What is Society's Demand for Retention and Restoration?

Non-Market Valuation of Wetlands

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Non-Market Valuation of Wetlands

- EGSs from wetlands are not priced in economic markets
  - Hence their value typically set at $0
- Wetlands provide use and non-use economic values
  - Use value example: recreation – has a behavioural trail
  - Non-use: wildlife habitat, water quality, carbon sequestration – no associated behaviour
  - Broadly called Passive Use values

Passive Use Values

- Values derived from motivations other than personal use
  - John Krutilla "Conservation Reconsidered" *American Economic Review* (1967)
- Form a significant component of the values of wetlands
- Estimation of their economic value requires development of hypothetical market simulations
- These estimation methods are called Stated Preference approaches
  - Contingent valuation
  - Choice experiments

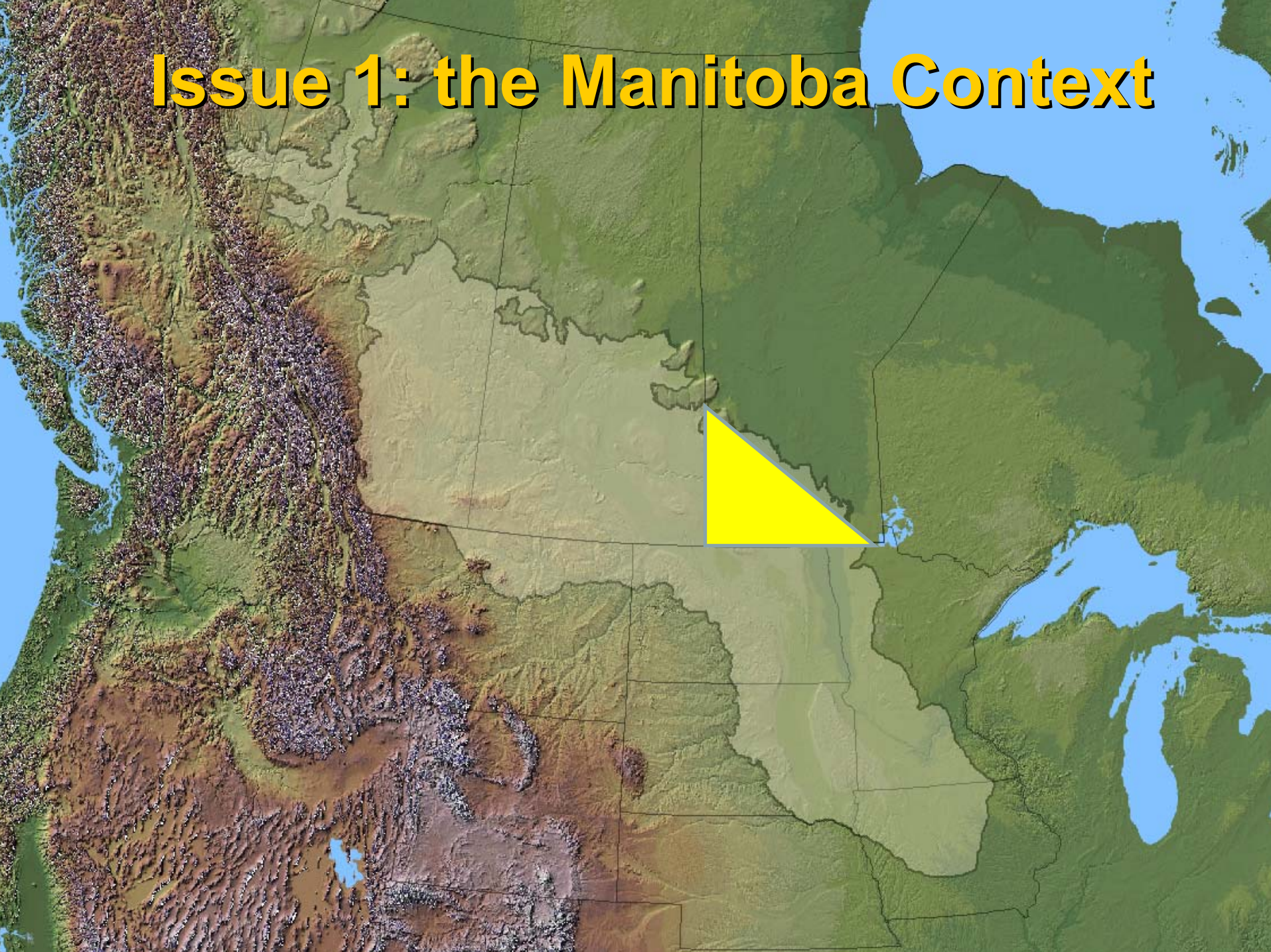
Passive Use Benefit Estimation

- SP methods involve questionnaires in which hypothetical policy situations are employed
- Trade-offs between personal income and EGSs service provisions are elicited
- A typical CVM approach for this:
  - "Would you agree with the policy or program if it provided X at cost $Y?"
- Need potential policies and estimates of costs
- Must use survey approaches
- Issues – strategic bias, uncertain policies, heterogeneity in preferences

Steps in Developing SP Tasks

- Overview of issue and context
- Describe the current situation
- Describe institutional framework for delivery
- Changes in quality for the delivery of public good
- Credible payment mechanism
- Pre-briefing
- Valuation Scenarios
- Debriefing
- Focus Groups and Pre-Tests

