Invasive species management & the human dimension

A few examples how the social sciences can contribute to better decision making: The case of *Elodea spp.*

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Cordova Elodea Workshop March 3rd 2014

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“It is doubtful whether universal species eradication regardless of cost is even possible, or if possible, whether it holds a moral trump card over all other priorities such as our children’s health and education.”

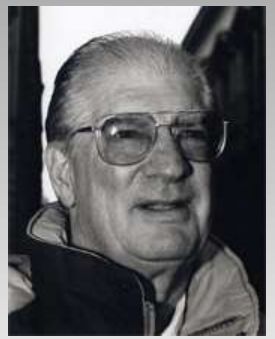
Jason F. Shogren

Education

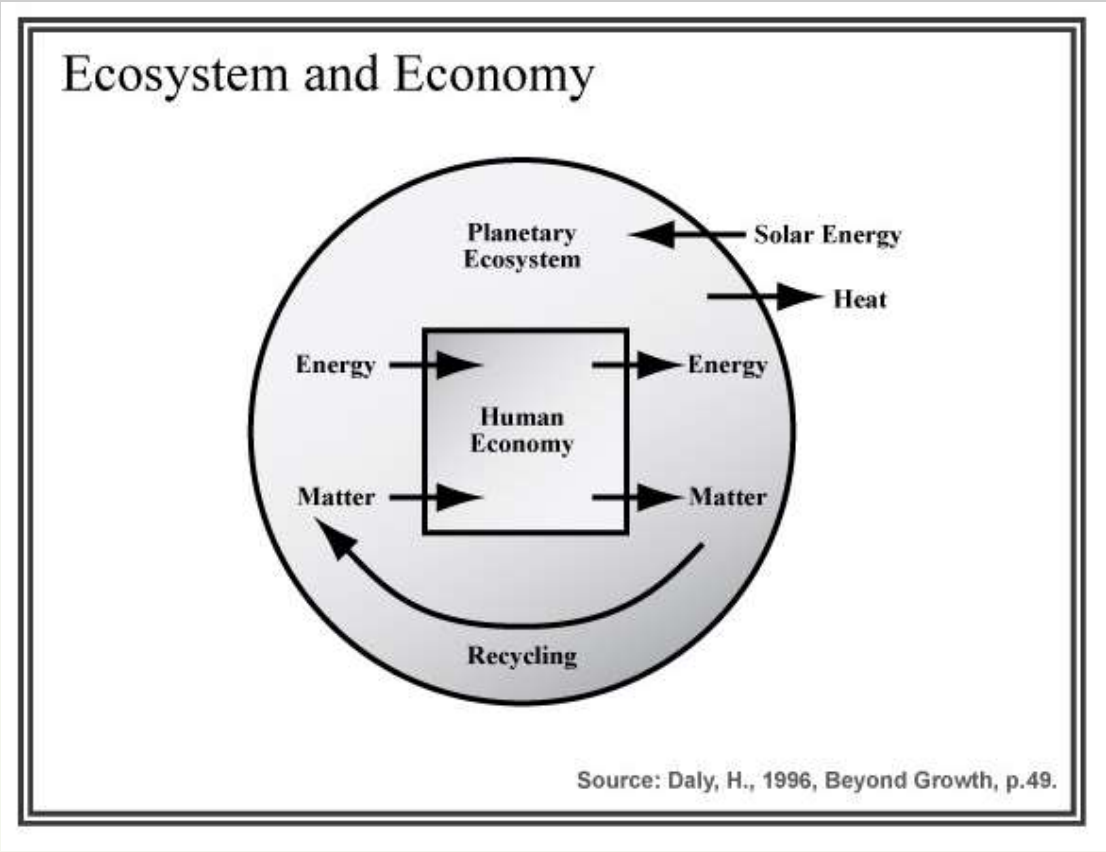
In Alaska and other energy states, low oil prices put pressure on public schools

Washington Post January 2015

Greek: Οἶκος "house"



Herman E. Daly



"The economy is a wholly owned subsidiary of the environment, not the reverse."

Why consider the human dimension in invasive species management?

We are the primary vector

We benefit from nature

We deal with change and try to be better off as a society

From risk assessment to risk management

- Optimal management action (spending $) influenced by how reliably we predict potential outcomes.
- Large uncertainties
- Willingness to *work with/account for* uncertainty rather than ignoring it.

