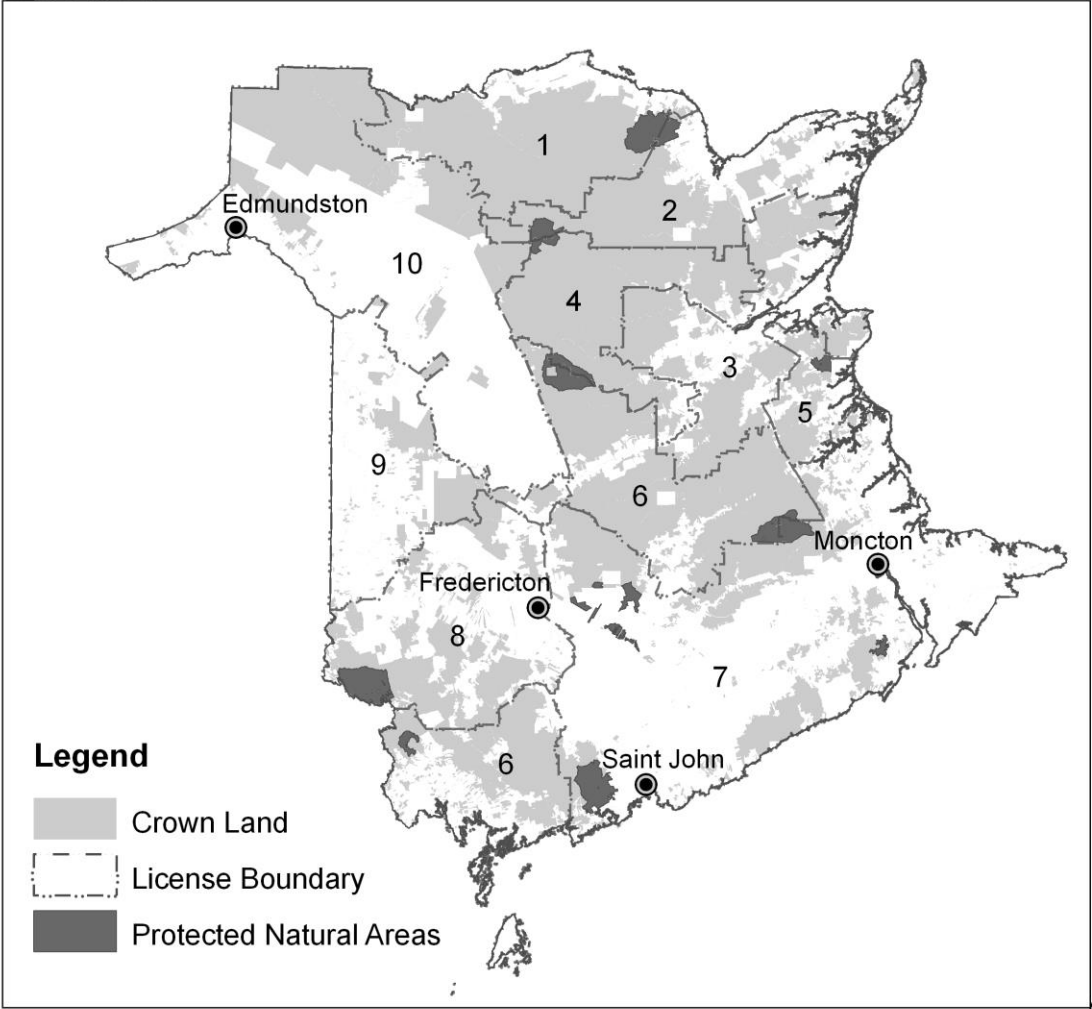
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Background: PNAs in NB

- In the 1990's NB had protected ~ 1%
 - In 1998 the government of NB released report proposing new protected areas
 - Socioeconomic impacts of proposed PNAs were examined by Gardner Pinfold Consulting Ltd
 - In 2003, Protected Natural Areas Act is established, protecting an additional 2%
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Background: Valuing PNAs