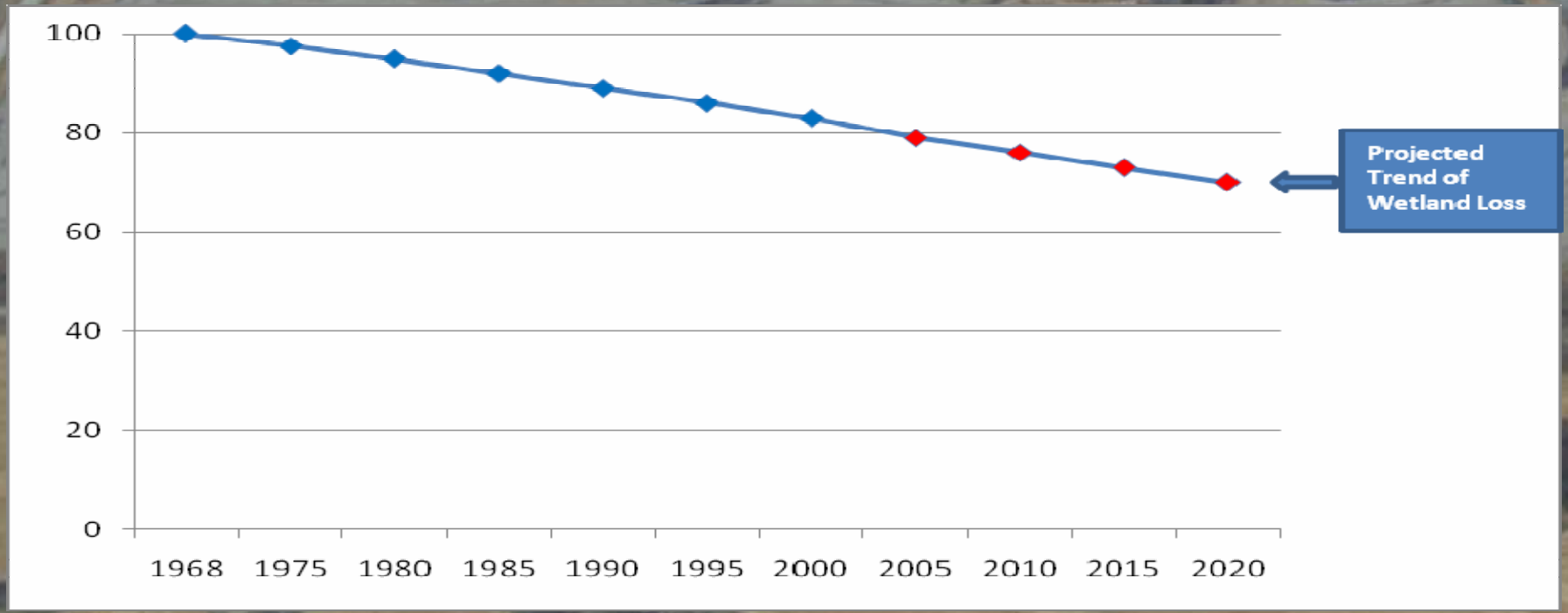
Issue 1: the Manitoba Context



The Prairie Pothole Region

High level of wetland loss

- ***How*** Much?
- ***Since*** When?



- Projected loss of 7,000 acres per year (0.57% rate of loss)
- Note that 1968 is the baseline year

Benefits of Wetlands

- Water filtration:
  - 0.043 tonnes/acre/yr N
  - 0.009 tonnes/acre/yr P
- Soil stabilization: 6.5 tonnes/acre/yr
- Flood control: 1200 m^3/acre/yr
- Carbon sequestration: ~4 tonnes/acre/yr
- Biodiversity: production of waterfowl (?)

How to communicate this information to a respondent?

Translated

At the current rate of loss, by 2020 wetlands will provide the following services:

- Removal of nutrients equivalent to 45 semi-truck loads of fertilizer
- Provide storage for 9 million cubic meters of flood water
- Prevent loss of 50,000 tonnes of eroded soils
- Store carbon equivalent to 6,000 cars on provincial roads
- Provide habitat to produce 58,000 breeding pairs of ducks

If Programs Restore XX% of Wetlands that existed in 1968:

by 2020 wetlands will provide the following services:

- Removal of nutrients equivalent to XX semi-truck loads of fertilizer
- Provide storage for X million cubic meters of flood water
- Prevent loss of XX,XXX tonnes of eroded soils
- Store carbon equivalent to X,XXX cars on provincial roads
- Provide habitats to produce XX,XXX breeding pairs of ducks

But Wetlands also Impose Costs

- **Opportunity Costs:** Lost cultivated acreage translates to lower yields
- **Nuisance Costs**: time spent driving around potholes, increased fuel consumption, seed overlap
- **Restoration Costs** – unplugging drains, etc
- **Crop Damage** - Wildlife feeding on crops – especially waterfowl!
- **Tradeoffs** – less funds available for other programs such as health care, infrastructure development, education, etc.

Mechanisms to Address Hypothetical Bias and other Issues

- Used a cheap talk script
- Reminded respondents of budget and substitutes
- Uncertainty scale used for the votes
  - How certain are you of your vote?
  - Recode Uncertain “YES” to “NO”
- Used debriefing questions
  - why they voted for current situation; why they voted for a proposed program
  - Identification of “yea-sayers”

Pre-Briefing Script

Design Issues: hypothetical bias, strategic behaviour, scope etc.

Cheap Talk Script

PLEASE NOTE: Research has shown that how people vote on a survey is often not a reliable indication of how people would actually vote at the polls. In surveys, some people ignore the monetary and other sacrifices they would really have to make if their vote won a majority and became law. We call this hypothetical bias. In surveys that ask people if they would pay more for certain services, research has found that people may say that they would pay 50% more than they actually will in real transactions.

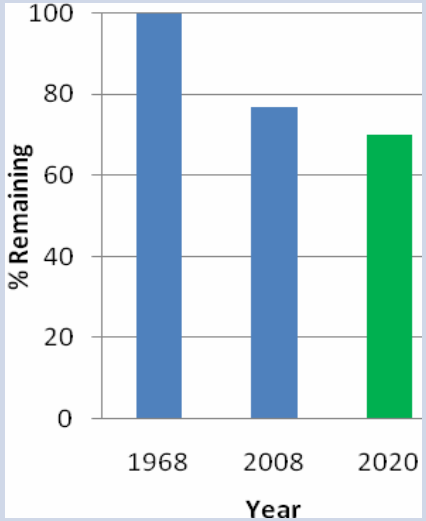
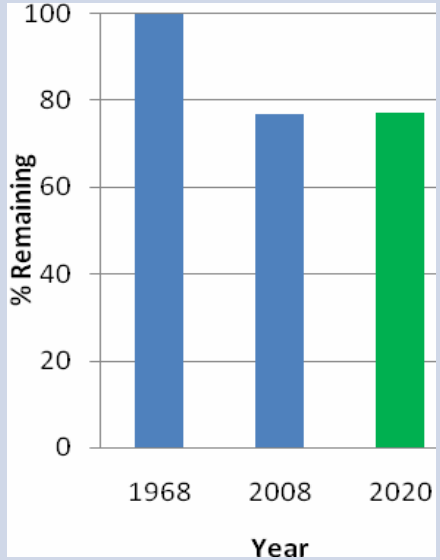
It is very important that you "vote" as if this were a real vote. You need to imagine that you actually have to dig into your household budget and pay the additional costs.

