Final Project Completion Report

WHPRP 2006 Project Topic 1H: "Development of an Operational Benefits Estimation Tool for the U.S."

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1. Abstract

We review the literature on the economic values provided by undeveloped lands. We conduct meta-analyses of the available studies to construct a spreadsheet-based "Benefits Estimation Toolkit" - a set of valuation and visitation models, value tables and databases. This Toolkit allows users to generate comprehensive estimates of the economic values associated with many conservation-oriented uses of undeveloped lands. Specifically, users can employ the Toolkit to estimate the dollar values of the benefits generated by a particular undeveloped area. The quantified benefits comprise open space property value premiums received by properties located near undeveloped lands; benefits to participants in wildlife-associated recreation activities; benefits associated with the conservation of threatened, endangered or rare species; and ecosystem services provided by terrestrial habitats, wetlands and aquatic habitat improvements. We also use available data on National Wildlife Refuge visitation and state-level participation in wildlife-associated recreation activities to construct two sets of models that allow users to estimate the number of wildlife-associated activity days an existing or proposed conservation area generates per year, or the additional days that would result from the expansion of an existing area. We provide detailed user manuals for the application of the models, tables and databases.

Our review and synthesis of the open space premium literature supports the robust conclusion that open space, especially protected open space, increases residential property values compared to the baseline, represented by the full development/no open space scenario. These premiums increase with increasing scarcity of open space but are also clearly present in less-developed areas. Our meta-analysis of the literature – the first such attempt – yields a statistically significant open space premium estimation model that explains almost 60 percent of the observed variation in open space premiums. It identifies size, protection status and ownership as significant factors for the size of open space premiums. While all open spaces generate price premiums, this premium is highest for forest cover and natural areas and lowest for agricultural areas.

We also review the literature on the impacts of natural amenities on county or state-level income and output, employment, population, and per-capita income. The empirical studies employ both statistical modeling and survey approaches to analyze the impact of natural amenities. Their results clearly support the hypothesis that amenities positively impact output, employment and population growth and aggregate output in rural areas. In particular, limiting our analysis to studies that assess the impact of protected lands and excluding those that employ broader amenity measures such as climate, topography or man-made recreation facilities, none of the studies revealed a negative association between

protected lands and income, output, employment or population. While several studies did not detect a significant impact of protected lands, the large majority reported significant positive impacts. By contrast, the evidence on the impact of protected lands on per-capita income is mixed, with studies revealing a negative, positive or no association at all. We construct a database of the existing studies that indicates the type and size of the impact analyzed in a particular study, the study area and method, the time period covered, the type of amenity measure used and the main characteristics of the amenity.

2. Introduction

Ecosystems and the habitats they contain support a wide range of human uses that carry economic values. Recent comprehensive assessments indicate that in many locales, the provision of a range of these services has been declining over the last decades. For many services, this decline is expected to continue, driven to a large extent by expanding human populations and rising per-capita incomes, coupled with the public good character of many services that results in there being insufficient financial incentives for private landowners to manage their lands for the provision of ecosystem services. In addition, recent research suggests that climate change already is having and is expected to continue to have major impacts on many ecosystems and the services they provide to humans.

The decline in the volume of many ecosystem services is however also a result of our still insufficient ability to accurately quantify many of these service flows in physical terms (an issue addressed explicitly by WHPRP 2006 Project 1.G), and a lack of understanding of the value of the benefits these services provide to individuals and society as a whole.[1] It will be necessary, though not sufficient, to overcome this last impediment in order to allow the value of ecosystem service to be included in policy-making and evaluation.

Two ecosystem services that are among the best-studied with respect to the benefits they provide to individuals and society are the provision of species habitat and open (undeveloped) space. Habitat and open space generate direct use values in the form of recreation (both consumptive, such as fishing and hunting, and non-consumptive, such as wildlife viewing) and scenic amenity values for local residents and visitors. They also generate passive use values, in cases where individuals hold a value for knowing that a particular wildlife species or the associated habitat-supporting landscape exist and are preserved. Unfortunately, no quantitative synthesis of the results of habitat and open space benefit studies has been attempted so far that would make the findings of these studies easily accessible and thus directly useful for land use or wildlife planners and other local decision-makers. Furthermore, both habitat and open space service values often are highly context-specific, that is, they vary with the location of service provision in both space and time. The lack of a statistical synthesis of habitat and open space benefit studies means that, despite the substantial number of such studies that exist, local decision makers cannot readily apply those individual studies to construct reasonably reliable benefit estimates for the value of habitat and open space in particular area of interest to them. Thus, the information

[1] See for example: Kroeger, T. and F. Casey. 2007. An assessment of market-based approaches to providing ecosystem services on agricultural lands. *Ecological Economics* 64(2):321-332.

generated in those studies generally is not easily applicable to other local contexts and thus often is not considered in land use planning decisions.