- PNAs provide benefits to society: biodiversity, wildlife, spiritual value, bequest values, etc.
 - These are hard to measure
 - PNAs also produce costs: maintenance costs, foregone timber revenues, etc.
 - These are easier to measure
 - From a policy perspective, we can support PNAs if perceived benefits outweigh costs
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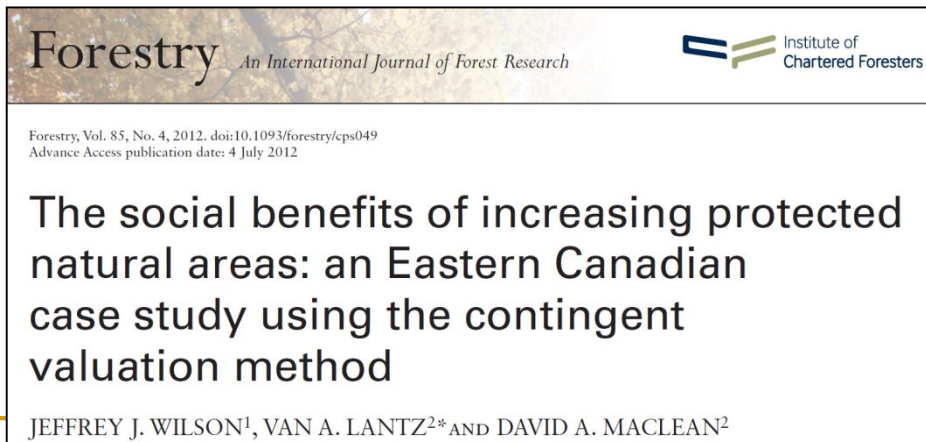
Research Objectives

- To evaluate benefits and costs associated with PNAs in New Brunswick

1. Conduct a benefit-cost analysis of existing PNAs in NB



2. Examine the sensitivity of benefit estimates to further increases of PNAs in NB



1. Conduct a benefit-cost analysis of the existing PNAs system in NB

■ Estimating benefits

- Used the contingent valuation method (CVM) to estimate the public's willingness-to-pay (WTP) for maintaining the existing PNAs at 2% of landbase
- Facilitated through a mail survey (n=1000; response rate = 45%)

■ Estimating costs

- Used the NB DNR Crown wood supply model to estimate net loss in timber revenues and stumpage

Benefit Estimates:

Mean Annual WTP (\$) per Household for maintaining existing PNAs in NB

Distributional Assumptions	All responses (n=447)	Potential protests removed (n=310)
Normal	\$13.51	\$75.47
Logistic	\$37.02	\$58.63
Log-normal mean	\$126.20	\$150.50
Log-normal median	\$27.50	\$55.72

- Individual household WTP values are multiplied by the total households in NB to estimate total benefits

Cost Estimates:

Economic rent (\$M CDN, discounted at 5% over 80-yrs) with and without PNAs

Economic Rent	With Existing PNAs	No PNA (1) (existing silvic. budget)	No PNA (2) (increased silvic. budget)
Logging Sector	\$1,548	\$1,571	\$1,592
Government	\$1,037	\$1,047	\$1,092
Wood products Sector	\$207	\$215	\$218
Total	\$2,792	\$2,860	\$2,902

- The difference between 'With PNAs' vs. 'Without PNAs' - represents opportunity cost estimates

Benefit-Cost Estimates:

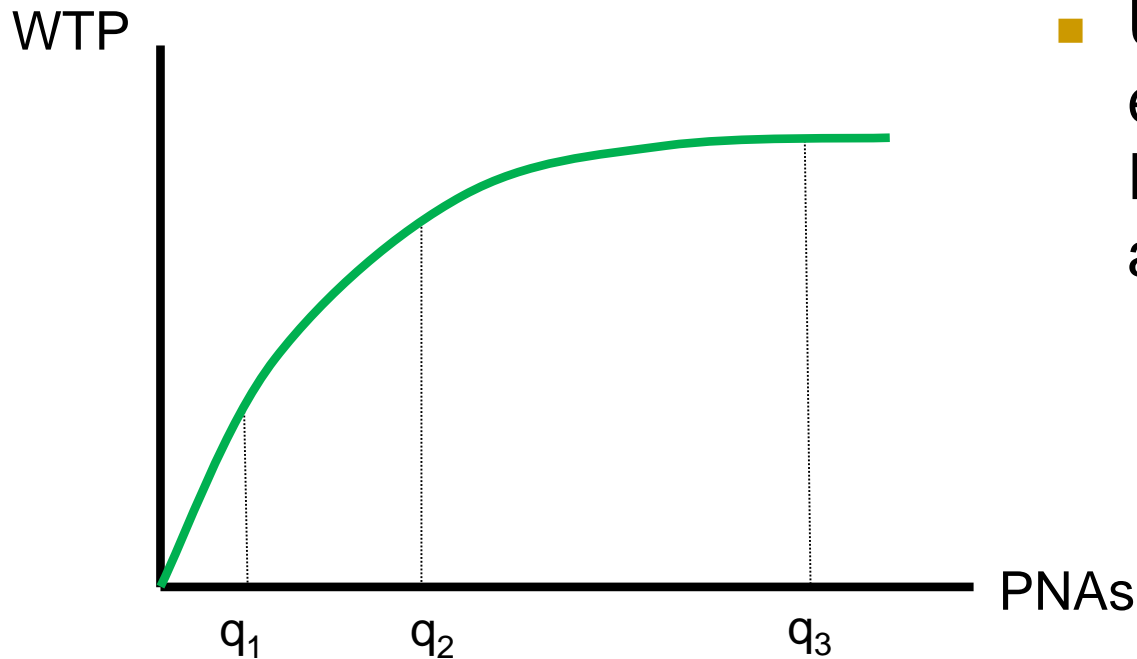
Net present values (\$M CDN, discounted 5%; 80-year horizon)