Reminder of what is to follow and to treat each vote independently

- **You will now vote 5 times**
- **Assume that the options on EACH SCREEN are the ONLY ones available**
- **Each time, please vote independently from the other votes - do not compare options on different screens**

Valuation Scenarios

- Each respondent voted 5 times between the current situation and a proposed restoration program
  - Referendum binary choice format
  - Order of votes randomized
  - Tax level in each vote randomized
- Attributes and levels describing the proposed programs
  - Wetland Restoration targets:
    - 77% - 80% - 83% - 89% - 100%
  - Prices (Tax imposed) of the proposed programs randomly assigned
    - $50 - $100 - $200 - $350 - $600

Vote	The Current Trend	A Proposed Program
Wetland Area Targets	Results in further wetland loss: 77% of 1968 wetlands currently remain in southern Manitoba, but this will decline to 70% (950,000 acres) by 2020. 	**Maintain** wetlands at their current level through 2020, which is **77%** (1,000,000 acres) of 1968 levels in southern Manitoba 
Water Quality *By 2020 wetlands will annually filter the equivalent of about:*	4500 semi-truck loads of fertilizer	5000 semi-truck loads of fertilizer
Flood Control *By 2020 wetlands will annually control about:*	1.1 billion cubic meters of water	1.2 billion cubic meters of water
Soil Erosion *By 2020 wetlands will annually control about:*	6 million tonnes of soil from being eroded	6.8 million tonnes of soil from being eroded
Wildlife Habitat *By 2020 wetlands will annually provide habitat for about:*	58,000 breeding pairs of ducks	63,000 breeding pairs of ducks
Carbon Capture and Storage *By 2020 wetlands will annually store carbon equivalent to the emissions of about:*	740,000 cars	800,000 cars
Your household's annual share investment paid through tax increases for the next 5 years, 2008-2012	$0 annually for 5 years	$ annually for 5 years

The Referendum Question

Question 10a. Please carefully compare the two alternatives presented in the table above. If you had to vote on these two options, which one would you choose?

Please treat independently from all other votes. Please mark one box only.

Current Trend □ ***Proposed Program*** □

Question 10b. How confident are you that this is the choice you would make if this was an actual referendum? *Choose one only.*

- 1. Very uncertain
- 2. Somewhat uncertain
- 3. Somewhat certain
- 4. Very certain

Development of Survey

- Formed an Expert Advisory Group
  - Wetland experts, agriculture experts
  - Used to assist in survey design (content)
- Held a focus groups of other experts
  - “sniff-test” of content and process
- Held a focus group of graduate students
  - Editing, formatting etc.
- Held 3 focus groups with randomly drawn Manitobans (each group about 10-11 in size)
  - 2 in Winnipeg, 1 in Brandon
- Held 1 focus group with agricultural producers

Development of Survey

- These procedures ensured:
  - Consequentiality of the voting scenarios
  - Construction of the vector of tax levels
  - Ensured information was pertinent, balanced, and not too onerous in length and depth
  - Checked for bias in terms of pushing respondents to vote YES for programs
  - Time taken to complete survey