There are a few ecosystem services that have attracted a fair amount of economic valuation research. Principal among these are services provided by wetlands, such as the mitigation of flood and storm events or the improvement of water quality, and habitat provision for threatened and endangered species. In some cases, extensive statistical (meta) analyses of the existing literature are available. What is needed for these results to be accessible and thus useful to local and state land use and conservation planners and others is the compilation and updating of these studies and their packaging into one easy-to-use toolkit that allows users to access the wealth of valuation data that exists for some ecosystem services.

Not surprisingly, the difficulty of estimating the economic value of the benefits produced by undeveloped lands at a specific location results in zoning and land use regulations that often do not take into account sufficiently the very real economic values generated by open spaces. This leads to ecologically unwise and economically inefficient development patterns that make local communities or society as a whole worse off than they would be had the information been available and considered in land use planning.

Syntheses and systematic analyses of the available habitat, open space and ecosystem service valuation literatures is needed to provides local decision-makers with the tools that can allow them to make better-informed land use decisions. The availability of an easily accessible habitat benefit valuation tool would enhance the ability of local conservation and land use planners to identify the very real and often substantial economic values generated by habitat conservation and thus will allow conservation to be recognized in many places as an economically valuable land use. The information that can be generated by such a toolkit should enhance the ability of state wildlife agencies to argue for the value of conserving high-economic value undeveloped lands vis-à-vis other, conservation-incompatible land uses. It should also help wildlife and natural resource agencies attain the funding commensurate with their responsibility for acting as stewards of the high-value natural resources in their state. Finally, the information generated by a habitat benefits toolkit also should help them prioritize the use of scarce financial resources for increased protection of lands identified in the State Wildlife Action Plans and State Comprehensive Wildlife Conservation Strategies.

Conservation planning also should take into account the potential increases and associated economic value that conservation of additional lands can generate. The creation of additional, publicly accessible conservation areas generally will increase the total number of outdoor recreation activity days.[2] Thus, increases in conservation acreage will generate economic value in the form of net benefits to participants. They will also generate output, income, employment and tax revenues as a result of visitor spending. What is needed is a model that relates wildlife-related recreation visitor days to protected acreage in order to allow local and state planners to develop estimates of the increase in recreation an expansion of conservation acreage would lead to.

[2] See for example: Loomis, John B. 1999. Do additional designations of wilderness result in increases in recreation use? *Society and Natural Resources* 12(5):481-91.

Finally, the effort to mobilize increased public support for land conservation should also draw on the findings reported in the studies that examines how land conservation impacts economic growth, income and employment at the county and state level. A sizeable number of studies have analyzed the impact of natural amenities on these variables. A subset of these studies has focused specifically on the impact of protected lands. A synthesis of the positive findings of these studies would help bolster the economic argument for land conservation.

3. Purpose

The purpose of the Habitat Benefits Estimation Toolkit is to systematically analyze and synthesize in an easily-accessible format the findings from the large volume of studies that have examined the economic value associated with species and natural lands, in order to allow users to draw upon this wealth of data and generate value estimates tailored for areas of interest to them. The large body of natural resource valuation studies often is not easily available or technically accessible to the non-economist. The Wildlife Habitat Benefits Estimation Toolkit addresses these limitations by providing 1) syntheses of the literature findings in the form of spreadsheet-based statistical models and average-value tables that allow users to draw upon the wealth of available data and apply it to a particular site, and 2) databases that list the available studies, their findings, study characteristics and contexts, thereby making it easier for users to locate studies and findings that may be of particular applicability to their site of interest for which value estimates are sought.

