

Valuing Indigenous Biodiversity

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Foundation for Research Science & Technology



Outline

- Objectives
- Methods
- Case studies
 - Results
- Decision Support System

Objectives

1. Identify money values of native species
2. Compare species' values to other values
3. Develop a decision support system to assist in integrating indigenous biodiversity values with other values associated with invasive species
4. Potential use in CBA

Method

- Valuation: Choice experiments
 - Decide on object(s) of study
 - Focus groups
 - Design the experiments
 - Data collection in selected communities
 - Statistical analysis
- Four valuation case studies
 - Marine: European shore crab
 - Freshwater: Hydrilla
 - South Island High Country: Wilding pines
 - Beech Forest: Wasps

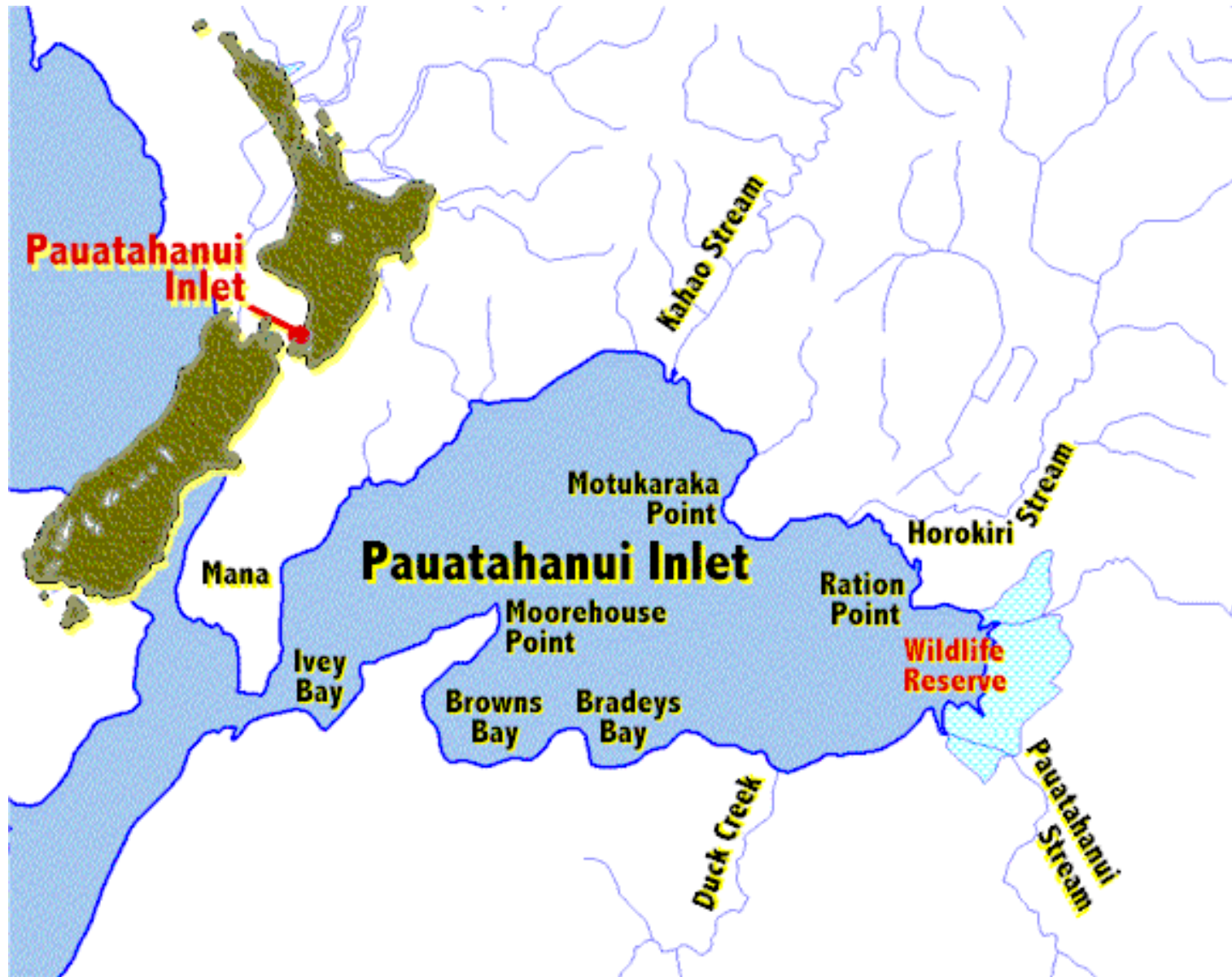
Coastal Marine: Potential invasive crab

European shore crab Not yet arrived in NZ