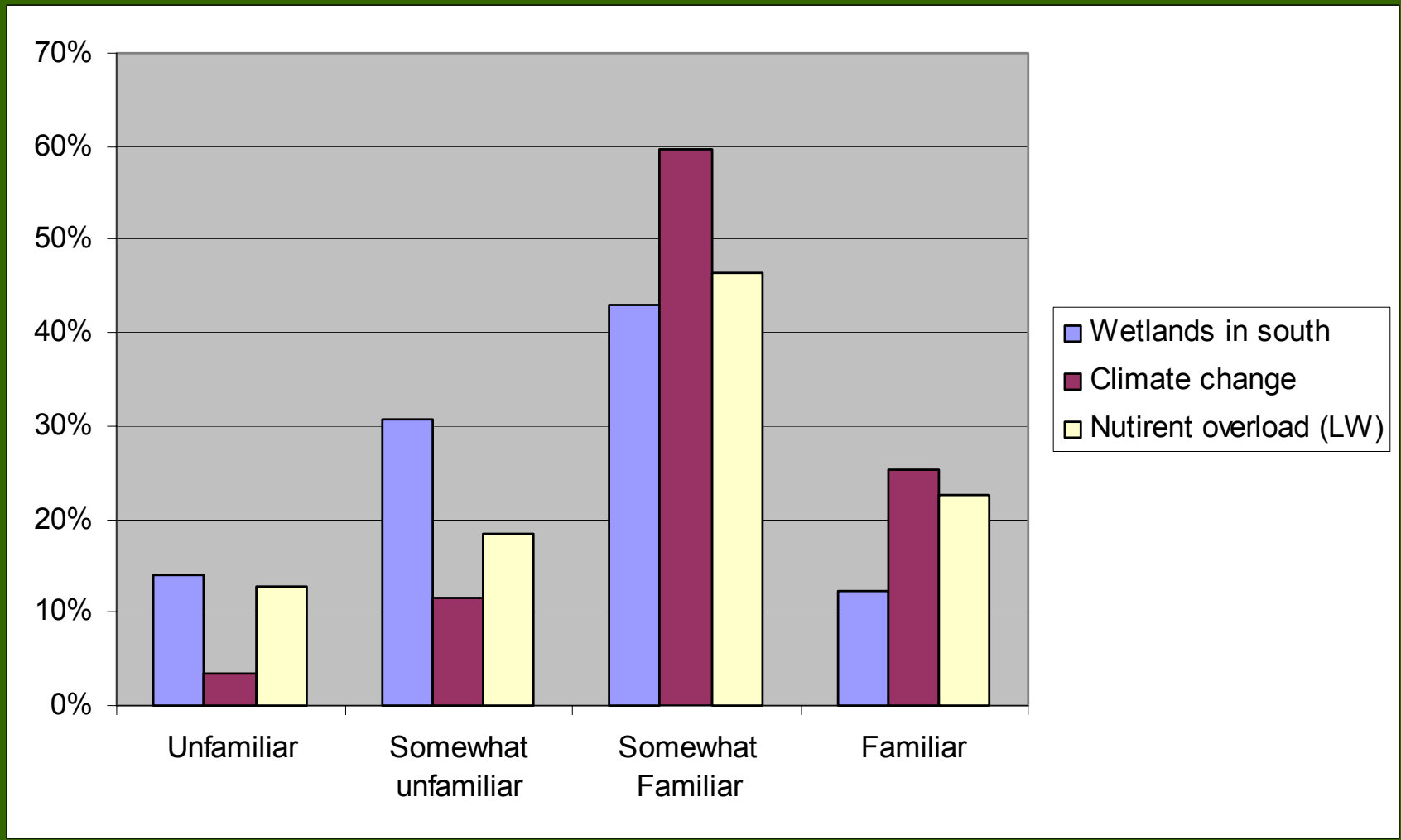
Survey Administration

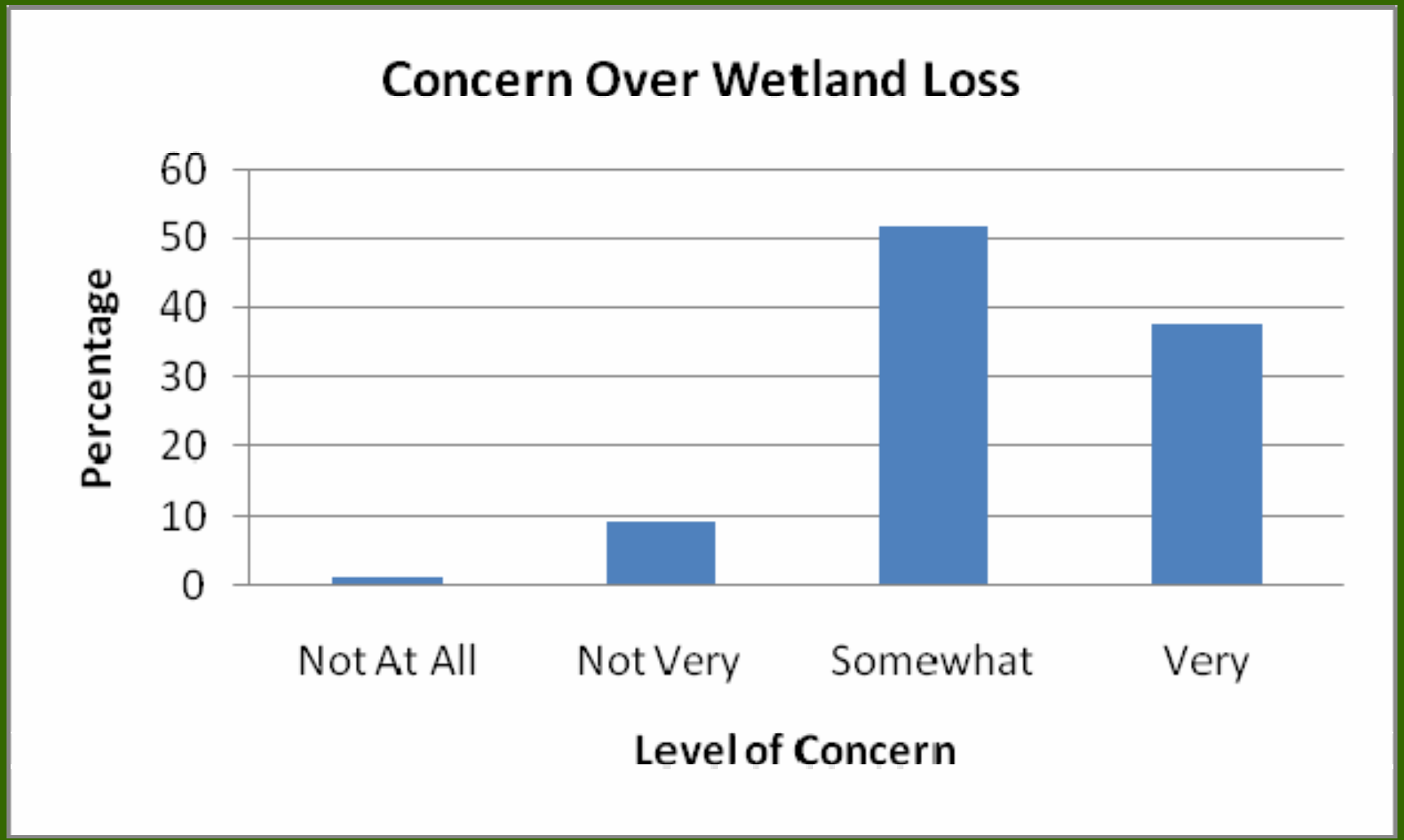
- Mode of administration: Internet
  - a number of different advantages
- Ipsos Reid contracted
  - Maintains a panel of 10,000 Manitobans
  - Refreshes panel to ensure representativeness
- Two pilot samples used to further test
  - 353 and 446 respondents respectively
  - Used to further adjust tax levels
- Full sample size - 2000 respondents
  - 1000 in each version