The Toolkit assembles and in some cases updates previously estimated valuation models for wetlands, aquatic habitat improvements, terrestrial habitats, salmon and other threatened, endangered and rare species and adds newly-developed models that estimate open space-related property value premiums and the number of wildlife-associated visitation trips an area attracts. The Toolkit also includes previously developed and updated average-value models and databases, thus compiling in one place a wealth of resources on the economic valuation of wildlife and natural lands. Furthermore, the Toolkit directs users to readily available additional resources that allow them to generate estimates of the substantial economic impact of wildlife-associated recreation, estimated at over $200 billion per year for the U.S. as a whole.[3]

The Toolkit also includes a literature review and synthesis of the impacts of natural amenities, and, in particular, protected lands, on community economic competitiveness as measured by income, output, employment and population. The purpose of this analysis is to identify whether there exists widespread agreement on the nature of the relationship between natural amenities, particularly protected lands, and output, income, employment and population growth, and about the type and size of any impacts.

[3] Trip and equipment expenditures for wildlife-associated recreation activities in the U.S. in 2006 totaled over $122 billion (see: U.S. Fish and Wildlife Service and U.S. Census Bureau. 2007. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Washington, DC: FWS and CB. 164 pp.). Assuming conservatively an average total effects output multiplier of 1.65 for all states, this spending generated total economic output of over $200 billion in 2006.

Our Habitat Benefits Estimation Toolkit is intended to provide conservation and land use planners with a tool that generates heretofore often unavailable information on the economic value of the benefits provided by particular undeveloped areas, with the objective of achieving a more economically sensible land use and the protection of valuable natural assets whose highest and best use is in conservation.

4. Summary of Results

The Toolkit includes two types of estimation models: valuation models and visitation models. The valuation models comprise the *Open Space Property Value Premium* model that generates estimates of the portion of the value of a property/ies in an area that is attributable to a particular open space nearby, *Activity Day Value* models that generate estimates of the value of wildlife-associated recreation activities (hunting, fishing, wildlife viewing) per activity day; *Habitat* or *Habitat Improvement* models that generate estimates of the annual per-acre values of the ecosystem services provided by an area, and *Threatened, Endangered and Rare Species* and *Salmon* models that generate estimates of the annual value to people of a change in the population of a particular species, or the value of avoiding a reduction in the population of the species. For most values quantified in the Toolkit, we also provide average/median value tables and value databases (see Table 1).

Table 1: Values quantified by Toolkit and provided value models, tables and databases

Value analyzed	*Value expressed as*	*Valuation model*	*Avg./median value table*	*Database table*
OS property value premiums	- % of property value - total $ for all properties near site	✓	-	✓
Ecosystem service values	- $/acre/year at site - total $/year for site			
Terrestrial		✓	-	-
Aquatic improvements		✓	-	-
Wetlands		✓ (2)	✓	✓
Wildlife-associated recreation net benefits (CS)	- $/activity day at site; multiply w/ visitor days to get total $/year for site			
Fishing		✓	✓	✓
Hunting		✓	✓	✓
Wildlife viewing		-	✓	✓
T/E/R species values	- $/household for species population change; - total $ for species population change	✓	-	✓
Salmon		✓	✓	✓

Open space property value premium analysis and estimation model

Our review of 55 original quantitative studies, using both revealed and stated preference approaches, that examined the impact of open space on residential property values shows

that preserving open space generally increases property values. The size of open space premiums tends to be case-specific, varying considerably with the factors shown in Table 2.

Table 2: Variables that influence the property enhancement value of open space

Variable	*Direction of influence*
Scarcity of open space	+
Protected status/permanence	+
Size of open space	+
Distance to open space	- *
Type of open space	+/-
Opportunity costs / value of competing land uses	+
Income	+

Notes: * Exception: In cases of heavily used public open spaces such as some urban parks, adjacency to such areas may lead to a loss in privacy for some properties and to an associated negative open space premium on properties adjacent to the park.

Our meta-analysis of the studies yielded a statistical model that explains nearly 60 percent of the variation in open space premiums in the pooled dataset. The analysis identified the size of an open space, protection (or absence thereof), ownership and land cover type as statistically significant variables that determine the size of open space premiums. Our estimation results also show that open space premiums decrease in size for successively larger increases in the percentage of an area covered by open space, a finding that is consistent with those reported in the small number of studies that calculate the elasticity of open space premiums to open space prevalence in an area.

We constructed an easy-to use, spreadsheet-based model that generates estimates of the premium in residential property (lot + structure) prices associated with a given open space for a particular area of interest to the user. A screenshot of the model is shown in Figure 1 below. The user is required to enter a few key characteristics of the open space the property value impacts of which are to be evaluated, which allows her to tailor the model estimate to the local context. In addition to the percentage of the price of the average property in the area of interest near the open space, the model can also be used to calculate the total dollar value of premiums that is attributable to the open space. This requires her to use Census Data (explained in detail in the user manual) or local data obtained from county appraisers.

