

State of the Science on Economic Valuation in Protected Areas
Report on the CASIOPA HSM Workshop 26 March 2010



Context. Following up from the 2009 CASIOPA webinar on general Human Dimensions, this workshop will focus on the various techniques that have been used to yield economic valuations for natural or protected areas. As well as presentations on how to accomplish economic valuations, presenters will show case studies of where this has been used, and what the criticisms of such analyses are. Key issues of economic valuation are the existence values, i.e. "Out of Site but Not Out of Mind" with respect to the relative importance of protected areas to non-visitors. This workshop provided ideas and examples for those involved in communicating to our non-users. Over 140 people attended this workshop in person or (mostly) via webex.

Our first speakers (OMNR team of Will Wistowsky, Eric Miller, and Peter Masson) discussed "Valuation and protected areas: The research and policy context". The ecological "why" included benefits such as cleansing of air and water, wildlife, preserve habitats for future generations, place for scientific study, and income for recreation and tourism industries. The economic "why" is more difficult as traditional measures such as contribution to GDP is minimal and parks and protected areas mainly have \$0 contribution. The entire point of valuation then is to shed light on everything else in terms of non-market economic value. This means examining what benefits are valuable using innovative accounting frameworks related to use or service terms aligned with ways to better define benefits using proper valuation methodologies. They were cautious to note that talk of the economic value of benefits we are getting from nature builds on ecological valuation.

Modelling techniques in economic valuation are tricky and, of course, one needs to know how to correctly apply and interpret results. This may seem trite but too often it can mislead citizens and policymakers into chasing one big number of valuation. Therefore, some form of tradeoff analysis is in order – it is important to know what you are and are not counting and it must be recognized that this field is one that is still in its neonatal stage – it is a partial assessment in the correct direction. This is a general guideline – convey the novelty and convey the right context of your valuation.

Will Wistowsky spoke to his earlier studies with Parks Canada and ongoing studies with OMNR on ecosystem service value (ESVs) in protected areas. ESVs are the dollar value of the benefits people obtain directly or indirectly from ecological systems. For example, one can, for an urban wetland, estimate economic value of benefits (ecosystem services). These largely correspond with the indirect use values associate with Total Economic Value (TEV), i.e. use values and non-use values. Use values are easiest to measure - direct use value (canoeing, camping etc), recreation benefits. Indirect use value is somewhat harder to measure - ecosystem service benefits such as watershed protection, carbon sequestration. Non-use values are more difficult still to examine; these include option value (safeguard of use benefits – future visits, future pharmaceuticals). Bequest value (legacy benefits) can sometimes be interpreted via 'ecological gift' tax breaks but these are more truly intergenerational and hardest to measure is the habitat value. Such difficult does not mean avoid attempts to measure; it means strive for new methods to improve understanding. There have been successful measurements made.

For example, in Rondeau Provincial park, Troy et al (one of our next speakers) help OMNR/Ontario Parks to use output from spatial valuation of southern ecological land classification to quantify ESVs for protected areas in southern regions and report on findings. They found that protected areas represent 32% of ESVs – wetlands contribute the most, ESVs are largely non-market that are unaccounted for elsewhere. In the study, they learned:

- there is an opportunity to have a standardized way to compare and add areas that have natural resources
- integrate ecological and economic planning considerations
- communicate relevance of protected areas to both users and non-users – common language everyone can understand
- make a stronger case using an economic message that will be more competitive with other government priorities
- extend appreciation for economic value of protected areas
- isolate information gaps (where research is needed)
- there is linguistic uncertainty- varied definition and use of key terms
- there is counting and classification confusion, making the analogy to a car – you only look at final value of car and not try and add all components or if you wish to examine components as in a Life Cycle Analysis, you cannot double count costs and benefits of both components and finished product
- there are landscape consideration problems – how does one define spatially implicit and explicit boundaries
- the communication is still unclear – should we use one large dollar value number and, if so, how to utilize the big number so it does not appear contrived.