High on Biosecurity NZ's list of potential invasive species

Listed among the 100 'world's worst invasive alien species'
















Payment mechanism

1. Reallocation

- Respondents asked to reallocate existing government expenditure
- Tested with non-significant results

2. Special tax

- A tax on households aligns with individual utility maximisation
- Gave statistically significant results

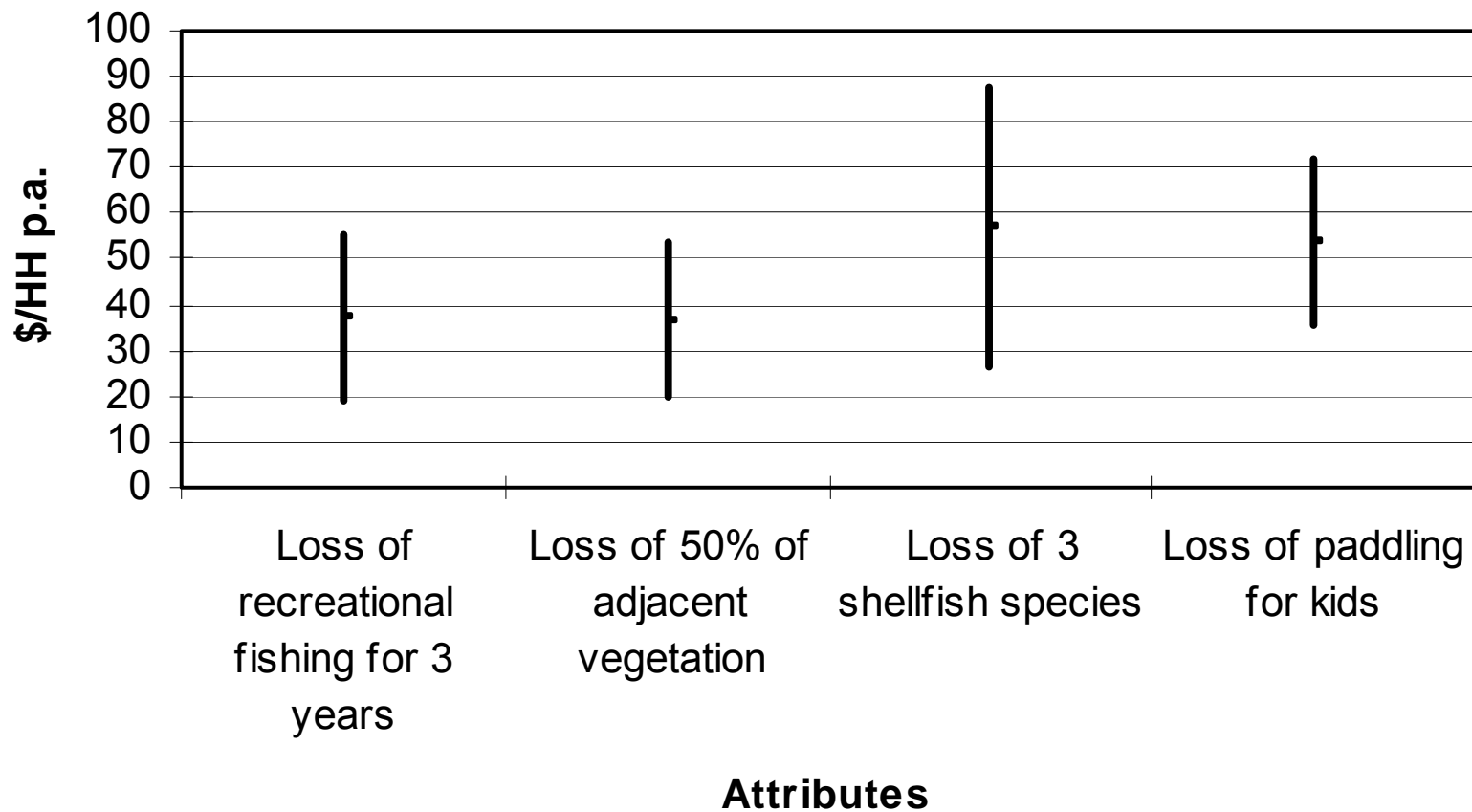
<p>Question 1: Options A, B and C Please choose the option you prefer By ticking ONE box</p>			
	Option A	Option B	Option C
Recreational shellfish take for 3 years	 Same as now	 No fishing	 No fishing
% vegetation dies	<p>50% dies</p> 	<p>10% dies</p> 	<p>50% dies</p> 
Number of shellfish species that disappear	 3 disappear	 Same as now	 3 disappear
Children paddling on water's edge	No	Yes	No
Cost to your household each year for 3 years	\$25	\$100	\$0
I would choose	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C