The open space premium represents the portion of a home's value that is attributable solely to the presence of the open space in the vicinity of the home. This is the value that would be lost or reduced if the open space in question were lost or reduced in size. Conversely, the premium and thus the home value generally would increase if total open space acreage in the area were increased. Open space increases the market value of residential properties compared to an otherwise identical area without open space. This has two implications for land use planning. First, the conservation or new creation of open spaces generates benefits for nearby residents, be they owners or renters. Secondly, the presence of open spaces, via the associated premiums in home values, directly translates into higher local property tax revenues.

Property value premium estimator model

Instructions: Fill in all cells marked "ENTER >". (See accompanying user manual for detailed instructions and documentation.)

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

ENTER > C — Enter "C" for circular and "R" for rectangular shape of area

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

ENTER > 2640 — Radius of area in feet

OUTPUT: 503 — Size of study area (acres)

STEP 3: Enter the size of the open space

ENTER > 85 — Size in acres of the open space whose property value impact is to be estimated

OUTPUT: 16.9 — **%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

ENTER > 1 — **FOR**. Enter "1" if the open space is a forest. Otherwise, enter "0".

ENTER > 0 — **PARK**. Enter "1" if the open space is a park. Otherwise, enter "0".

ENTER > 0 — **WET**. Enter "1" if the open space is a wetland. Otherwise, enter "0".

ENTER > 0 — **PROT**. Enter "1" if the open space is protected. Otherwise, enter "0". Protection is defined as the absence of the possibility of development (i.e., easement, public ownership).

ENTER > 1 — **PRIV**. Enter "1" if the open space is privately owned. Otherwise, enter "0".

P_{OS} = 6.7 — **% increase in average residential property value from open space of interest**

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

ENTER > 150 — Number of properties located in study area. NOTE: Include only single-family homes.

ENTER > $250,000 — Average value of properties ($)

OUTPUT: $2,511,138 — **Estimated total property premium in study area attributable to open space of interest**

Figure 1: Screen shot of open space property value premium estimation model with example data entered

The property value premium estimation model is accompanied by a technical report that provides a literature review, documents the development of the model and provides a detailed user manual that provides a series of application examples and guides the user through the application of the model.

Activity day value models, tables and databases for wildlife-associated recreation; value models, tables and databases for threatened and endangered or rare species, wetland and terrestrial habitats, and aquatic habitat improvements

The wildlife activity day value estimation models measure the benefits participants in wildlife-associated recreation activities receive as a result of their direct interaction with wildlife and their habitats. These models express the value participants gain from a day spent fishing, hunting or wildlife viewing and employ the economic concept of "Consumer Surplus" or net willingness to pay (WTP). Consumer surplus is measured in dollars and in our case expresses the amount a person would have been willing to spent on a day of fishing, hunting or wildlife viewing *above and beyond* what they actually spent in the form of trip and equipment costs for that day. Thus, consumer surplus is the *net benefit* people receive from engaging in wildlife-associated activities, and measures the contribution to people's well-