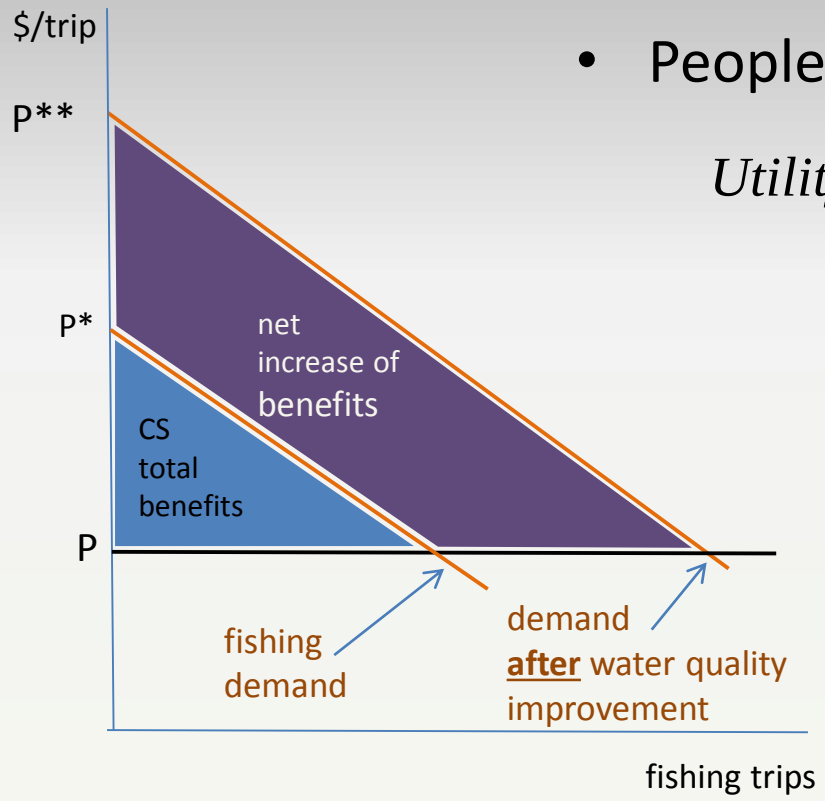
Some sources of uncertainty

- Inability to completely understand consequences
- Transferability and measurement error in predicting
  - Biophysical change
  - Economic change
  - Change is dynamic
- Type and rate of spread
- Policy irreversibility
- Treatment efficacy
- Spatial dynamics of invasion process

Some fundamental questions

- Economic:
  - How are we going to be better (best) off?
  - What are the values at stake and whose values count?
  - What are the costs of inaction/delay?
  - Are the benefits of action greater than the costs of (in)action?

Individual demand for invasive species management



- People's preferences count

$$Utility = f(goods, ES)$$

Working with uncertainty in decision making

Timely response:

- Get the best available information at the time
  - Available data & literature
  - Learn from other places
  - Include expert opinion
    (**not** a substitute for good science!)

