Benefit Transfer and Visitor Use Estimating Toolkit for Wildlife Recreation, Species and Habitat

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Background

- Restoration projects can be costly
- Estimates of visitor use and the economic value of goods/services provided by restored habitats are an important component in justifying restoration budgets
- Collecting primary data to obtain estimates is not always feasible or justified
Provides resource managers/planners with a tool to estimate:

- Economic value of wildlife-based recreation activities, species, habitats, and open space
- Visitor use (fishing, hunting, wildlife viewing) on National Wildlife Refuges and state lands

Includes 3 categories of databases and models

1) Recreation, Habitat and Species Valuation Models
2) Open Space Property Value Premiums Valuation Model
3) Visitor Use Estimating Models
Benefit Transfer

- Application of a value per unit estimate (per visitor day, per household, per acre) from an existing study site to an unstudied site for which such a benefit per unit value is needed

Source: Rosenberger and Loomis (2001)
Recreation, Habitat and Species Valuation Models

- How is value measured in the toolkit?

\[ \text{TEV} = \text{use value} + \text{passive use value} \]

- Value = total net benefit to consumer (consumer surplus)
  \[ = \text{benefits above and beyond any expenditures on the activity in question} \]
Recreation, Habitat and Species Valuation Models

Recreation
- Fishing
- Hunting
- Wildlife Viewing

Species
- T&E
- Salmon

Habitat
- Terrestrial
- Aquatic
- Wetlands
Recreation, Habitat and Species Valuation Models

- **Databases**
  - Literature reviews result in hundreds of existing original valuation studies pooled together
  - Information on each study is included in each database

- **Value Tables**
  - Provide mean, median, low and high values

<table>
<thead>
<tr>
<th>Wildlife Viewing</th>
<th>N</th>
<th>NORTHEAST</th>
<th>N</th>
<th>SOUTHEAST</th>
<th>N</th>
<th>INTERMOUNTAIN</th>
<th>N</th>
<th>PACIFIC</th>
<th>N</th>
<th>ALASKA</th>
<th>N</th>
<th>NATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>88</td>
<td>62</td>
<td>65</td>
<td></td>
<td>16</td>
<td></td>
<td>9</td>
<td></td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td></td>
<td>$2.56</td>
<td></td>
<td>$2.80</td>
<td></td>
<td>$14.73</td>
<td></td>
<td>$25.99</td>
<td></td>
<td>$4.24</td>
<td></td>
<td>$9.37</td>
</tr>
<tr>
<td>Max</td>
<td></td>
<td>$171.04</td>
<td></td>
<td>$217.48</td>
<td></td>
<td>$193.37</td>
<td></td>
<td>$135.92</td>
<td></td>
<td>$129.13</td>
<td></td>
<td>$113.82</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>$46.48</td>
<td></td>
<td>$42.89</td>
<td></td>
<td>$47.86</td>
<td></td>
<td>$58.87</td>
<td></td>
<td>$51.68</td>
<td></td>
<td>$31.25</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td>$37.29</td>
<td></td>
<td>$36.14</td>
<td></td>
<td>$39.56</td>
<td></td>
<td>$44.38</td>
<td></td>
<td>$48.89</td>
<td></td>
<td>$24.29</td>
</tr>
</tbody>
</table>
Recreation, Habitat and Species Valuation Models

Valuation Models

- Meta analysis regression models based on dozens to hundreds of value estimates yield valuation functions
- Statistically accounts for differences across studies (methods, contexts, location, etc.) to identify variables that explain the variation in value estimates
- Can be used to estimate current values or to predict changes in values associated with a management action

Value of Fishing per Angler Day

STEP 1: Enter a 1 next to the primary species to be valued; 0 otherwise
- ENTER > 0 Salmon
- ENTER > 1 Trout
- ENTER > 0 Pike
- ENTER > 0 Bass
- ENTER > 0 Walleye
- ENTER > 0 Other freshwater species
- ENTER > 0 Other saltwater species
- ENTER > 0 Other aggregate groupings (bottomfish, etc.)