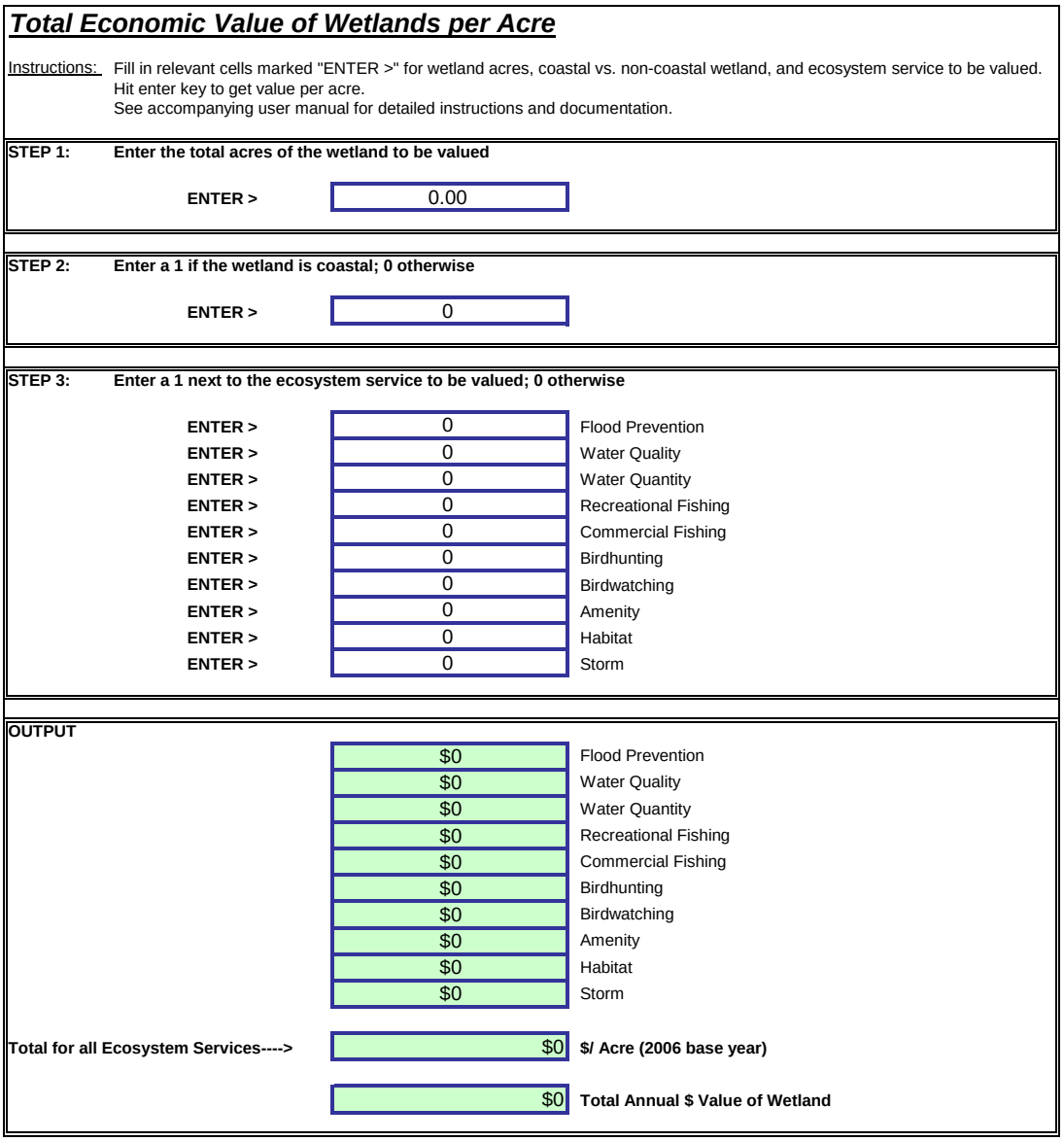
being from fishing, hunting or wildlife watching. It may be thought of as representing a kind of "personal profit" in the sense that participants receive more benefits from these activities than they incur in costs. To the extent that public policy making has the purpose of maximizing the well-being of local constituents, the net benefit (benefits minus costs) constituents receive represents the ultimate measure of good policy making and thus should be a key consideration in any policy decisions. Economists analyze the benefits of recreation activities in terms of the consumer surplus of participants precisely because it is this *net benefit* someone receives from an activity that determines how much the activity enhances their personal well-being. Net benefit is the benefit measure used in cost-benefit analyses by federal water agencies and by regulatory agencies such as the U.S. Environmental Protection Agency and in natural resource damage assessments by federal agencies.[4] Net benefit also is the benefit measure required by the U.S. Office of Management and Budget for measuring impacts on individuals in cost-benefit analyses by federal agencies.[5]

The threatened, endangered or rare (T&E/R) species and salmon models generate estimates of the value to a person, measured as willingness to pay (WTP) for an increase in the population of a threatened, endangered or rare species, or for the prevention of a decrease in the population of the species. Threatened or endangered species are those listed under the U.S. Endangered Species Act, while rare species are those identified in the states' Comprehensive Wildlife Conservation Strategies or Wildlife Action Plans.

The terrestrial, aquatic and wetland value models generate estimates of the value of the ecosystem services supplied by these lands. These models require the user to select from a range of ecosystems services provided by a site of interest. The models provide estimates of the total annual value generated by the whole site as well as per-acre estimates. Figure 2 shows a screen shot of the wetland valuation model.