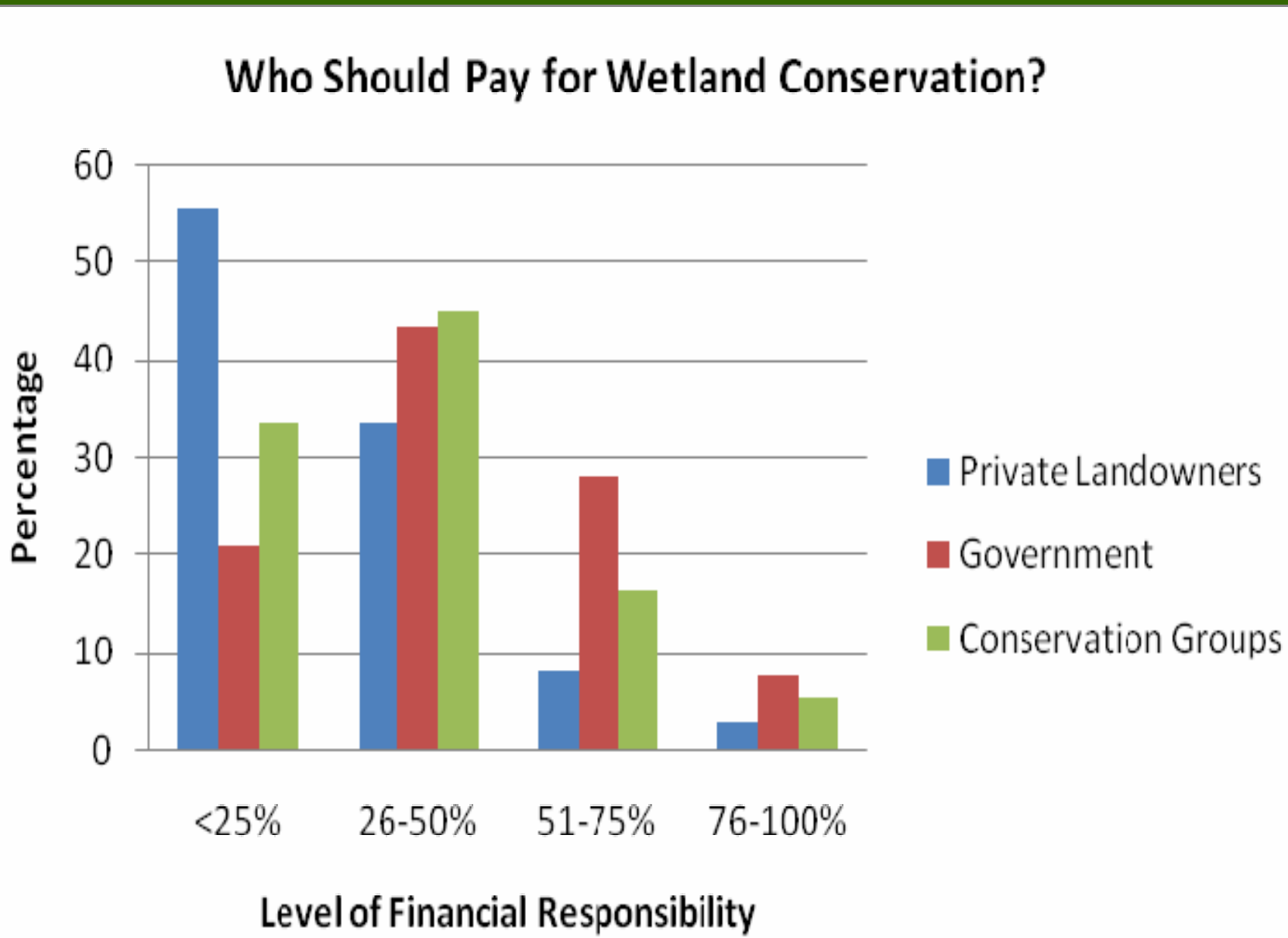
General Results

- % of respondents who felt government could do MORE to:
  - 70%: protect the environment
  - 77%: reduce crime
  - 86%: improve roads and highways
  - 86%: improve health care
  - 66%: lower taxes

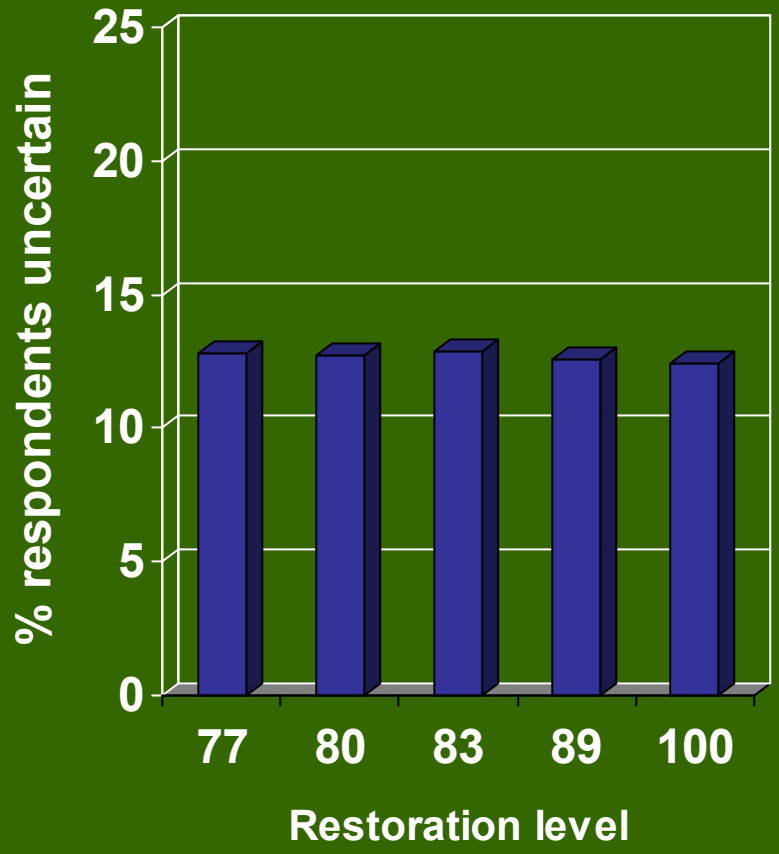
Familiarity with Environmental Issues

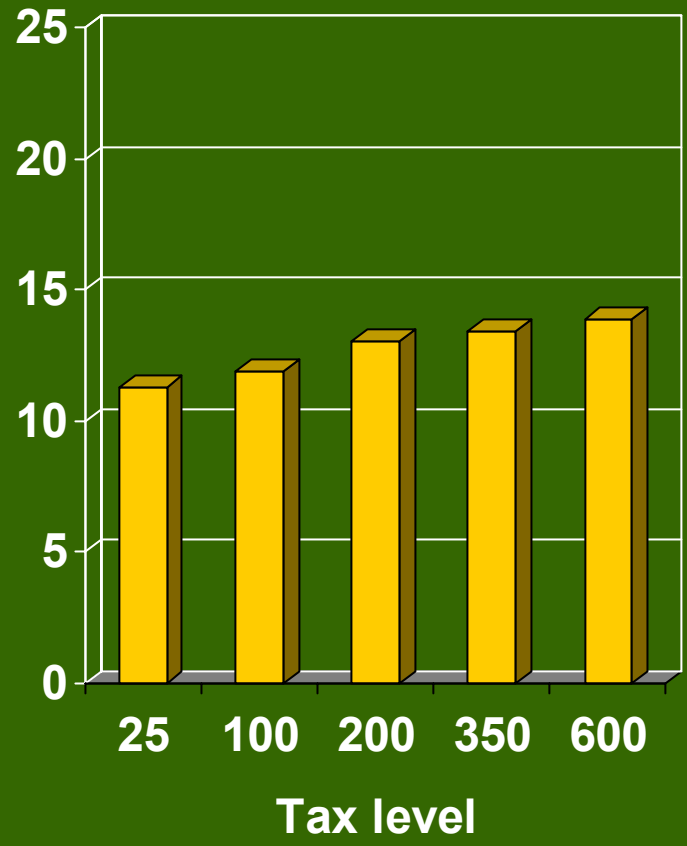



Concern Over Wetland Loss
Percentage
60
50
40
30
20
10
0
Not At All
Not Very
Somewhat
Very
Level of Concern