- Decision analysis evaluating management alternatives

Past, current and upcoming Elodea-related research

1. Eliciting expert knowledge

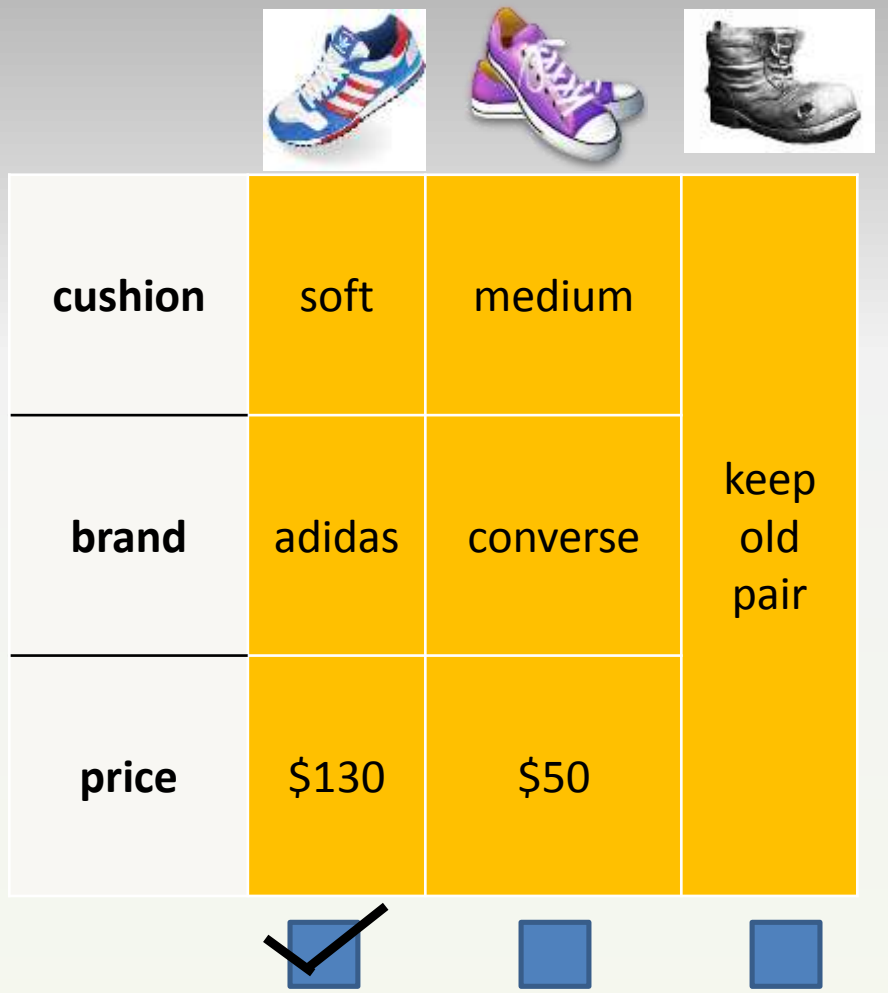
2. Results from stakeholder survey on the Kenai

3. Vector analysis in the Copper River Delta

4. Social science research this summer and fall

1. Borrowing techniques from marketing research

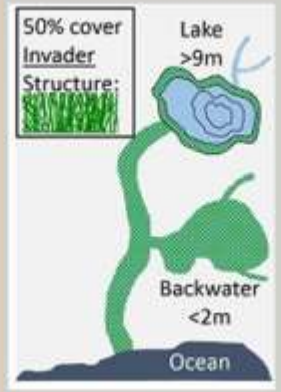
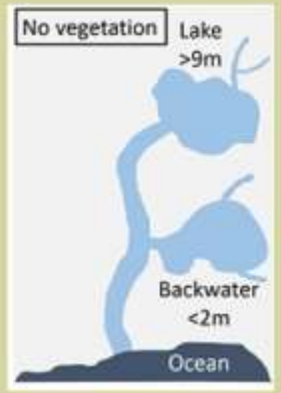
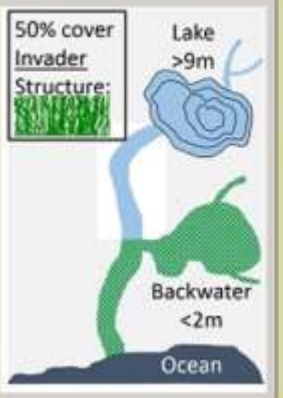
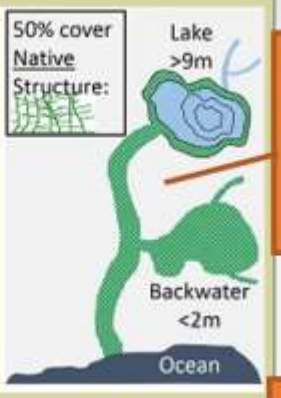
- Hypothetical market situation
- Each alternative has "utility" = U_j
- Individuals maximize U_j