Estimates of WTP

\$/HH p.a.

	Mean	$X \leq 2.5\%$	$X \geq 97.5\%$
Loss of recreational fishing for 3 yrs	37	19	56
Loss of adjacent vegetation	37	20	54
Loss of 3 shellfish species	57	27	87
Loss of paddling for kids	54	36	72

WTP - Mean & 95% Confidence Intervals



Estimates of WTP

PV over 3 years for district (3,372 HH)

\$'000	Mean	$X \leq 2.5\%$	$X \geq 97.5\%$
Loss of recreational fishing for 3 yrs	340	170	510
Loss of adjacent vegetation	340	180	490
Loss of 3 shellfish species	530	250	810
Loss of paddling for kids	500	330	660
Total	1,710	930	2,470

Lake Rotoroa (Hamilton Lake)











no-BELL
PANY LTD.



Hydrilla

(hydrilla verticillata)

An invasive weed that grows underwater

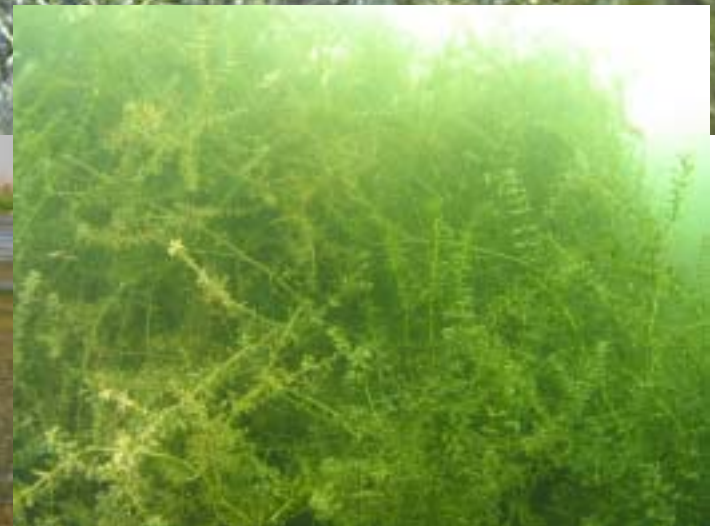


One of the worlds' worst because:

- It is very difficult to get rid of – spread by dormant compressed shoots, chemicals not very effective
- It can spread quickly among a variety of habitats
- It excludes other plant species
- It can cause significant economic, social and environmental damage