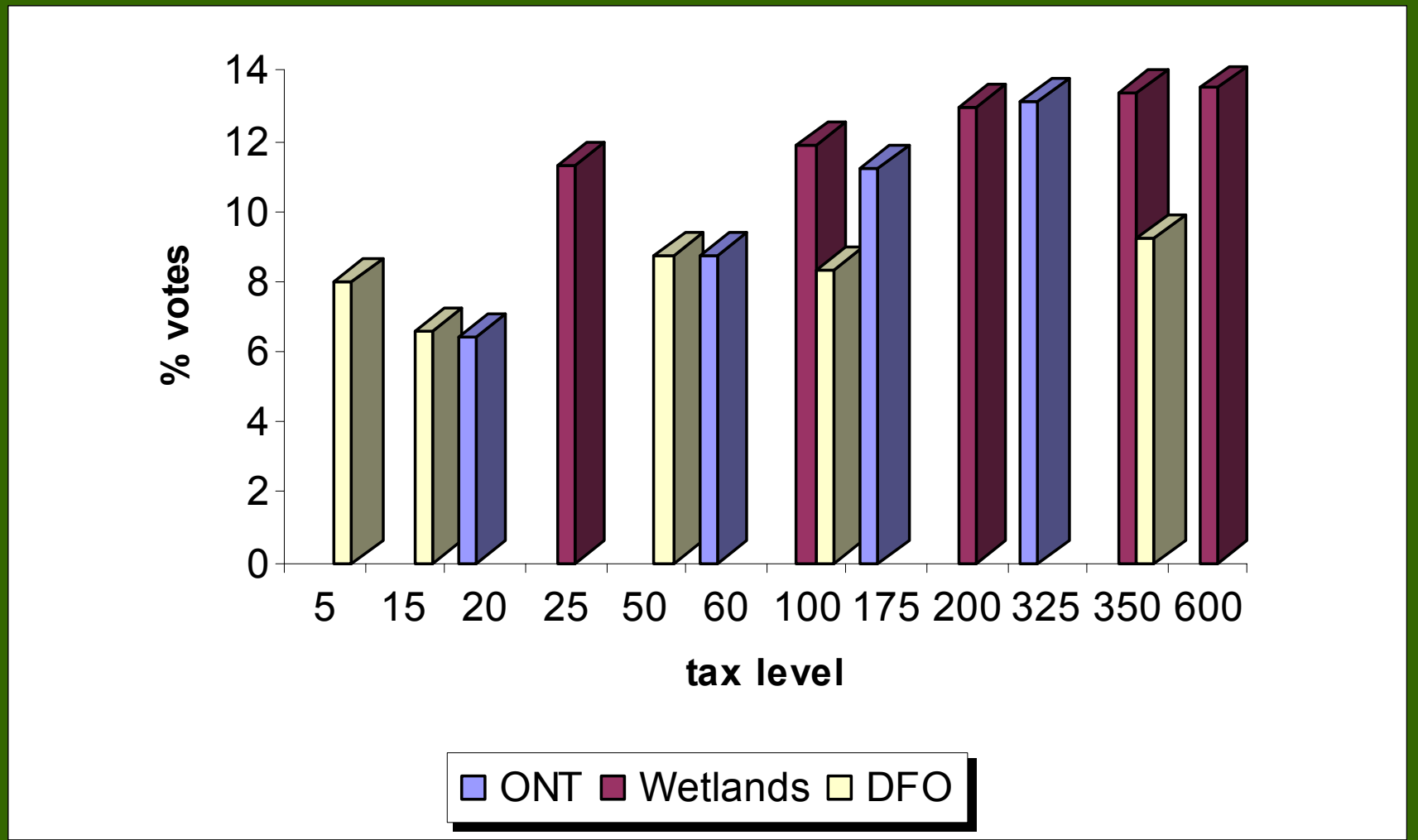

Who Should Pay for Wetland Conservation?
60
50
40
30
20
10
0
Percentage
<25%
26-50%
51-75%
76-100%
Level of Financial Responsibility
Private Landowners
Government
Conservation Groups