Net Present Value	Benefit Assumptions			
	(a) Non-respondent WTP = mean	(b) Non-respondent WTP = 0	(c) WTP for 10 yrs only	(d) Both (b) & (c)
Most conservative	\$232	-\$4	\$25	-\$68
Least Conservative	\$857	\$281	\$269	\$45

- Benefits outweigh costs for existing PNAs under a majority of assumptions.

1. Examine the sensitivity of benefit estimates to further increases of PNAs in NB

- We expect that benefits (WTP) should increase with the scale of PNAs



- Used CVM again to estimate WTP for PNA increase to 8% and 14% of landbase

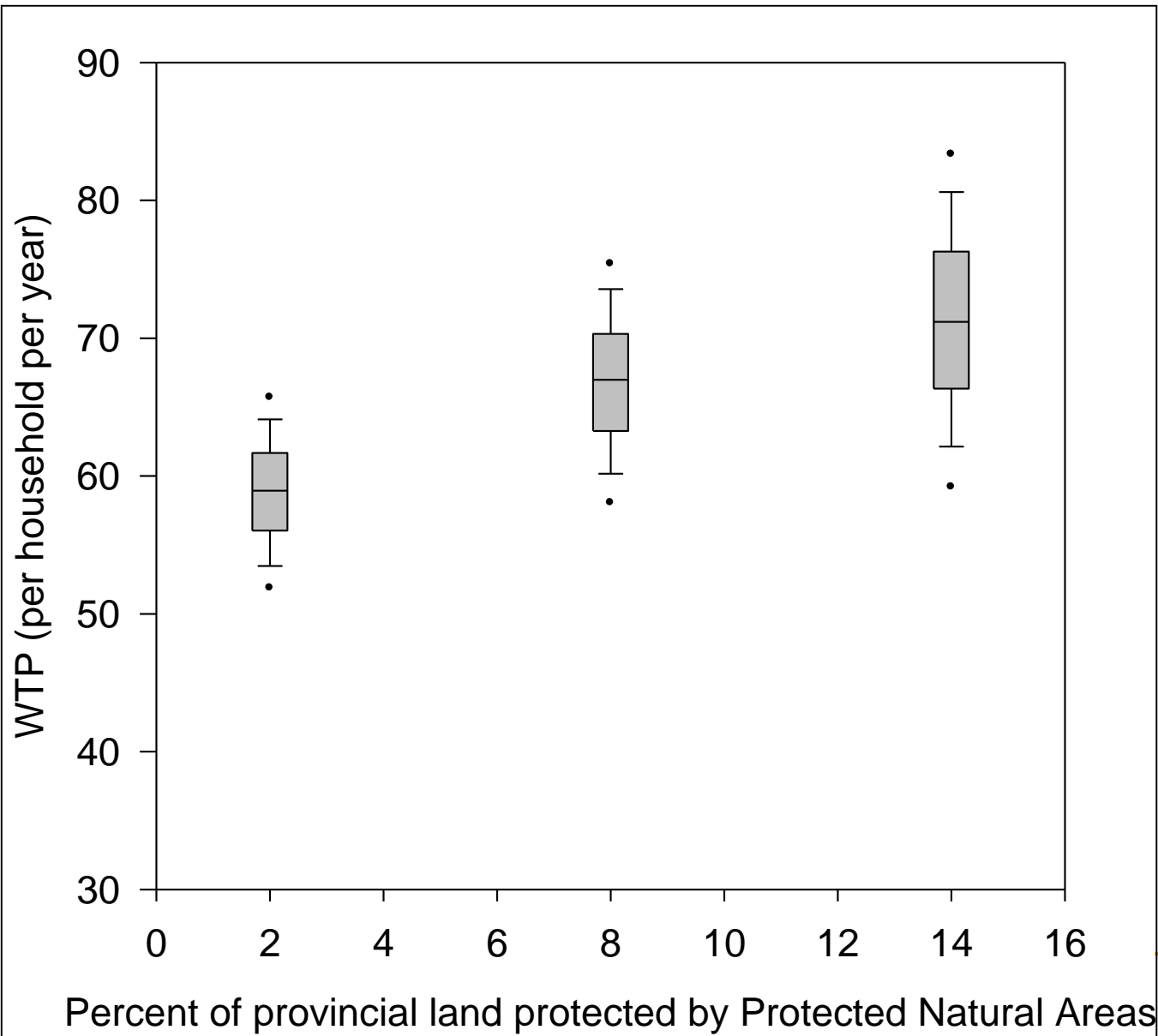
Benefit Estimates:

Mean Annual WTP (\$) per Household for different levels of PNAs in NB (potential protests removed)

Distributional Assumptions	PNAs = 2%	PNAs = 8%	PNAs = 14%
Normal	\$75.47	\$74.06	\$60.58
Logistic	\$58.63	\$66.57	\$71.29
Log-normal mean	\$150.50	\$126.34	\$137.62
Log-normal median	\$55.72	\$60.51	\$62.87

- The logistic distribution represented the best fit model.

Relationship between WTP and % PNAs



- Average WTP increases with PNAs
- However, confidence intervals overlap
- Casts doubt that WTP increases with PNAs

Next Steps

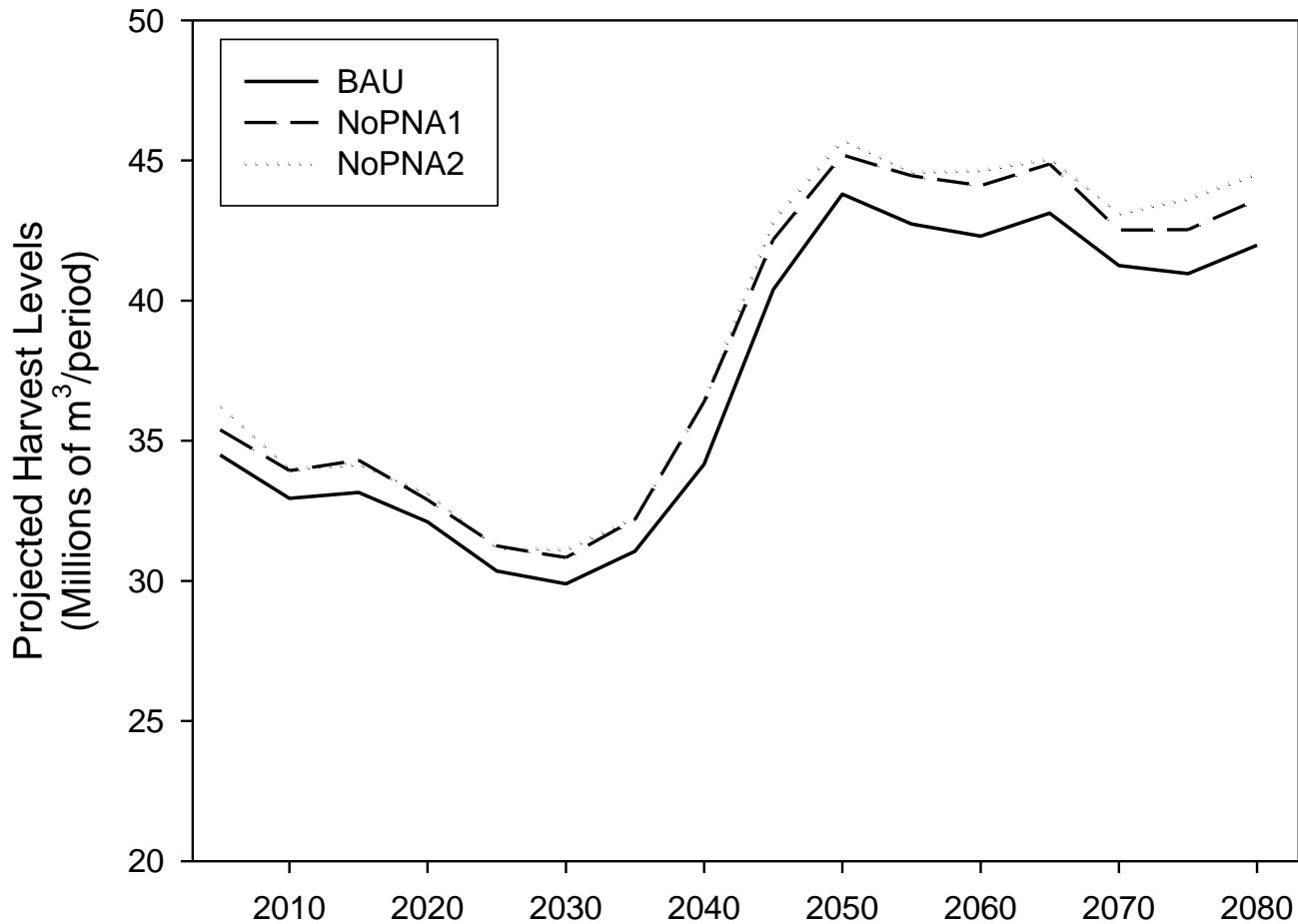
- Need to better understand why household WTP may or may not increase with PNAs
 - Lack of understanding of the function of PNAs?
 - Protesting against paying \$ for more PNAs?
 - Concerned about the impacts on the forest sector?
 - Need to estimate the opportunity costs of further increases in PNAs
 - Can use these to conduct a benefit-cost analysis of further increases in PNAs – can be used to advise on future PNAs policy
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Extra Slides