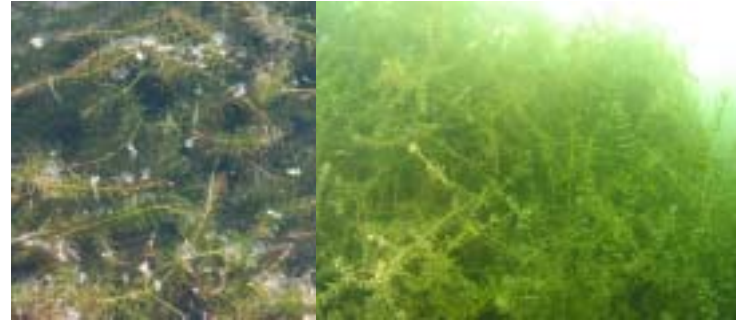
Hydrilla

The impact on a freshwater ecosystem can be very prolific



Hydrilla

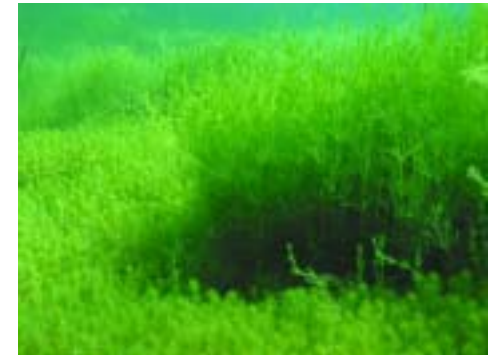
(exotic underwater weed)



- Currently there is no hydrilla in Lake Rotoroa
- There are other weeds – mainly Egeria (an oxygen weed). This is under control at present.
- If hydrilla invaded it could potentially overcome all the vegetation in the lake (i.e. 100% cover)
- Lake Rotoroa is a high use lake – if it established there, the risk of hydrilla spreading to other lakes in New Zealand would be significantly increased

Charophytes

(native underwater plants)



- Currently 21% lake bed cover
- They absorb nutrients and help to stabilise bottom sediments
- Charophytes are internationally recognised as a species group under threat
- A hydrilla invasion will reduce or even eliminate the Charophytes from Lake Rotoroa
- If destroyed, Charophytes can recover from seed banks, but this would take many years
- A sustained hydrilla invasion may degrade the Charophyte seed banks eventually preventing recovery

Charopytes vs. Hydrilla



Thanks go to
NIWA for the
photos



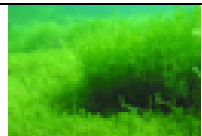






Choice survey process

- Focus groups – MAFBNZ, Wn and Ham
 - Convenience sample – priors
 - Sub-samples
 - Rotoroa (44)
 - Hamilton (56)
 - Morrinsville (65)
 - Wellington (64)
- Waikato Region (165)

