Skeena Watershed Ecosystem Valuation Project Plan

Skeena Watershed Conservation Coalition

SkeenaWild Conservation Trust

Bulkley Valley Centre
for Natural Resources Research and Management

June 2013

Skeena Watershed Conservation Coalition

The Skeena Watershed Conservation Coalition was founded in 2004 by a diverse group of people living and working in the Skeena River watershed. Our board of directors and membership reflect the broad interests of the people in this region. We are united in understanding that short term industrial development plans, even 50 year plans, will not benefit our region in the long run if they undermine the social and environmental fabric that holds the watershed and its communities together.

Bulkley Valley Centre for Natural Resources Research and Management

The Bulkley Valley Research Centre is an independent, not-for-profit society based in Smithers, British Columbia that conducts high quality inter-disciplinary research on our environment, including its human dimensions. Our members are researchers, resource professionals, community members, and businesses primarily located in the Bulkley Valley that have an interest in natural resource research and management.

SkeenaWild Conservation Trust

SkeenaWild Conservation Trust is a regionally based organization. We are dedicated to bringing together governments, First Nations and members of the public in the Skeena Watershed to sustain the long-term health and resilience of the wild salmon ecosystem, while optimizing economic returns to First Nations and local communities.

Skeena-Nass Centre for Innovation in Resource Economics

SNCIRE is a non-profit society serving Northwest BC. Through innovation and research, we identify, develop and promote opportunities to build a resilient and sustainable natural resource economy in the Skeena-Nass region.

Acknowledgements

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EXECUTIVE SUMMARY

Policy and decision-making bodies worldwide are increasingly recognizing the critical importance of economics to human health, wellbeing and economic systems – and the costs to all of these of ongoing environmental decline. The ecosystem services concept is increasingly being used as an approach to measuring and accounting for these costs. It contributes to natural resource and environmental management by taking into consideration the ecological systems and flows that benefit people. By providing approaches and processes for identifying, quantifying and weighing ecosystem benefits it helps illustrate the trade-offs involved in various management decisions.

This plan lays out priorities, considerations, scope and approaches for the Skeena Watershed Ecosystem Valuation project. We envision a two-year multi-phased research project using the ecosystem services concept and associated ecosystem valuation frameworks and methodology to assess ecosystem goods and services in the Skeena watershed. The project will also examine social and cultural aspects of ecosystem services in an effort to develop a broad understanding of the nature and value of ecosystem benefits in the Skeena watershed.

The results will ultimately provide a robust tool to aid future land use decision-making and will contribute to a common language and credible information on non-market ecosystem benefits. This information can then be used by different groups to inform the public, government, industry and other stakeholders, thereby contributing to improved cost-benefit analyses of proposed projects in the region.

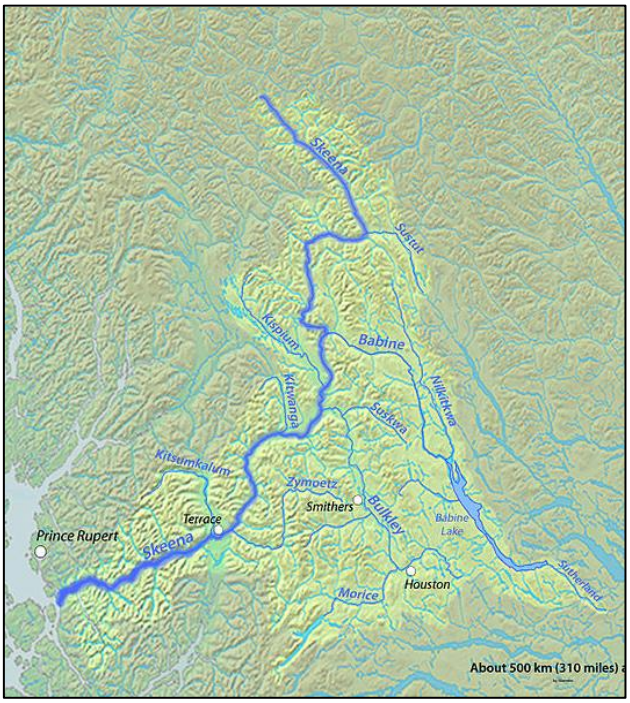
During the scoping phase of the project, which ran from January to June 2013, a team of seven working group members came together to discuss approaches and considerations. This paper, which lays out approaches and methods for subsequent phases, is the result of their work.