[4] See: U.S. Water Resources Council. 1983. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Washington, DC: U.S. Government Printing Office. March 10; U.S. Environmental Protection Agency. 2000. Guidelines for Preparing Economic Analyses. Report, September 2000. EPA 240-R-00-003. Washington, DC: EPA; U.S. Department of the Interior. 1994. Natural Resource Damage Assessments; Final Rule. 43 CFR Part 11. Federal Register 59(58):14262-14288.

[5] U.S. Office of Management and Budget. 2000. Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements. Memorandum for the Heads of Departments and Agencies, M-00-08. Washington DC. March 22, 2000.



Total Economic Value of Wetlands per Acre

Instructions: Fill in relevant cells marked "ENTER >" for wetland acres, coastal vs. non-coastal wetland, and ecosystem service to be valued. Hit enter key to get value per acre. See accompanying user manual for detailed instructions and documentation.

STEP 1: **Enter the total acres of the wetland to be valued**

ENTER > 0.00

STEP 2: **Enter a 1 if the wetland is coastal; 0 otherwise**

ENTER > 0

STEP 3: **Enter a 1 next to the ecosystem service to be valued; 0 otherwise**

ENTER >	0	Flood Prevention
ENTER >	0	Water Quality
ENTER >	0	Water Quantity
ENTER >	0	Recreational Fishing
ENTER >	0	Commercial Fishing
ENTER >	0	Birdhunting
ENTER >	0	Birdwatching
ENTER >	0	Amenity
ENTER >	0	Habitat
ENTER >	0	Storm

OUTPUT

	$0	Flood Prevention
	$0	Water Quality
	$0	Water Quantity
	$0	Recreational Fishing
	$0	Commercial Fishing
	$0	Birdhunting
	$0	Birdwatching
	$0	Amenity
	$0	Habitat
	$0	Storm
Total for all Ecosystem Services---->	$0	**$/ Acre (2006 base year)**
	$0	**Total Annual $ Value of Wetland**

Figure 2: Screen shot of the wetland value estimation model

Visitor use estimation models

The visitation or visitor use estimation models generate the number of fishing, hunting or wildlife viewing days a particular area is expected to attract per year. The Toolkit contains separate sets of models, one for estimating visitation at areas managed primarily for wildlife (National Wildlife Refuges and State Wildlife Management Areas, "NWR/SWMA"), the other for estimating the state-wide recreation days on lands managed for a variety of uses but also providing wildlife habitat ("State-level"). Each set is comprised of freshwater and saltwater fishing, big game, small game, migratory bird and total (all) hunting models as well as a wildlife viewing (State-level) or non-consumptive recreation (NWR/SWMA) model.[6]

[6] Non-consumptive recreation includes wildlife viewing but in addition includes a number of other recreation activities not necessarily associated with wildlife, such as picnicking, photography, walking on nature trails or use of observation platforms and beach/water use (Caudill and Henderson, 2005).

Again, as in all other estimation models in the Toolkit, the user is required to enter several pieces of generally readily-available information for the site of interest into the model. The model then generates an estimate of the annual number of particular wildlife-associated activity days (fishing, hunting wildlife viewing) for the site of interest.

Summary Output Model

For the convenience of the user, the Toolkit includes a Summary Output Model that displays the results the user has generated with the individual visitation models and valuation models or tables described above. The spreadsheet-based Summary Output Model consists of an input area where the user specifies the particular Toolkit models or tables he wants to use to generate Summary Output data, and an output area that displays the results. The model performs net present value conversions of the outputs of those individual models that are expressed as annual value estimates, allowing the user to specify the time period over which benefit flows are to be considered as well as the annual rate by which to discount future benefit flows. The Toolkit Introduction guides the user through the selection of appropriate environmental discount rates.

Community economic competitiveness analysis

Our review of the empirical and theoretical literature on the impacts of natural amenities on county or state-level income and output, employment, population, and per-capita income clearly support the hypothesis that amenities positively impact output and employment and population growth and aggregate output in rural areas. In particular, if we limit the analysis to studies that assess the impact of protected lands, excluding studies that employ broader amenity measures such as climate or topography or man-made recreation facilities, none of the studies reviewed discovered a negative association between protected lands and income, output, employment or population. While several studies did not detect a significant impact of protected lands on income, output, employment or population, most reported significant positive impacts (Table 3).