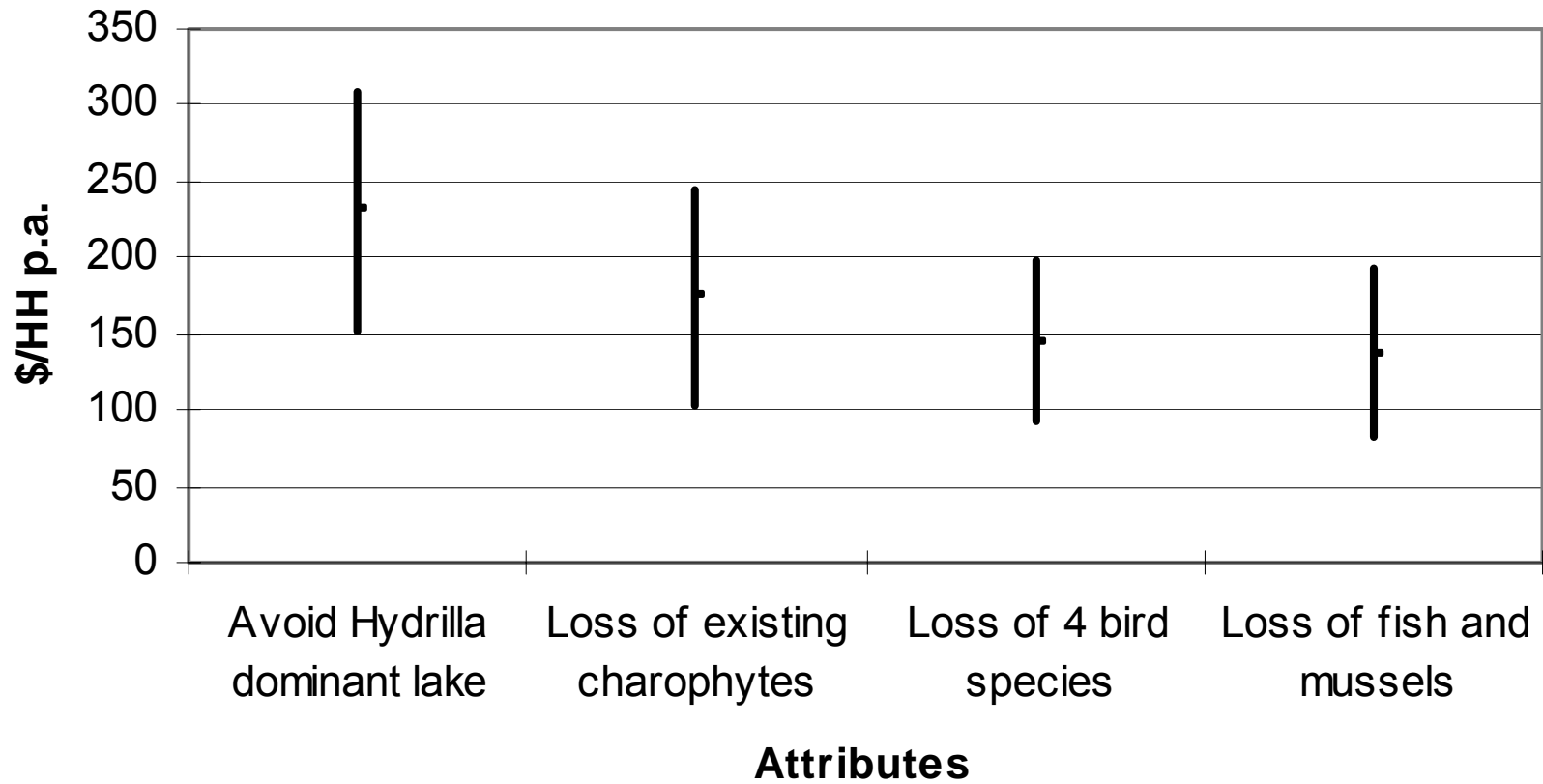
Sample choice question

Question 1:

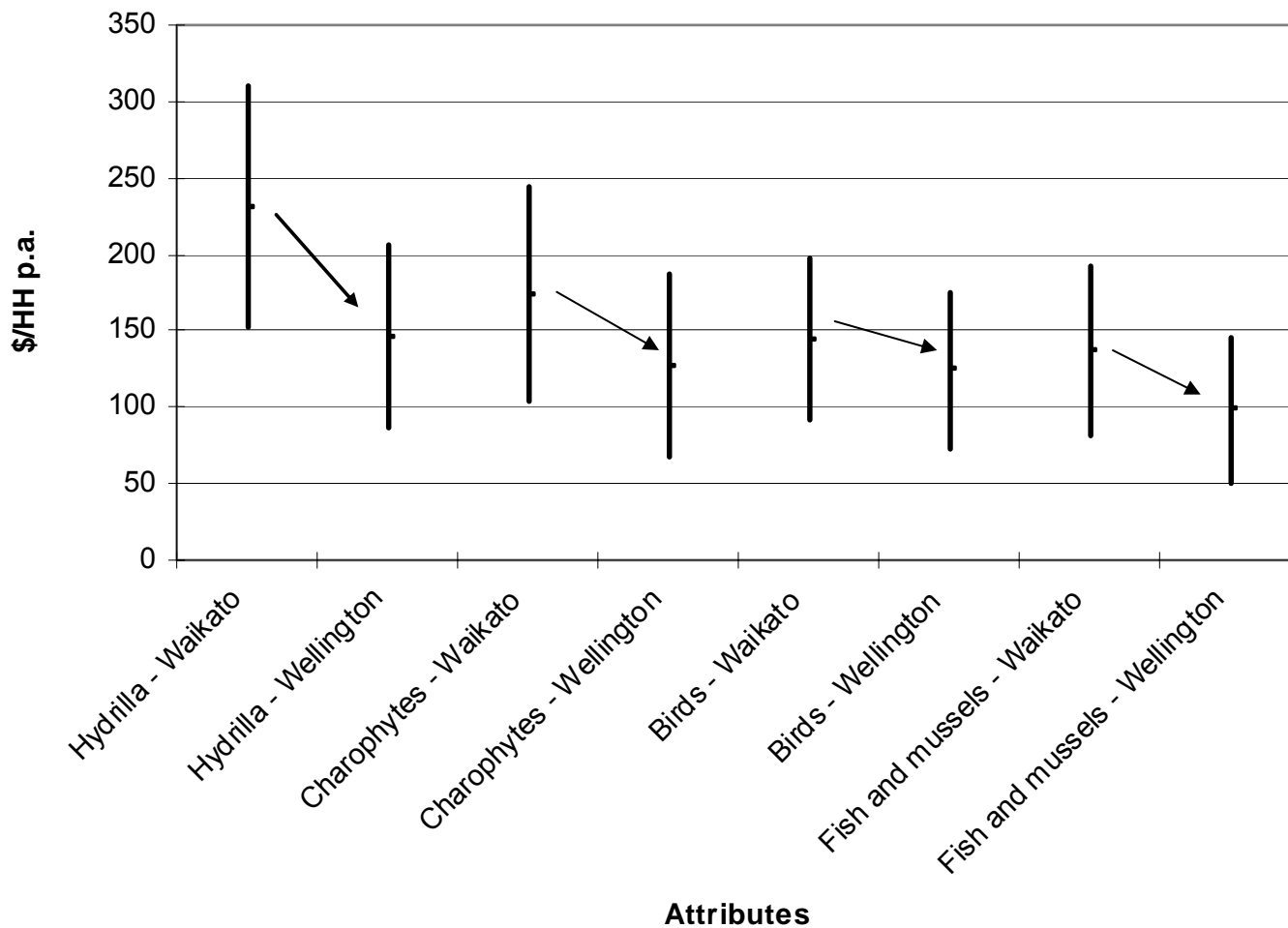
Options A, B and C
Please choose the option you prefer
By ticking ONE box

	Option A	Option B	Option C
Extent of hydrilla	 100% coverage	 30% coverage	No hydrilla
Water quality and clarity	Significant deterioration	OK Same as now	OK Same as now
Coverage of native submerged plants	Eliminated from lake	Eliminated from lake	 Same as now at 21% cover
Number of native bird species	 All 4 shag species do not visit the lake anymore	 3 shag species do not visit the lake anymore	 2 shag species do not visit the lake anymore
Fish and mussels	 2 fish species and mussels disappear from the lake	 Mussels disappear from the lake	 1 species of fish and mussels disappear from the lake
Cost to your household each year for 5 years	\$0	\$160	\$20
I would choose <input checked="" type="checkbox"/>	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C