Peter Masson then spoke about his studies related to the most difficult issue if Out of Sight but Not Out of Mind - Non users versus users in southern Ontario Provincial parks. He contracted out a telephone survey (Strategic Council Consulting) in winter 2009 to contact a weighted sample (N = 1500) of non users and users in Ontario. The key results were that nonusers are generally older, slightly lower income bracket, retired; users are more likely to be married, married have kids. Unlike some studies (see the example in this document by Murphy), there were no significant differences in users/nonusers in terms of birthplace (as a proxy for ethnicity or culture). Peter noted that you cannot drill down these data to a country or region of origin. Both non users and users found provincial parks important. The most important reason was similar between non users and users: “because I want them available for future generations to enjoy parks”. The least important reason was similar “business opportunities”. Both groups prefer to focus on protection and both wanted more information of what parks have to offer to come to the park more. Few realized that most of the funding of parks does not come from grants but from user fees (80% of funding depends on visitors). 62% users and 45% non users willing to contribute to a non-profit fund dedicated to Ontario Parks \$45-55 per year, though as Adamowicz later noted a better measure might be to ask what respondents thought others would pay (which is usually lower and probably reflects the real value of the respondent – they

just will not admit it and prefer to project a lower Willingness to Pay value on 'others'). Future questions that will be addressed included:

- Are the differences in non users and users willingness to pay a reflection of the difference in income and employment status?
- Can people differentiate between park jurisdictions?
- Is there a need to target messaging at new immigrants?
- Do parks need to incorporate public or visitor park education programs more (because of the response for similar results of 'why parks are important' for users and non users)

In the question section:

- the speakers noted the reports are available for public use (contact Peter and he will send you a copy of this report but you can view it at: <http://www.mnr.gov.on.ca/en/Business/LUEPS/2ColumnSubPage/279467.html>).
- there are vague plans to follow up the project with qualitative research – at this point, still exploring options.
- in response to a question of whether there unique values that can be parsed out for only protected areas and not part of the general landscape, they noted Austin Troy (next speaker) addresses this. They did comment that some scales do not go to that level. Over time, they hope to get richer inventories, we need better basic, baseline physical data.
- in terms of whether landscape scale patch size (of a park) was taken into account to examine ESC, this was not done here. They hope to address it in future studies.
- the Parks Canada and OMNR surveys were done the same way; there should be no between-study biases
- there were concerns with using 'the big summary numbers' of ecosystem services (*sensu* Robert Costanza's group)
- there was a question of how reliable and temporal are dollar values are applicable to southern Ontario (on OMNR site); in other words were 'transferable values' being used. The speakers noted they went back to the primary literature but did not use transferable values in this study.
- there was a question on ethics (*sensu lato*) was raised: While it may be true that if you don't apply a value to something, it more than likely gets undervalued, is that an ethical framework. Murphy noted that while he agreed that is an issue, as long as the methods are correct and the results refrain from hyperbole or arrogance then the practical issue is that governments and society will indeed 'love the environment more but be less willing to pay' if no number is assigned (something Adamowicz also raised at the end of the day)
- one attendee asked if this been done for Algonquin yet? The response was that no but OMNR/Ontario Parks does want to do it in the future.

The 2nd speaker was Austin Troy and colleagues speaking about "Challenges and opportunities for using ecosystem service valuation in protected areas management" (Austin Troy, Shelley Cole, Dave Saah, Matthew Wilson (University of Vermont [AT], Spatial Informatics Group LLC [SC & DS], & CH2M [MW])). Troy et al, again, were the authors of the

[studies on Ontario protected areas](#) mentioned in the previous talk. They began with the overview of what are issues with ecosystem services in protected areas and are some ecosystem services more relevant to protected areas than other? Using the Millennium Assessment (2003) as a framework and expert knowledge, Troy et al noted that there are definable services that contribute to valuation:

- disturbance moderation (flood and storm surge, wetland vegetation),
- air quality and climate regulation (sinks for pollution and greenhouse gasses),
- freshwater regulation (improve groundwater recharge capacity),
- waste treatment and water purification (erosion regulation and organic pollution controlled by wetlands, streams, biota and riparian zones),
- pest regulation (agriculture nearby),
- pollination of crops (agriculture nearby)

In examining valuation, one must ask about:

- whether you are allowed to harvest in the park (wild foods, fiber, heating fuel)
- are there competing interests like fuel for biomass (if so, where are the access to markets and the rules),
- what cultural services are permitted or demanded
- is recreation consumptive (hunting),
- it recreation non-consumptive (hiking),
- what role do onsite aesthetics play (value distinct from recreational experience, when there is an aesthetic value based on view accruing to property owners or residents, scenery),
- what is the social value (education, cultural heritage, spirituality, social capital),
- what is the existence value (simply knowing the place exists regardless of use, probably the most difficult to measure)

Troy et al noted that Willingness to Pay is a useful analysis but it may be inflated because they don't actually have to pay in most cases. The other issues they raised included:

- what do you do with places that are so far out no one goes to visit it?
- How do we address the gaps and strength in literature: cultural services gets the most literature (and there already are big biases towards "cultural services") but the gaps in knowledge of issues like transfer value are usually harder to measure though not less valuable to understand
- should protected areas have a distinct land typology to make analyses tractable or is this too simple?

The framework the speakers used consists of 6 steps where the issue of "value transfer basics" was important. This means how does one extrapolate value from one study and site and transfer it from the original study site to a 'policy site' where the new one is something very similar to original site. The approach of transferring by "type" requires a creation of "typology". The issue is whether more types means more precision but difficult to find valuation estimates or geographical data. How then to build a typology for protected area? Should it depend on categorizing pixels or the whole of the parks? Parks are management units so fine grain pixels

are not as useful. One can then be tempted to use simple land cover measures in landscape scales but this is not enough – you need contextual factors of greater park ecosystems and economic landscapes.

Thus, there will be critical cultural contextual factors for protected areas such as accessibility to population, characteristics of the population (how do we avoid income-biasing when using WTP), scarcity of resource for population, accounting for whether draw is local, regional or national, and the infrastructure of park – may increase accessibility. This results in syntactic components of a land cover typology specific to protected areas – a very large and complex summary table indeed. Such tables are really ontologies and are a way of organizing context factors.

Once we have context, then what should we count (what should we add or avoid adding) because the biggest problem is double counting inputs and outputs. To the best extent possible, the solution is to create service typology with mutually exclusive categories. A key idea is to avoid counting indirect (supporting) services when you also count the direct service. The challenge is that the literature is often too vague to determine whether the value applies to ultimate or proximate service or whether goes in one or two related categories. If one tries to do the parsimonious approach and simply eliminate all vague studies or values, then this would cut the available studies in half and leave us with insufficient data. This is quite the conundrum and speaks to the need for more studies but with better typologies.

To illustrate all this, consider how adding versus averaging works for recreation value. If there are different activities (e.g. canoeing on lake 1, bird-watching on lake 2), then it is critical to disentangle the value or even the definition of an activity defined as either recreation or amenity - the two are “jointly produced”.

How far should we disaggregate to try and untangle the mess? First, we must realize that ESV is an imprecise instrument designed for big picture thinking and it is not meant for micro-management. The real danger is trying to derive non market valuation for single parcels. The *Paradox of ESV* is rather bold and easily illustrated. If one says “let’s build cities for nature” then if you build new city in the middle of nowhere, suddenly that wilderness goes from having little ESV to having too much ESV because of the presence of beneficiaries.

How do we use ESV? One can examine an ESV feasibility spectrum. The most feasible is inventorying land (landscape inventory) to help evaluate potential impacts of a broad scale policy change. More difficult is using ESVs to weigh tradeoffs to specific land management alternatives for both market and nonmarket values over a large area. Most difficult is using ESVs to value a specific site or to develop a payment system where beneficiaries fairly compensate provides (original studies imperative, primary valuation study on site). In summary, there is much research to be done. There are many caveats for using value transfer in policy and ESV is a useful simplification that must be tempered by those caveats. ESV is a partial estimate of the actual of functioning ecosystems (lower bound estimate).