Expert elicitation – a way to account for uncertainty

Habitat characteristics

Habitat scenarios

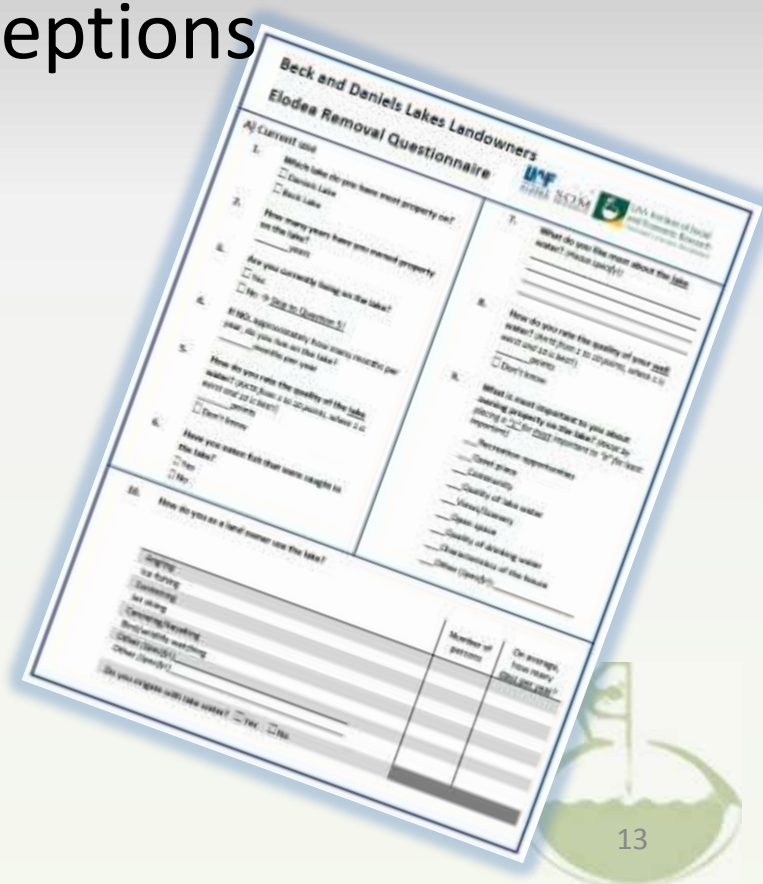
Species utilizing habitat	Chum	Coho	Sockeye	Sockeye
State of habitat	invaded	not invaded	invaded	not invaded
Invasion dynamics	boom-bust-cycle repeats every 5yrs		peak biomass persists over 30yrs	
Aquatic vegetation in habitat type				
Dissolved oxygen (mg/l 10°C)	0.5	10.5	5.5	10.5
Prey abundance	500 indiv./m² macroinvertebrates	500 indiv./m² macroinvertebrates	50 mg dry/m² zooplankton	400 mg dry/m² zooplankton
Predators/acre	20	20	20	20
Pick one per scenario!	○ Likely viable ○ Extinction possible	○ Likely viable ○ Extinction possible	○ Likely viable ○ Extinction possible	○ Likely viable ○ Extinction possible

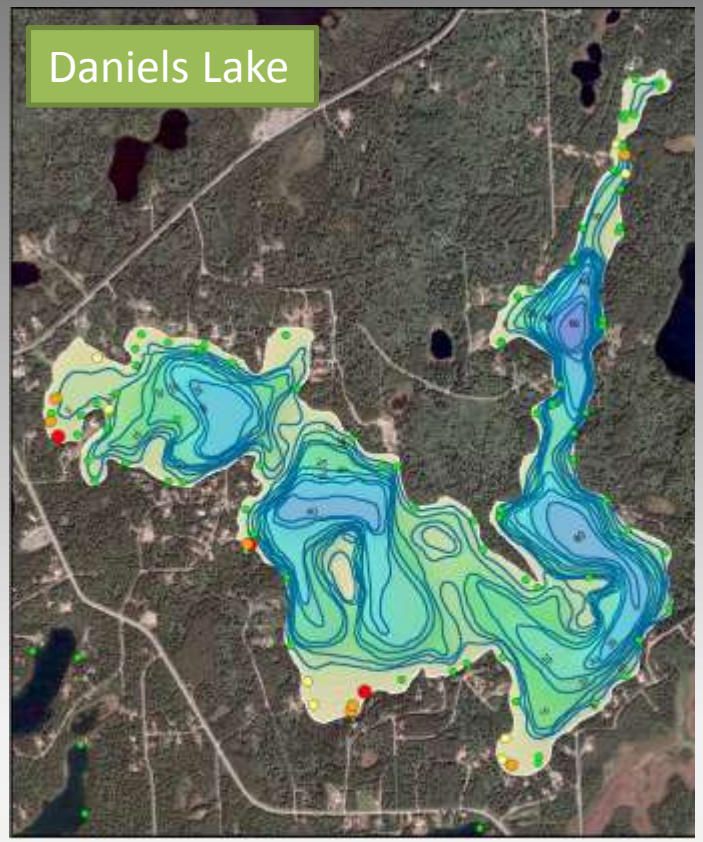
Map showing the habitat utilized by the hypothetical salmonid population