Levels of Voting Uncertainty Found

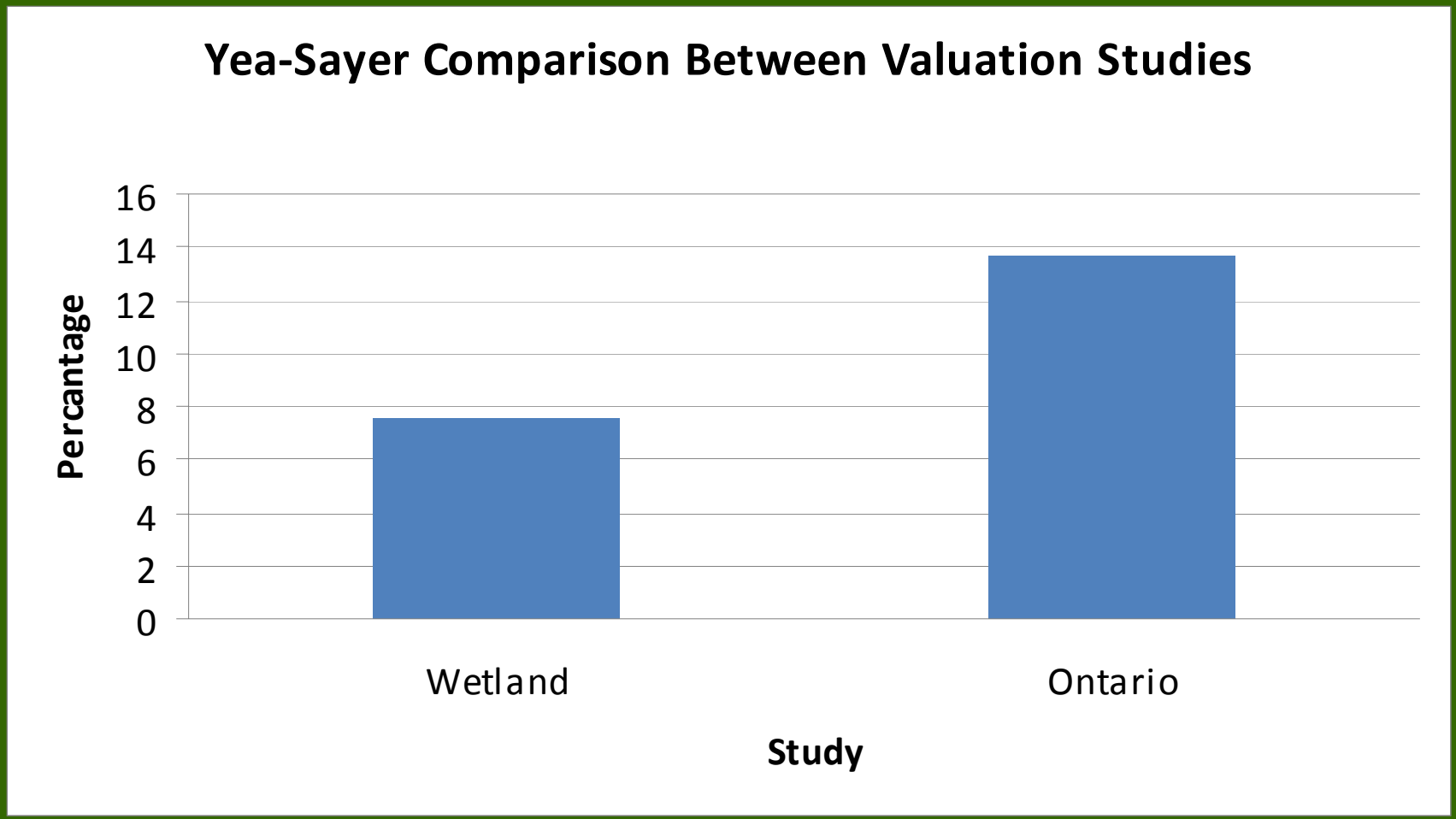




Comparison with Other Studies

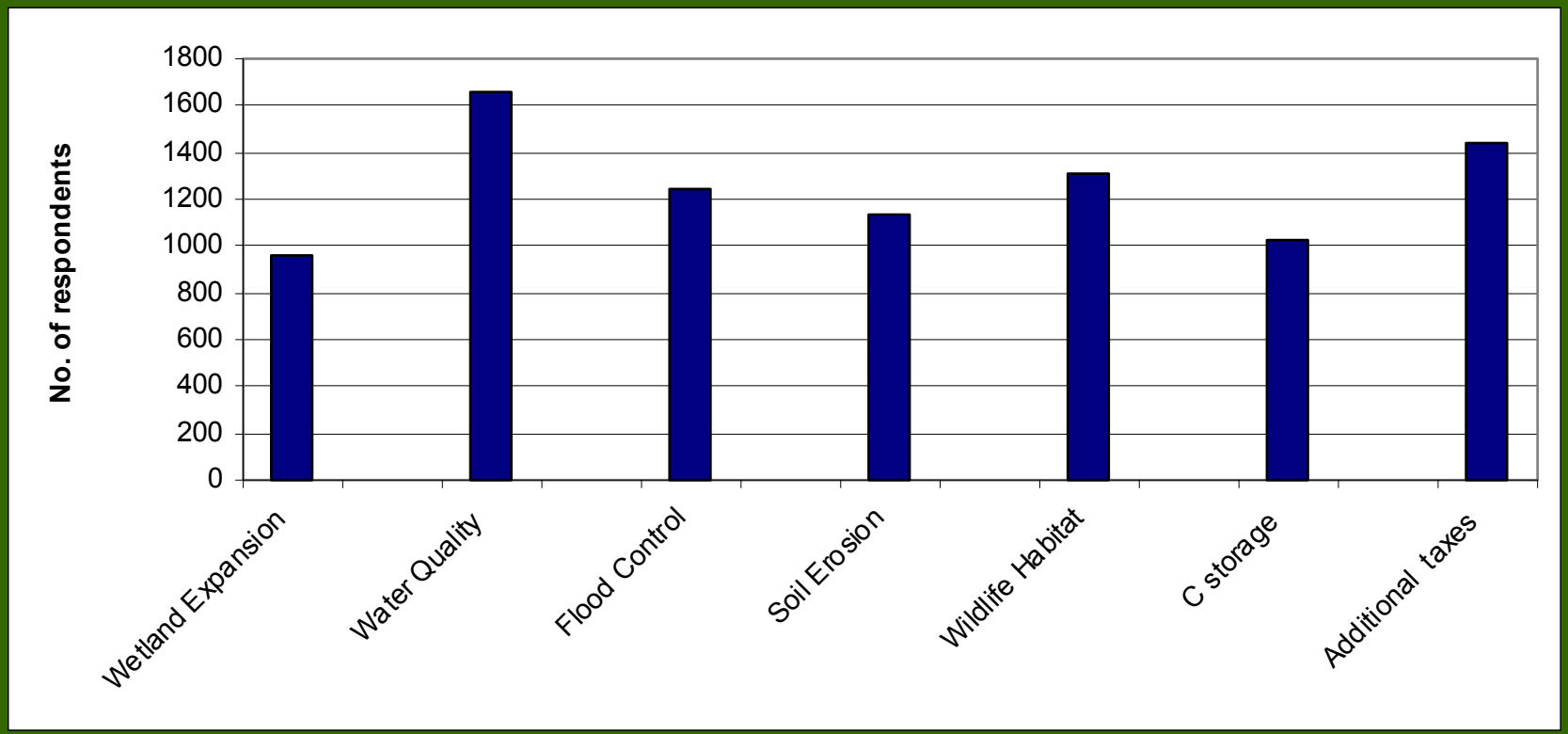


Comparison of Yea-Sayers



Which program attributes were important in voting?