The 3rd speakers were the “The Artificial Intelligence for Ecosystem Services (ARIES) approach to ecosystem services assessment and valuation - Marta Ceroni, Ferdinando Villa, Kenneth Bagstad (University of Vermont). This was a working decision support system model that is better described in action than in words. To quote the authors and their websites:

“ARIES is a web-based decision support system that is used for the assessment of ecosystem services. ARIES generates detailed, quantitative assessments of the flow of valuable services between ecosystems and human beneficiaries in a selected area and then links the flows to potential and realized economic values. ARIES users can explore likely trends for future values, and study the effects of actual or potential policy changes on ecosystem services. Valuation is a flexible concept in ARIES: users will be able to specify values as weights and priorities to obtain a customized, spatial map ranking how well the ecosystem meets their specific priorities. If economic estimates of the value of ecosystem services and assets are requested, the results will take into account the supply, demand, and criticality of the services, factoring in both the thresholds that affect the capacity of ecosystems to produce given services and those that make the services essential to human life.”

Attendees may try it at [this site](#).

Our 4th speaker was Valerie Sexton (Environment Canada) who led a presentation by her and colleagues on “A Proposed Analytical Framework for Integrating Ecological Goods & Services (EG&S) in Policy Decisions”. Sexton noted that The UN Millennium Ecosystem Assessment showed that 60% of the earth’s ecosystems are degraded due to human activities. Thus, we need to improve decisions related to the environment and EG&S need to be given full weight. There are challenges, e.g. Nahanni national park extension where qualitative descriptions of benefits of nature conservation were trumped by mineral development arguments. As of 2007, there has been a system wide mandate to “pursue policy and regulatory excellence?” and ES&G (valuation in general) offers a set of tools useful to meet such a mandate. Work has been done on a benefits transfer using an environmental valuation reference inventory. There are important concepts to be included. These include an ability to differentiate between total economic value (replacement value, if everything disappeared, how much would it cost to replace it all) and marginal economic value (trade-off scenarios, not threshold or disappearance). A technical issue is whether some form of self-reflexive analysis be part of the models?

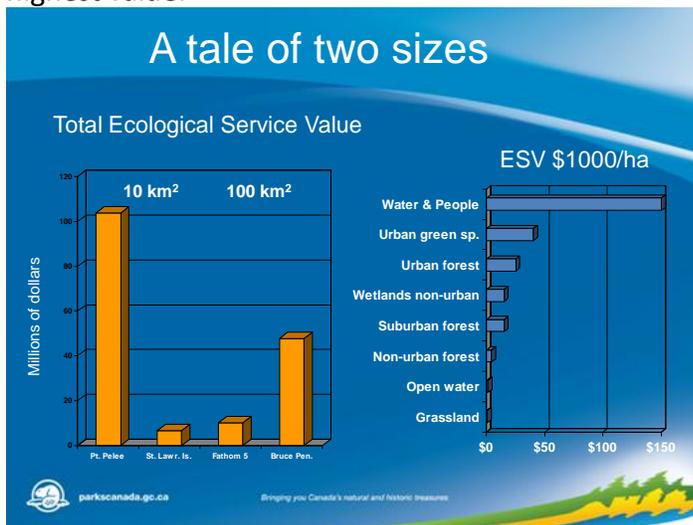
This all has led to the refinement and validation of frameworks used by Environment Canada – and Sexton reminded all that Parks Canada was not the only agency that can create natural protected areas (National Wildlife Areas are also in existence). There needs to be new data collection, such as new nature survey (the last one was in 1996 and mostly addressed recreation – Adamowicz bemoaned this as well). The goal overall will be to estimate and develop benefits transfer guidelines for Canada but this still is in the beginning stages. Some

related (though older documents) are available [here](#) and [here](#); a new contract was let with a deadline for RFP in February 2010, hence much more is planned.

Our 5th speaker was Eugenio Figueroa (University of Chile) who examined a total economic value calculating matrix (TEVCM) to value ecosystem services: a multidisciplinary step to promote conservation. The conceptual framework was created from ecological and social (mostly economic). If one has a different ecosystem then one is hard pressed to compare EG&S even though EG&S determine in a crucial manner human welfare and in the absence life would be impossible. Figueroa argued that environmental deterioration is a result of ecosystem undervaluation. To this end, his research group expanded upon the UN Millennium Ecosystem Assessment (2005). A flaw of the MEA is the definition of ecosystem services – “ecosystem services are the benefits people obtain from ecosystems”. The definition is misleading and messy since it confounds the concepts of service and of benefit, which are of complete different nature.