Table 3: Findings of studies focusing particularly on local economic impacts of protected lands

Impact analyzed: Change in	*Number of studies showing impact of conservation lands is*		
	Positive	*Negative*	*Not significant*
Income/Output	6	0	2
Employment	9	0	2
Population	7	0	2

By contrast, the evidence on the impact of protected lands on per-capita income is mixed, with studies revealing a negative, positive or no association at all.

Guiding users to sources for valuation of additional benefits produced by conservation lands that are not covered in the Toolkit

We also provide the user with information about and links to data sources for values of conserved lands not quantified in the habitat benefits estimation Toolkit. These include carbon sequestration, outdoor recreation that is not primarily wildlife-related, as well as the avoided cost of community services (net loss in tax revenues from avoided development).[7] In addition, we provide detailed information and sources on how do develop estimates of the outdoor recreation-related spending and associated economic impacts on output, income, employment and local/state and federal tax revenues.

5. Approach

We used regression analysis to estimate our valuation and visitation models. Specifically, we performed original meta-analyses of existing studies (in the case of open space property value premiums and the value of population increases in endangered and threatened salmon species) or updated existing meta-analyses (in the case of threatened, endangered or rare species). In other cases, we located recent existing published and unpublished (a recent Ph.D. dissertation) meta-analyses (sportfishing activity day values; wetlands, terrestrial and aquatic habitat values) that were so comprehensive and thorough that they needed no updating. Meta-analysis is a regression analysis of the findings of a set of empirical studies that systematically explores study characteristics as possible explanatory factors for the variation of results observed across primary studies. Thus, by pooling observations from available studies, meta-analysis is able to identify those variables (e.g., site characteristics, study method, demographics) that significantly affect the value of the associated activity (e.g., fishing) or natural resource (e.g., wetlands), as well as the size of their impact on the value. In all cases, we tested a number of different model specifications in order to identify the model that best fit the data. We performed extensive literature searches using the EconLit database to identify the available studies. We also used university contacts to identify any relevant valuation studies in the gray literature.

We used standard (non-meta-) regression analysis to estimate visitor use models for wildlife-associated recreation activities from visitation data for National Wildlife refuges and site characteristics of refuges as well as State-level recreation visitor use models. We based our estimation on a sample of refuges, their location, the number of visits per activity (non-consumptive, fishing, hunting) for each refuge and per-capita income were obtained from a recent Fish and Wildlife Service report.[8] Refuge size (total, upland, wetland) as well as natural features within the refuge (lakes, rivers, oceans) were obtained from refuge brochures and planning documents, such as Comprehensive Conservation plans and U.S. Fish and Wildlife Service Environmental Impact Statements, and verified with the "Banking on

[7] See: Crompton, John L. 2001. Parks and open space: The highest and best use of public land? *Journal of Park and Recreation Administration* 19(3):133-154.

[8] Caudill, James and Erin Henderson. 2005. Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. September 2005. Washington, DC: USDI FWS Division of Economics. 434 pp.

Nature 2004" report and refuge websites. Finally, population of counties within a 60 mile radius was obtained using U.S. Census Bureau data.

More detail on the estimation procedures can be found in the individual technical reports.

6. Deliverables

Deliverable #1: Review and synthesis of literature on open space value premiums for residential properties; Review and synthesis of literature on the relation between protected lands and community economic competitiveness; and property premium value estimation model

Our open space property value premium analysis comprises a literature review and synthesis of the impact of open space on the market prices of nearby residential properties, as well as a statistical analysis of the literature using meta-analysis. The literature review and synthesis and the statistical analysis are presented in a technical report entitled "Open Space Property Value Premium Analysis." This report also includes a detailed user manual that provides step-by-step instructions on applying the model and also contains several detailed application examples.

The meta-analysis results (i.e., the open space premium estimation equation) are programmed into an Excel spreadsheet. This spreadsheet is the Open Space Property Premium Value Estimation model, which allows users to generate estimates of the open space premium for an open space of interest to them by setting specific, clearly identified variables such that their values match the characteristics of the open space of interest to users of the model. The Excel file also lists the studies reviewed and their findings (open space premiums in percent of property price) as well as the characteristics of the open spaces examined in the studies.