OUTPUT $32.85/
Angler Day (2006 base year)

STEP 2: Enter a 1 next to the type of water body containing the species; 0 otherwise
- ENTER > 1 Lakes, ponds, and reservoirs
- ENTER > 0 Brackish, saltwater embayments (bays)
- ENTER > 0 Saltwater, offshore
- ENTER > 0 Rivers, streams, flowing-water systems
- ENTER > 0 Great Lakes

OUTPUT $32.85/
Angler Day (2006 base year)
Open Space Property Value Premiums
Valuation Model

- 55 studies valuing the benefits of living near open space

- Value = market value of open space premium (% of property price), i.e., the benefit of proximity to open space captured by property value

- Variables such as the % of an area covered by OS of interest, land cover characteristics, land ownership, whether the land is protected or not, are significant determinants of value
## Open Space Property Value Premiums Valuation Model

<table>
<thead>
<tr>
<th>Property value premium estimator model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructions: Fill in all cells marked &quot;ENTER &gt;&quot;. (See accompanying user manual for detailed instructions and documentation.)</td>
</tr>
</tbody>
</table>

### STEP 1: Select shape of area of analysis in which property value premiums are analyzed

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
</tr>
<tr>
<td>Enter &quot;C&quot; for circular and &quot;R&quot; for rectangular shape of area</td>
</tr>
</tbody>
</table>

### STEP 2: Enter the radius (circular area) or length and width (rectangular area) of the area of analysis

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
</tr>
<tr>
<td>Radius of area in feet</td>
</tr>
</tbody>
</table>

**OUTPUT:** 288 Size of study area (acres)

### STEP 3: Enter the size of the open space

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
</tr>
<tr>
<td>Size in acres of the open space whose property value impact is to be estimated</td>
</tr>
</tbody>
</table>

**OUTPUT:** 6.9 %OSChange. Percentage of the study area occupied by the open space of interest. Example: A 20 percent share of open space in the area of interest is indicated as "20".

### STEP 4: Enter the appropriate values for the indicator variables (see the Land Cover Definitions tab for how to code a particular land cover)

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>FOR. Enter &quot;1&quot; if the open space is a forest. Otherwise, enter &quot;0&quot;.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>PARK. Enter &quot;1&quot; if the open space is a park. Otherwise, enter &quot;0&quot;.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>WET. Enter &quot;1&quot; if the open space is a wetland. Otherwise, enter &quot;0&quot;.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>PROT. Enter &quot;1&quot; if the open space is protected. Otherwise, enter &quot;0&quot;. Protection is defined as the absence of the possibility of development (i.e., easement, public ownership).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>PRIV. Enter &quot;1&quot; if the open space is privately owned. Otherwise, enter &quot;0&quot;.</td>
</tr>
</tbody>
</table>

**POS =** 2.3 % increase in average residential property value from open space of interest

### STEP 5: Enter the number of residential properties located in the area

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
</tr>
<tr>
<td>Number of properties located in study area. NOTE: Include only single-family homes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENTER &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>$250,000</td>
</tr>
<tr>
<td>Average value of properties ($)</td>
</tr>
</tbody>
</table>

**OUTPUT:** $284,527 Estimated total property premium in study area attributable to open space of interest
Visitor Use Estimating Models

- Relate NWR and state level recreation activity visitor days to factors such as land type, habitat acreage, population, income...

![Diagram showing visitor use at National Wildlife Refuge (NWR) and state level visits with activities like fishing, hunting, and wildlife viewing.](diagram.png)
Visitor Use Estimating Models

- NWR models can be used to estimate activity days associated with a new refuge or change to an existing refuge.

- State level models estimate the change in visitor days associated with a change in land type.