Figueroa’s group wanted to define such terms more precisely and then define the goods and services generated by the ecosystem through the multiple and complex ecosystem functions, determined by the basic ecosystem mechanisms and processes studied by natural science. This leads to a spreadsheet used to measure Total Economic Value Matrix (TEVCM). Similar to the ARIES group, readers are best directed to the speaker’s website to try out this application:

The 6th speaker was Stephen McCanny who gave “Parks Canada’s perspective”. He noted valuation and marketing can be difficult with a lot of the remote parks like North Bathurst (northernmost in Canada). Parks Canada owns 3% of Canada landbase but much of this is not wanted by citizens (the lack of economic value or perception therein at the time is the reason why many parks exist) though of course much of this area has ecological value – it’s the economic value that is not clear. If one carries out an ESV for four parks (Fathom Five, Point Pelee, St. Lawrence Islands, Bruce Peninsula), the results show that water and people create highest value:



Quoting *verbatim*, with a Scoping Study on Ecological, Social and Economic Benefits of NPs and NMCAs, the key objectives are:

1. Summarize key benefits of Parks Canada's sites
 - Climate Change
 - Biodiversity
2. Develop preliminary benefits framework
3. Pilot application for one NP
4. Analyze opportunities and challenges of the approach
5. Recommendations for next steps

Within the framework development, the approach is to:

1. Summarize case for valuations – survey up to 6 international methodologies/approaches
2. Evaluate relevance of these methodologies in Canadian NP and NMCA context
3. Applicability to other parks jurisdictions (i.e. uniquely Canadian framework)
4. High-level summary of typical landscape and seascape data availability

To use a specific case (establish a national park on the east arm of Great Slave Lake), there has been work to assess a full range of benefits/costs of study area for the proposed national park in support of future boundary discussions and legislative and regulatory processes. Additionally, there is a drive to develop information systems using cost-benefit approach to integrate assessments for evaluation of future park establishment opportunities. One needs to be cautious in terms of interpreting ESVs, e.g. compare the range (types) of landscapes to ESV for national parks; a more comprehensive study is to be done at Fundy National Park.

Speaker number seven was Vinay Kanetkar (University of Guelph) who spoke on “Conjoint and discrete choice designs for managing paradoxes”. Tying his work into the first presentation, Kanetkar reminded all that Wistowsky et al examined how much knowledge people had and, for example, that was lacking in that people did not know where funding came from. Kanetkar asserted that people may even have problems sorting out basics like whether all parks were national parks or where the nearest one was (ironically, even he made a small error – Pinery is not the nearest one to Guelph as he stated; Boyne or Hockley Valley are closer, though in fairness, these are non operating). The point however is that a lack of awareness makes it hard to convince shadow actors (non users) to care. One can delineate three groups of people as:

- Interested (users) – go to the park
- Crowd follower – follow interested people (e.g. tourists may go to Banff with skies but never ski there) – these people pay our bills for parks
- Disinterested group – they will never change their mind

The biggest challenge is to understand what we are asking people to do trade-offs in terms of parks and protected areas (interesting one thing that is sometimes lacking in protected area surveys is to ask a subject if they even care about the questions). Kanetkar concluded with a

good example of how even basic tools like cross-tabular rankings can tell researchers a lot about why people care or do not care about parks.

The final speaker was Vic Adamowicz of the University of Alberta who spoke to “Environmental Valuation – principles, priorities and perils”. His overview noted that Valuation is important and useful, but make sure you know what you are valuing (buying).

The principles were to examine monetary values or some related measure, i.e. “until there is some person somewhere who is benefitting from a given (ecological) process it is only a process and not a service” (c.f. Tallis and Polasky 2009). You need to know about the behavior of the people you are monitoring.

A further principle was related to measures of TEV (total economic value). If TEV is interpreted as value of total ecosystem, it doesn’t make much sense (ex. TEV of boreal forest is cryptic – it makes more sense to apply TEV to specific issues like loss of opportunities like hiking trails).