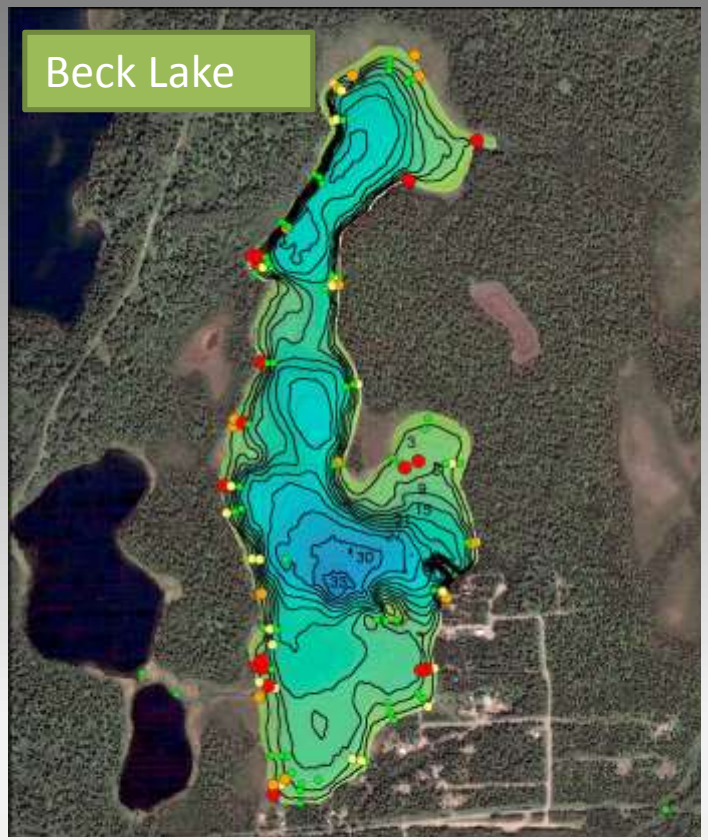
Example of a *level* related to DO

2. Lake residents survey, Kenai

- Measure awareness & outreach success
- Get a baseline on public perceptions
  - Perceived risk
- Quantify use and expected change in use