Testing the validity of WTP estimates for maintaining 2% PNAs

Variable	Mean with	Mean without	MLE Logistic	
	protests (n=447)	protests (n=310)	distribution coefficient	(n=310) ^a S.E.
Household income ^b	54.65	53.27	0.672***	0.164
Age of the respondent ^c	50.62	50.39	-0.372	0.239
Urban residence ^d	0.56	0.58	15.302*	8.504
Education level of the respondent ^e	13.57	13.66	2.601*	1.434
Affiliation with environmental groups ^d	0.39	0.42	12.753	8.513
Recreational property ownership ^d	0.20	0.19	-19.573*	10.346
Distance to the closest PNA ^f	32.29	29.84	-0.036	0.193
Active park user ^d	0.30	0.33	15.103*	9.097
Attitude towards forest conservation ^g	44.48	44.94	-0.358	0.424
Responded to the first mail out ^d	0.74	0.74	20.805**	9.548
- Log-likelihood (model)			-313.45	
Log-likelihood (constant only)			-347.52	

Project harvest levels of combined softwood and hardwood volume on Crown land



Testing the validity of WTP estimates for 2%, 8%, and 12% PNAs

Variable	Mean	PNA valuation scenario		
		(% of provincial land protected)		
		2%	8%	14%
Household income ^b	52.95	0.694*** (0.165)	0.666*** (0.210)	0.901*** (0.287)
Age of the respondent ^c	50.17	-0.464** (0.225)	-0.771*** (0.290)	-0.602 (0.402)
Urban residence ^d	0.56	14.031* (8.454)	15.090 (10.871)	16.743 (15.098)
Education level of the respondent ^e	13.67	2.236* (1.148)	4.375*** (1.478)	2.468 (2.075)
Affiliation with environmental groups ^d	0.42	14.126* (8.498)	24.363** (10.822)	27.533* (14.847)
Recreational property ownership ^d	0.20	-20.430** (10.367)	-19.587 (13.363)	-17.350 (18.567)
Distance to the closest PNA ^f	30.27	-0.089 (0.190)	-0.300 (0.241)	-0.273 (0.337)
Responded to the first mail out ^d	0.75	19.625** (9.416)	16.806 (11.844)	26.430 (16.553)
Log-likelihood (model)		-315.05	-334.80	-314.94
Log-likelihood (constant only)		-347.52	-367.53	-335.33