Researchers must be aware that measures of value are measures of change and we want to know the changes that are taking place. The problem is a lack of data, e.g. in terms of behavioural data, we stopped conducting the importance of nature to Canadians survey in 1996.

Sampling is an issue. If one wants to study passive use values, then how many people should we really think about? For example, with grizzly bears in Alberta - should you talk to Albertans, or all Canadians. Adamowicz himself is not yet sure if this is an empirical question or a conceptual question. One insight is that in surveys people better reflect their honest assessment (as in Willingness to Pay) if they are asked what they think others would do. Adamowicz warned all to beware the per-hectare transfer from one place to another. We must remember that it’s peoples’ values that generate the value

In the questions, several issues were raised:

- If people don’t understand ecosystems and the services they provide, how are we analysing to come to a conclusion with ESG. Adamowicz explained that we have to provide them with the information. Values are not constant, part of the difficulty, more information is better
- How do you look at 2 levels (if you focus on individual tree in a forest, you lose sight of the forest – more economic approach)? The answer was that macro and micro scales usually inform one another. However, ecological researchers struggle with scale, but so do economics and there still is a long way to go to resolve that.

Speaker number 9 (Stephen Murphy) had indicated he would not do a presentation but do a follow up in the briefing. This was to allow more speakers and more breadth to the workshop in the sense that Murphy is also Chair of CASIOPA. **Murphy and graduate students have done cross-border studies on valuation in protected areas.** One long term study (ongoing) is related to conservation and restoration in the Colorado River watershed in the USA and Mexico. Former graduate student Xochitl Itzel Hernández Morlán was instrumental in the first phase of

this work. A précis of this work follows and the full presentation is appended (Appendix 1 as a separate pdf).

The study is focused on attitudes, willingness to pay, and valuation along the Colorado River watershed in the USA and Mexico. We are aware of the caveats of such methods (see earlier commentaries). Our studies have used a standard design:

- 3 field surveys in each CMA
- 3 charettes (open) in each CMA
- Mail survey to those locales identified with a sufficient rate of literacy and where water bills are still mailed out
- Key informant interviews (community leaders, water and protected areas staff professionals, industry leaders, politicians [municipal to federal])

The analyses used were:

- cross tabulation analysis (Pearson's Chi-square), used to assess dependency across variables
 - chi-square (χ^2) goodness-of-fit test focuses on testing if there is a difference in willingness-to-pay between Mexicali and SLRC
 - non metric multidimensional scaling and canonical correspondence analysis
- One main result was that willingness to pay for water devoted for protected areas was a clear rank (highest to lowest):
1. (Rural) Grand Canyon AZ
 2. (Rural) Lake Mead NV
 3. Urban San Bernadino CA
 4. Urban Needles CA
 5. Urban Mexicali, MX
 6. Urban San Luis Rio Colorado, MX
 7. Rural San Bernadino CA
 8. Rural Mexicali MX
 9. Rural San Luis Rio Colorado, MX
 10. Rural Needles CA
 11. Urban Yuma AZ
 12. Rural Yuma AZ
 13. Urban Grand Junction CO
 14. Rural Grand Junction CO
 15. Rural Phoenix AZ
 16. Urban Phoenix AZ
 17. Rural Las Vegas NV
 18. Urban Las Vegas NV

- A second main result was also clear – different (self-identified and defined) groups were clearly different in their willingness to pay for water devoted for protected areas (highest to lowest):
 1. First Nations Rural
 2. First Nations Urban
 3. Hispanic Urban
 4. Caucasian Urban
 5. African-American Urban
 6. Hispanic Rural
 7. African-American Rural
 8. Caucasian Rural

To synthesize, the biggest surprise was that, culturally, Hispanics in Mexico and the USA were willing to pay for water devoted but did not generally wish to actually visit the protected area – cited a desire not to harm the area they wanted protected. This means that protected areas have a potentially untapped source of income (tricky to monetize though) and additionally it means reporting success should not always depend on actual visitor counts to a protected area

Literature on Economic Valuation in Parks and Protected Areas

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