Deliverable #2: Synthesis of empirical habitat conservation studies, and production of spreadsheet-based habitat conservation benefits estimation model

The synthesis of existing habitat conservation studies is presented in the report "Technical Documentation of Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats". This report presents and discusses key concepts pertaining to the economic valuation of natural resources, presents common valuation approaches. The report also details the development of the habitat value estimation models, which comprise the Wetland, Aquatic and Terrestrial Habitat ecosystem service value models, and the T&E/R species and Salmon value models. The report also presents the Visitor Use estimation models. All of these models are programmed into Excel spreadsheets. The models require users to set several key variables at values appropriate for the site of interest for which they want to generate value or visitation estimates. In addition to the spreadsheets containing the estimation models, there is a separate set of spreadsheets that contain valuation tables that present average, median and low and high value estimates reported in the literature for the respective habitats and ecosystem services values and for particular species. These valuation table spreadsheets also contain databases that list the studies available in the literature, their findings and key study characteristics. The technical

report is accompanied by a user manual, "Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats", which provides step-by-step guidance on applying the models and tables and several application examples.

Deliverable #3: **Wildlife activity day values for different activities by region, and Wildlife activity days value estimation model**

The development of the Activity Day value models and the models themselves are presented in the report "Technical Documentation of Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats." The models allow users to generate site-specific estimates of the per-day values for wildlife-associated recreation activities (fishing, hunting, wildlife viewing) by setting selected key variables to match their local site context. The models are programmed into Excel spreadsheets and are accompanied by a second set of spreadsheets that contain valuation tables. These tables present average, median and low and high value estimates reported in the literature for wildlife-associated activities. These activity day value table spreadsheets also contain databases that list the valuation studies available in the literature, their findings and key study characteristics. The separate user manual "Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats" provides step-by-step guidance on applying the models and tables and several application examples.

Deliverable #4: **Operational toolkit, including user manual for spreadsheets (CD), successful workshop with practitioners applying the toolkit, and final project report to WHPRP**

The Toolkit spreadsheets, comprising a set of valuation models, value tables and databases, visitation (visitor use) models, the open space property value premium model, habitat (ecosystem service) and threatened, endangered and rare species and salmon valuation models and value tables, and a summary output model, is provided as a set of Excel spreadsheet files. It is bundled with the technical reports and user manuals and with the community economic competitiveness analysis. This complete set of materials will be downloadable from Defenders of Wildlife's Conservation Economics Program's website http://www.defenders.org/programs_and_policy/science_and_economics/conservation_economics/index.php.

On April 3 and 4, 2008 the project team organized a workshop at the Defenders of Wildlife headquarters in Washington, DC. This workshop, attended by 14 participants from state and tribal wildlife agencies. Participants were provided with an overview of the Toolkit and individual models and tables in the form of detailed PowerPoint presentation. The project team and workshop participants then together applied the Toolkit to a range of individual hypothetical cases that involved valuation of particular uses at particular sites. Participants provided a number of suggestions on how to make the tool more intuitive, all of which were incorporated into a revised version of the Toolkit.

Final technical reports, models and associated user manuals:

In addition to the valuation and visitation models, value tables and databases and the Summary Output model, the Toolkit includes several additional documents. These are the

- **Introduction to the Wildlife Habitat Benefits Estimation Toolkit**, which provides an overview over the purpose of the Toolkit, the methods used in its development, its components and its applications and uses;
- **Open Space Property Value Premium Analysis**, which reviews the relevant literature, provides brief summaries of individual studies and discussed the development of the open space premium estimation model. This analysis also includes a **user manual** with step-by-step guidance on the application of the model that presents several examples of applications of the model; the
- **Technical Documentation of Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats**, which discusses key concepts of economic valuation of natural resources and common valuation approaches and details the development of the Activity Day value models, the Wetland, Aquatic and Terrestrial Habitat ecosystem service value models, the T&E/R species and Salmon value models and the Visitor Use models;
- **User Manual: Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats,** which provides step-by-step guidance on applying the models and tables and several application examples**;** and the
- **Community Economic Competitiveness Analysis**, which reviews and synthesizes the literature on the economic impacts of natural amenities in general and of protected lands in particular.

Finally, the Toolkit includes two PowerPoint presentations. The first, "**Quantifying the Economic Value of Habitat Protection: Application of a Benefits Estimation Toolkit**", provides an overview of the Toolkit. The second, "**The Wildlife Habitat Benefits Estimation Toolkit: Application Examples**", contains step-by-step application examples for many of the models.

7. References

The list of references useful to researchers and users is too long to be included here. References are listed in the individual Toolkit components.