Waikato Region: WTP - Mean & 95% Confidence intervals



Waikato v Wellington WTP



Distance decay effect

Attribute	Location	Mean WTP \$/HH p.a.	95% confidence interval	Distance decay effect
Avoidance of Hydrilla dominant lake	Waikato	231	153 - 310	63%
	Wellington	146	86 - 206	
Loss of Charophytes	Waikato	174	104 - 244	73%
	Wellington	127	67 - 187	
Loss of 4 bird species	Waikato	144	92 - 197	86%
	Wellington	124	73 - 175	
Loss of fish & mussels	Waikato	137	82 - 192	72%
	Wellington	99	51 - 146	

Aggregate values

	Annual		PV over 5 years	
\$ million	Waikato Region	Wellington City	Waikato Region	Wellington City
Avoidance of Hydrilla dominant lake	26	10	110	41
Loss of Charophytes	20	9	83	36
Loss of 4 bird species	16	8	69	35
Loss of fish & mussels	16	7	65	28
Total	78	34	327	140

Conclusions

- The choice experiments worked well
- Long gestation periods
- Responses from “informed citizens”
 - not representative of the community at large
- The community
 - values native species
 - values aesthetics
 - values prevention of stings
- Differences between communities
- Differences within communities
- Relative values can be identified

Decision Support System

- A database of ecosystem information including biodiversity values
- A process for utilising this information
 - Benefit Transfer
 - Cost Benefit Analysis
 - What if analysis
- An interface to Biosecurity Risk Assessment
- More than that?

What is benefit transfer?

- Use of information from previous studies to inform decisions
- Primarily about transferring values
- But can be much broader
- It's about learning from experience
- And providing a formal process for this

History of Benefit Transfer

- US agencies – engineers, foresters, planners
- Resource Planning Act (RPA)
- Renewable Resources Planning Act 1974
- RPA values \$\$ per person per activity day
- A combination of empirical evidence, expert judgement and political screening
- Process begins to be formalised 1984
- Water Resources Research J 1992
- Point estimates to entire WTP function

Trend to increasing sophistication

- Transferring values from a study site to a policy site
- Value transfer
 - Point estimates - *WTP with its context*
 - Average of several studies
 - Administratively approved values - RPA values
- Function transfer
 - Functions or statistical models
 - Regression coefficients from a study site plugged into a transfer function using summary statistics from a policy site
 - Meta-regression
 - Pooling data
 - Summary statistics from many studies
- Function transfer more reliable than value transfers

Transfer Values

Coastal Marine	Freshwater
<ul style="list-style-type: none">•Shellfish <i>spp</i>•Kids paddling•Recreational Fishing•Vegetation	<ul style="list-style-type: none">•Hydrilla•Charophytes•Water quality•Birds•Fish/shellfish
S.I high country	Beech forest
<ul style="list-style-type: none">•Vegetation (<i>Hebe</i>)•Grasshopper•Fish (<i>Galaxias</i>)•Aesthetics	<ul style="list-style-type: none">•Insect abundance•Bird abundance•Wasp stings

Each case study has details on

- Overall Ecology
 - The ecosystem throughout NZ
 - Potential pest
 - Biosecurity issues
- Specific ecology
 - Ecosystem attributes
 - Likely impact of pest
 - Biosecurity response options

Each case study has details on

- Economic problem
- Survey design
 - Focus groups
 - Convenience sample
 - Survey samples - primary data
 - Socio-demographic characteristics
 - Attitudes
 - Site characteristics

Each case study has details on

- Choice Model
 - Valuation methodology
 - Modelling format
 - Functional form
 - Results
 - Marginal Rates of Substitution
 - Willingness to Pay
 - Statistical significance
 - Confidence intervals
 - Aggregation of values

Caveats

- True economic values cannot be observed
Benefit transfer is cheaper and more timely than an original study, but.....
- There is no universally accepted systematic set of protocols for application
- Methods for verifying, validating and calibrating are lacking
- More primary studies are needed

Discussion topics

- How can this information be used by my organisation?
- What form of presentation is most useful?
- How should it be made accessible?
- Future research?