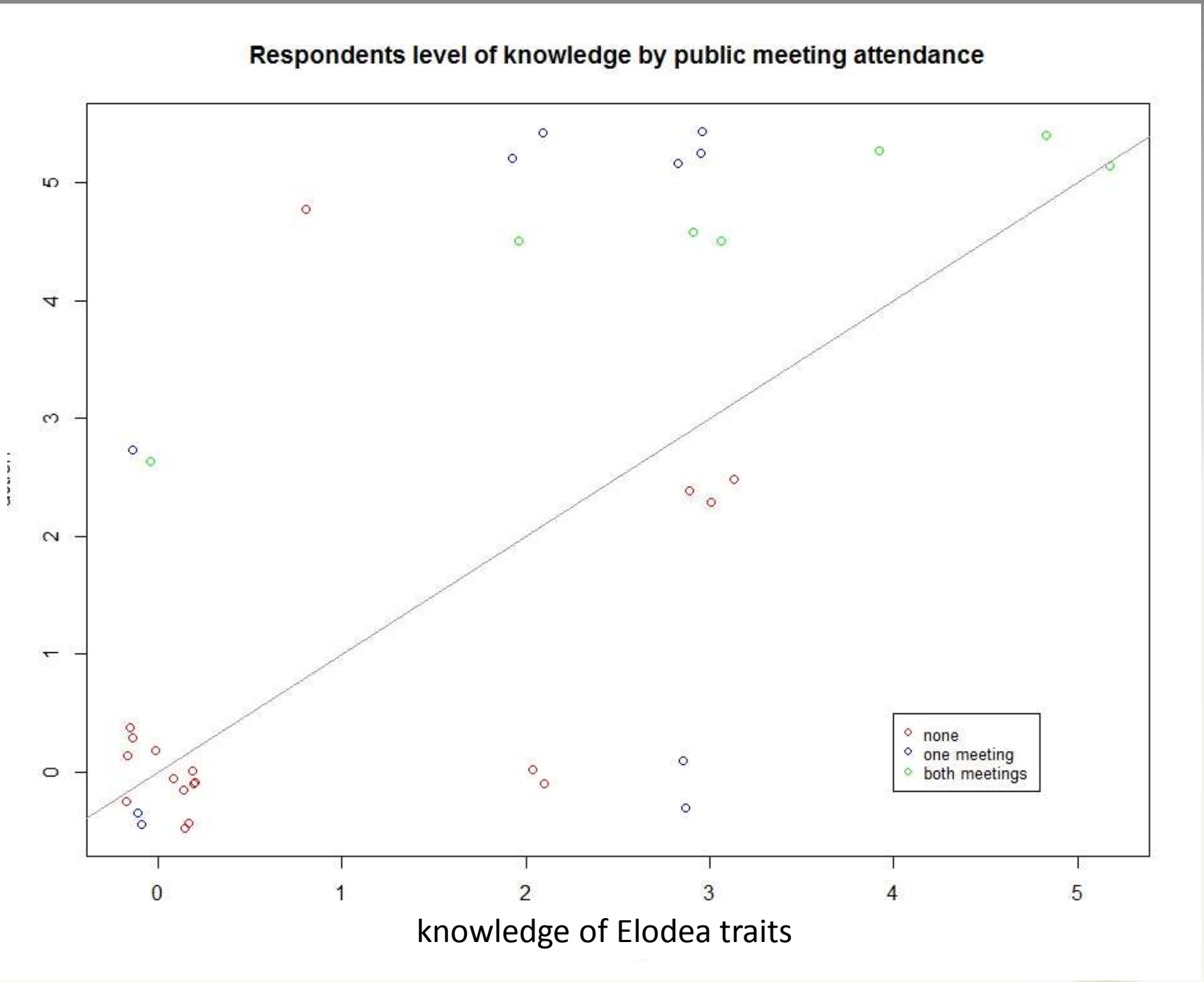




	Lake residents	Non-local property owners	Total
Initial door-to-door distribution and mailing	116	50	166
Returned mailings		4	
Responses	27	9	35
Response rate			21%

Maps: U.S. Fish and Wildlife Service, Kenai
Sample frame: Kenai Borough property records database

knowledge of mgmt action

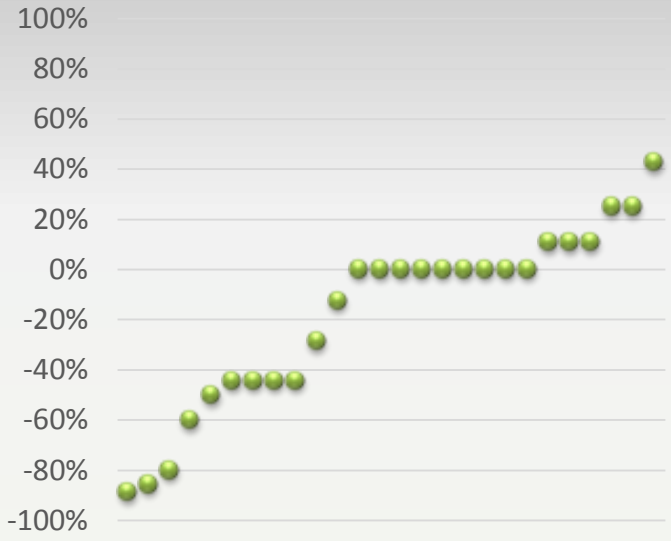


	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Don't know
"Elodea is a major threat to the lake's ecosystem, and native aquatic plants." ***(n=35)***	51%	17%	9%	9%	14%
"Elodea is a major threat to salmon and rainbow trout using the lake." ***(n=35)***	46%	17%	9%	9%	20%
"To maintain a healthy native ecosystem in the lake, chemical herbicides must be used to remove Elodea." ***(n=34)***	41%	9%	6%	18%	26%
"Non-chemical alternatives like hand pulling are just as effective as chemical pesticides in removing Elodea." ***(n=33)***	9%	9%	6%	42%	33%

Perceived risk to water quality after herbicide treatment (n=31)