### Example: Alabama

**CURRENT STATE VALUES (use the 'State Variable Input Tab')**

**STEP 1:** Enter the current acres of each type of land within Alabama (use the 'State Variable Input Values' Tab)

<table>
<thead>
<tr>
<th>Type of Land</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Forest Land</td>
<td>212,000</td>
</tr>
<tr>
<td>Private Forest Land</td>
<td>21,261,000</td>
</tr>
</tbody>
</table>

**STEP 2:** Enter household median income of Alabama (use the 'State Variable Input Values' Tab)

- ENTER > $41,310

**STEP 3:** Enter Alabama's state population (use the 'State Variable Input Values' Tab)

- ENTER > 4,447,100

**OUTPUT**

- 5,462,478 Wildlife Viewing Days / year in Alabama

**STATE VALUES WITH MANAGEMENT/POLICY ACTION**

**STEP 1a:** Enter the total number of acres of each type of land within the site of interest

<table>
<thead>
<tr>
<th>Type of Land</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Forest Land</td>
<td>300,000</td>
</tr>
<tr>
<td>Private Forest Land</td>
<td>23,000,000</td>
</tr>
</tbody>
</table>

**OUTPUT**

- 5,946,889 Wildlife Viewing Days / year for the site of interest

**CHANGE**

- OUTPUT 484,411 Change in Wildlife Viewing Days / year
Linking Estimates and Combining Model Outputs

By combining the visitor use estimates with the values per visitor day, an analyst can calculate annual hunting, fishing or viewing benefits for a particular site.

Linking Activity Day Values and Visitor Use models

Estimating the value of a site for wildlife-associated recreation:

- Fishing
- Hunting
- Wildlife viewing

Activity day value model $\times$ # of days/yr = $\$/yr for activity at the site

OR

Activity day value Table or Database $\times$ # of days/yr = $\$/yr for activity at the site
Combining value estimates....

Combining Model Outputs

Activity valuation models (wildlife-associated recreation)
+ Habitat Valuation models (wetlands, terrestrial and aquatic habitats)
+ Species Valuation models (T&E, Salmon)
+ Open Space Property Value Premium model

Value estimates can be combined to generate an estimate of the “total” value of a site/habitat

Requirement: some models have variables for a value estimated in other models; these variables must be set to zero to avoid double counting when combining model results.

Example: Terrestrial Habitat model has open space variable. If adding results of OS Property Premium model and Terrestrial Habitat model to estimate the value of a site, set the OS variable in the Terrestrial Habitat model to “0”.

### Linking Estimates and Combining Model Outputs

#### Combining value estimates....

<table>
<thead>
<tr>
<th>Output Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits Associated with:</strong></td>
</tr>
</tbody>
</table>

#### OPEN SPACE PROPERTY VALUE PREMIUMS

#### ACTIVITY-RELATED BENEFITS

(Wildlife associated recreation)

- Hunting-Total
- Hunting - Small game
- Hunting - Big game
- Hunting - Waterfowl
- Fishing - Freshwater
- Fishing - Saltwater
- Wildlife viewing/non-consumptive*

#### TOTAL ACTIVITY-RELATED:

*discount rate of 0% over a period of 0 years*

#### HABITAT-RELATED BENEFITS

- Terrestrial
- Aquatic habitat improvements
- Wetlands

#### E&T&R SPECIES-RELATED BENEFITS **

Avoided cost of public services: not included *(user estimate)*

#### TOTAL BENEFITS, Net Present Value

0

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*Note: Only selected ecosystem services are included in estimates (see models for detail)*

* Non-consumptive: includes wildlife viewing, picnicking, photography, nature trails, observation platforms, and beach/water use.
When to Use Benefit Transfer

- When making land management decisions with many high-valued competing uses, various stakeholders, unique policy site, etc.
  → primary data needs to be collected

- But if you have similarity of resource characteristics being valued, similarity of user profiles, equality of values considered (use, nonuse), and low resource impacts
  → Benefit Transfer is a good alternative
Future of the Toolkit

Potential areas of improvement:

- Including updated studies/data
- Improving upon models
- Expanding to other uses

**Colorado State University**
http://dare.colostate.edu/tools/benefittransfer.aspx

**Defenders of Wildlife**