Upper Big Walnut Watershed

A Conjoint Analysis of Local Opinion Towards Water Quality

Colleen Tennity, Brent Sohngen, Norm Fausey, Kevin King

The Ohio State University
Agriculture Research Service
What is a Conjoint Analysis & Why Use it?

Marketing technique used to determine what attributes of a product people value most and therefore it tells us how to market that product best.

- The Product – Conservation
- The Attributes
  - Number of Ground Nesting Birds
  - Number of Song Birds
  - Percentage of Small Streams Meeting EPA Standards
  - Percent Chance that Consumers Downstream have Clean water to Drink
Why Those Attributes?

- Initial CEAP study - water quality

- Land Bio-diversity Enhancement
  - Set aside programs and Buffers
    - Create recreational opportunities for hiking, birding, or hunting

- Aquatic Bio-diversity Enhancement
  - Reducing silt, fertilizer, and pesticide run-off from farms
    - Create recreational opportunities such as swimming, boating, and fishing
Why Those Attributes?

- Drinking Water Quality Enhancement
  (Used so that respondents distinguished between Aquatic Habitat and what actually comes out of the tap)
  - Silt, fertilizer, and pesticide run-off from farms can influence both the costs of treating the water as well as the palatability of the water that people drink
    - Reducing farm run-off can help reduce costs of treating water and help improve the palatability of water that people in Columbus drink
Survey Method

- **survey 1,000 residents** in central Ohio

- Ensure adequate sampling of individuals inside and outside the watershed in order to assess potential differences in values for improvements in this watershed
Upper Big Walnut Watershed Map
Survey Questionnaire

- Three types of questions
  1. Determine what **type of water quality they prefer**, prices are associated to attributes (used for the conjoint analysis)
  2. Determine **opinions towards water quality in general**
  3. Determine the general **demographic in central Ohio**

- Respondents asked to consider **human consumption, recreation, and aquatic habitat** when answering

- A dollar bill will be included in every survey to encourage response

- Reminder cards will be sent, along with a follow up copy of the survey
Scenario 1: Check your preferred alternative below

<table>
<thead>
<tr>
<th>Current Conditions</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
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| **Land bio-diversity:**
  On a 2.5 hour hike through the watershed, you will see:
  350 total song birds
  15 different species of song birds (such as Willow Flycatchers, Yellow Warblers, Eastern Bluebirds, Baltimore Orioles, Northern Cardinals)
  5 total ground birds (such as Ring Neat Pheasants and Wild Turkeys)
| 400 total song birds
  20 species of song birds
  10 ground birds | 500 total song birds
  30 species of song birds
  15 ground birds | |
| **Aquatic bio-diversity:**
  4 out of 10 of the small streams in the watershed (see map) currently meet the Federal Clean Water Act standards for water quality
| 6 out of 10 small streams meet water quality standards | 8 out of 10 small streams meet water quality standards |
| **Drinking water quality:**
  In 20 out of 100 uses, Columbus city tap water is not palatable due to abnormal colors, tastes, or smells.
| 10 out of 100 uses not palatable | 5 out of 100 uses not palatable |
| Each household in the Upper Big Walnut Watershed currently pays an average of $20 a year through Federal income tax for conservation programs. | Price: $30 (or $10 in addition to the current tax contribution) | Price: $40 (or $20 in addition to the current tax contribution) |
| Check your Preferred Alternative Here: ☐ | ☐ | ☐ |
Examples of Environmental Quality

Questions

Please rank the following water uses, in terms of importance of high water quality. Rank from 1 to 5, with 1 being the most important, 5 being the least important.

- ____ Drinking water
- ____ Swimming
- ____ Fishing
- ____ Boating
- ____ Adequate wildlife habitat (for species living in and around the water)

On average, how many bottles of water do you drink a month (check the best response)?

- ____ None
- ____ 0-10
- ____ 10 – 25
- ____ 25 - 50
- ____ more than 50

We should continue working to improve water quality so that future generations will have the option to use streams and rivers in the future.

(Strongly Disagree) ………………….. (Strongly Agree)

1 2 3 4 5 6 7
Examples of Demographic Questions

- Have you ever owned farmland or worked on a farm (check one)?
  - Yes
  - No

- How many miles do you live from downtown Columbus, Ohio (check one)?
  - 0-10
  - 10 - 25
  - 25 - 50
  - 50 – 75
  - More than 75

- What was the total before tax income of your entire household in 2004?
  - Less than $25,000
  - Between $25,000 and $49,999
  - Between $50,000 and $74,999
  - Between $75,000 and $99,999
  - More than $100,000

- Have you ever hunted ground birds?
  - Yes
  - No
Preliminary Results!

- D – Efficient design needed - “human factor”
- Preliminary study done of 20 people who live in the Columbus / Upper Big Walnut Area
- Asked 18 questions developed through a program written in Gauss
- Ran responses of the survey through Limdep
Limdep Results

- Limdep measures an indirect utility function, so its parameters are utility weightings.
- Results:
  - $b_1$ (ground birds) = 0.062
  - $b_2$ (water quality) = 0.425
  - $b_3$ (tap water) = -0.097
  - $b_4$ (price) = -0.09
What do Utilities Mean?

- Welfare effects of one unit change in each variable is measured as:
  \[ \frac{\text{\$ / unit}}{\text{unit}} \text{ (a.k.a. compensating variation)} = -\frac{bX}{b4}; \]
  where \( X = 1, 2, \) or 3

So from this formula, we can determine:

- Value of 1 additional ground bird = \(-.062/-0.09 = \$0.69\)
  (CI: \$0.041 to \$1.38)

- Value of 10% additional streams meeting EPA = \$4.71
  (CI: \$3.49 to \$6.45)

- Value of reducing the possibility of having a bad drink = \$1.08
  (CI: \$0.59 to \$1.68)
What’s Next?

- Use the d-efficient design to pick the appropriate 8 questions we are going to study
- Send the survey out to 1000 residents in Central Ohio
- Run the final responses through Limdep
- Compare the results with initial findings of ARS BMP monitoring study
ANY QUESTIONS??