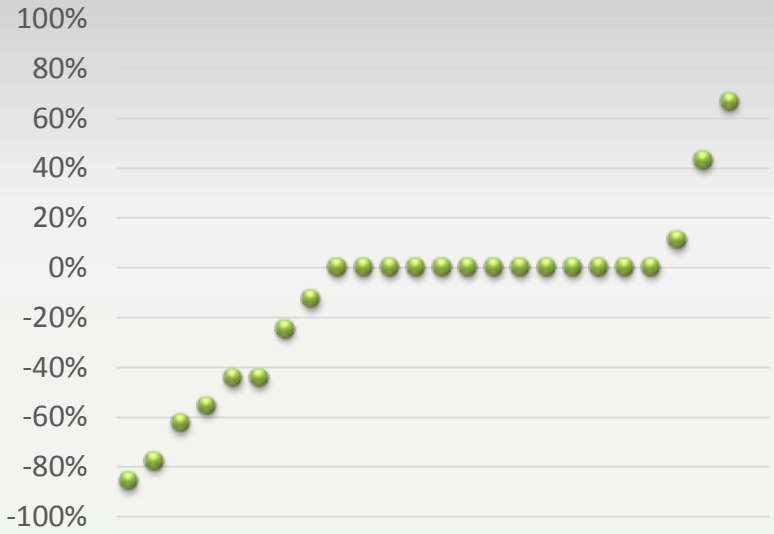
Perceived change in %

Lake water



Mean average:
– 29% expected decrease

Well water



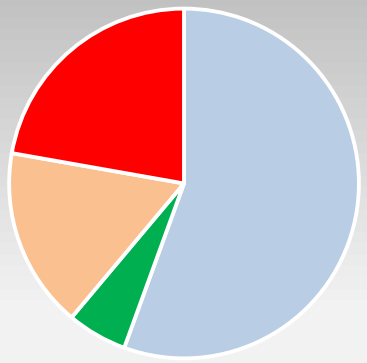
Mean average:
– 17% expected decrease

Perceived risk of eating fish from the lake after herbicide treatment (n=31)

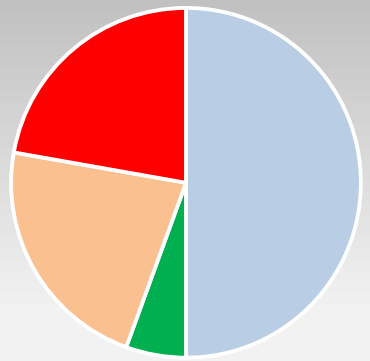
	Eat fish caught in the lake, %	Plan to eat fish after treatment, %	Stated change
Yes	74%	45%	-29%
No	26%	42%	+16%
Don’t know		13%	+13%

Stated change in use of the lake after treatment (n=31)?