Extremely and Very Important attributes:
Water Quality & Price of the proposed programs (taxes)



Econometric Analysis

- Develop explanators of voting behaviour
- Used a binary logit model which assesses the probability of voting “YES”
- Uses maximum likelihood procedures
- Can be fancy
  - Random coefficients, latent class, panel data procedures etc.
  - But not right now

Results of Tests of Scope

	All	1st Vote	2nd Vote	3rd Vote	4th Vote	5th Vote
Retention	271.67	463.87	318.88	225.28	272.51	175.42
S.D	17.60	951.00	45.67	39.72	29.83	44.44
Restoration to 100%	359.48	519.39	380.75	405.55	396.45	359.96
S.D.	21.17	390.00	40.02	35.65	28.06	20.85

Basic Econometric Modeling

- Used just the “design” variables
  - Restoration level, tax level
- Included demographic variables
  - Income, male, age, household size
- Included possibly “endogenous” variables
  - membership in enviro orgs, visited a park in Manitoba, attitudinal score on New Environmental Paradigm Scale

Econometric Results

- Most results as expected!!
- Tax negative and highly significant
  - People do not like to pay taxes *ceterus paribus*
  - Universally found in all economic studies
  - Downward sloping demand curve
- Restoration positive and highly significant
  - Increased restoration is preferred

Results continued

- Income positive and significant
  - Higher incomes tend to vote for wetland programs
- Male negative and insignificant
- Age positive and significant
  - Older people tend to vote for the programs
- Household size negative and significant
  - Larger households with more kids tend to vote against programs
- Residency matters in some cases
  - Brandon respondents tend to vote for wetland programs
  - Rural residence and other towns not significant

Results continued

- Members of environmental orgs positive and significant
  - Members tend to vote for the wetland programs
- Visiting a park in Manitoba positive and significant
  - Visitors tend to vote for the wetland programs

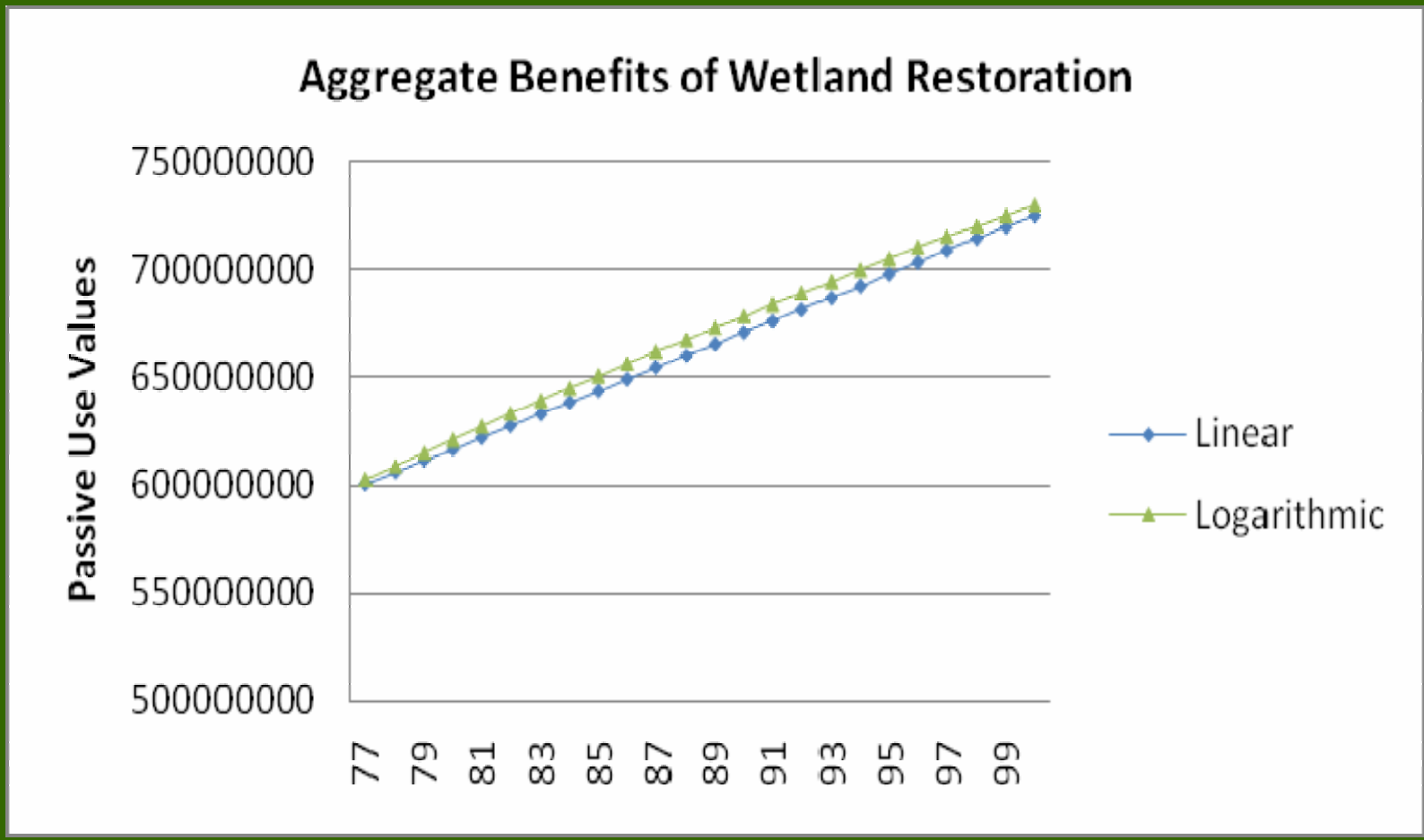
Valuation Estimates

- Retention:
  - $294.02/household/yr over 5 years (SD=$11.56)
- Low Levels of Restoration:
  - $315.67/household/yr over 5 years
  - (SD= $8.33)
- High Levels of Restoration:
  - $357.75/household/yr over 5 years (SD=$15.57)

Gross Estimates

- These are per household estimates
- Need to multiply by number of households in Manitoba as this is a provincial survey
  - 448,765 household; 2006 census
- Also discounting issues because payments over 5 years involved

$$NPV_i = \sum_{t=1}^{5} \frac{WTP_i^t}{(1+r)^t}$$



Household WTP x 5 years discounted x total # households

Retention = $ 600 million
Low Restoration = $ 640 million
High Restoration = $ 730 million

Conclusions

- There is significant demand for wetland restoration
- Need to compare this with the cost and supply-side information to develop economically efficient programs
  - NOTE the STC research to be reported tomorrow
- This ACAAF study points the way forward as to the information required and some of the methods that can be employed

The Research Team Thanks:

- ACAAF – Ducks Unlimited for funding support and advice
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