Swimming

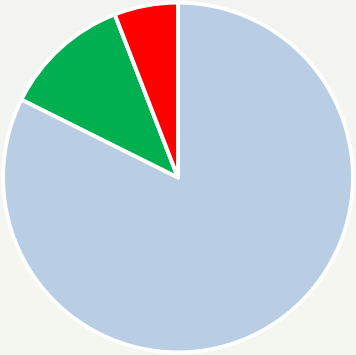


Sport fishing

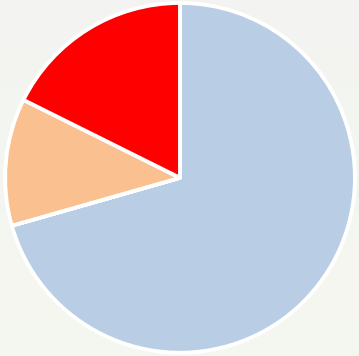


No change
More
Less
Stop

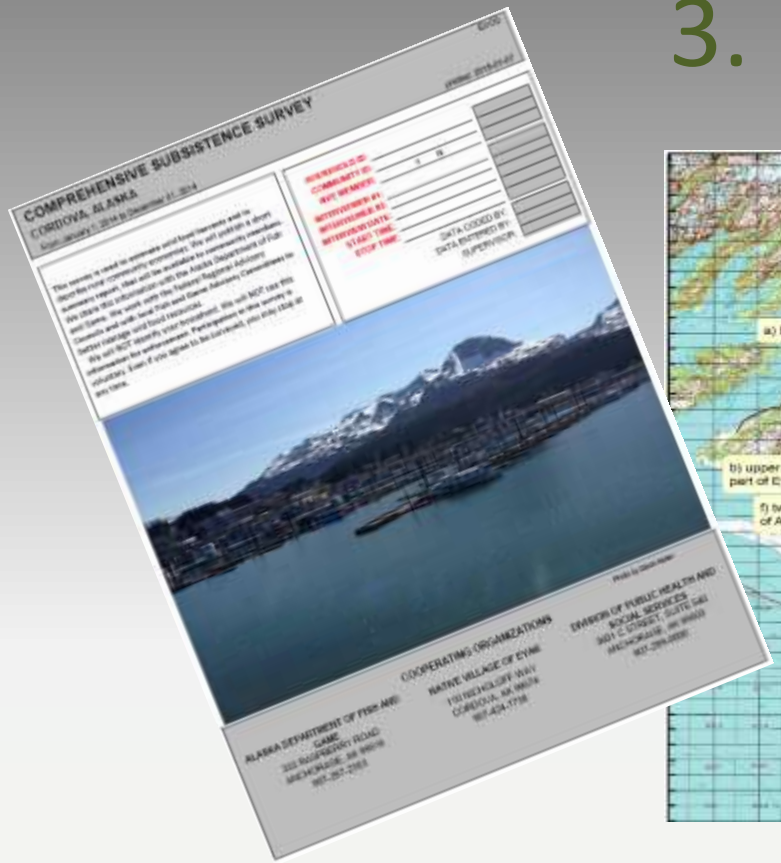
Boating/canoeing

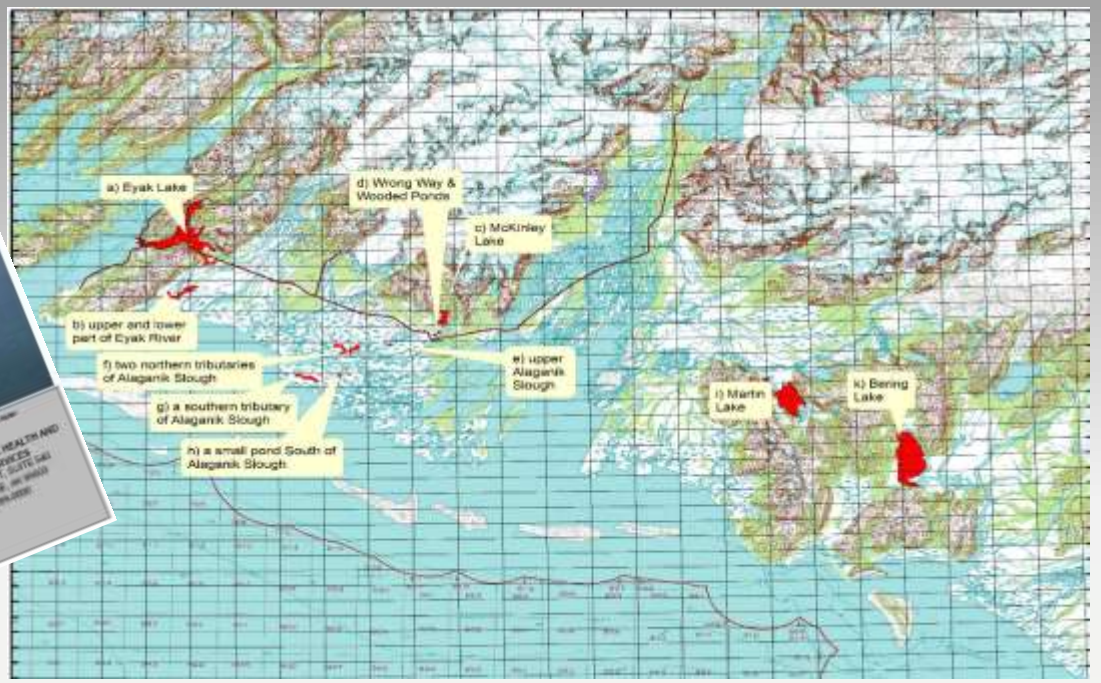


Ice fishing



3. Human vector analysis





Traffic depends on:

- population size
- # of destinations
- distance from town
- attractiveness

probability of elodea establishing in an additional lake

4. Social science research summer and fall 2015

- Measure public preferences and trade-offs
  - Focus groups and household surveys in:
    - Cordova
    - Fairbanks
    - Anchorage
- Develop bioeconomic framework to assess potential economic trade-offs related to action