PART I: BACKGROUND

SKEENA WATERSHED CONTEXT

The Skeena Watershed is the second largest watershed in British Columbia (54,432 km^2). It is located in the northwestern portion of BC with its mouth just south of the Alaska panhandle. In its eastern headwaters, the Skeena River extends through the Coast Ranges to drain part of the Nechako Plateau. Consequently, different portions of the watershed experience different climatic, hydrological, and ecological conditions. Skeena watershed has sustained Aboriginal peoples for millennia and currently supports approximately 55,000 residents spread throughout the southern portion.

The entire Skeena watershed remains the traditional, unceded territories of the Tsimshian, Gitxsan, Wet'suwet'en, Carrier Sekani, Ned'u'ten, and Tahltan peoples. These nations are rebuilding traditional and contemporary systems of governance alongside colonial, electoral systems and continue to use and occupy the landscapes of their ancestors. The traditional practices and perspectives that members of these nations espouse diverge in some respects from those of their settler counterparts and must form a fundamental part of the design of any research or management framework.



The majority of the watershed is forested and salmon were abundant and widely distributed. Environmental damage is widespread in the watershed, though not serious enough to interfere with normal functioning of most ecosystems. The habitat in general is in relatively good condition, although there are localized areas of high impacts. It is widely recognized that land management practices degraded forestlands, water quality, and fish habitat in the watershed. Coastal mixed-stock fisheries have depleted salmon abundance. Linear development, settlement, and agricultural activity have also affected floodplain and valley bottom areas.

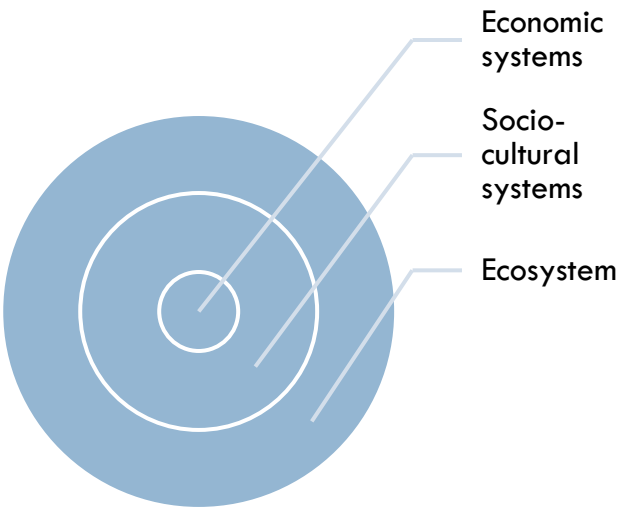
In 2004, an economic assessment of these salmon stocks valued Skeena fisheries at an estimated annual average of $110 million; a value that rivals that of other dominant industries in terms of total contribution to the regional economy (IBM Business Consulting Services, 2006).

Since 2012, there has been a surge of proposed development in and adjacent to the watershed, much of which consists of the extraction and transport of hydrocarbons. Many Skeena constituents feel that the proposed developments conflict with their vision and values of sustainable development and futures, diminishing climate change conditions, and implementing local decision-making. Presently, there are no ecological valuation systems being practised in the watershed.

In the existing economic development framework, industrial development projects are treated on a case by case basis by government and industry. There is no requirement to assess the additive effects of myriad major and minor projects that accrue over space and time (FPB, 2011). The provincial government has undertaken a pilot project to assess the cumulative effects of multiple industrial projects. The pilot remains to be implemented as a formal, ongoing government program, with the results that the cumulative effects of industrial developments remain largely unknown and unmanaged (*ibid*).

The Economics of Nature

Designing sound land and resource management requires a thorough appraisal of the full costs and benefits of particular management decisions. Yet these costs and benefits are seldom well-understood; by and large we lack economic information on the economic value of healthy ecosystems and the services and benefits they deliver. Without this information, land and resource management decisions are inevitably sub-optimal from an economic perspective. Ecosystem valuation helps illustrate the ways and extent to which ecosystems and their associated services contribute to human societies. By using an economic lens, the full benefits and costs associated with an activity can begin to be quantified and a more thorough awareness of net economic effects can begin to be developed. This in turn enables the identification, quantification and analysis of trade-offs and opportunity costs associated with policy and management decisions.



"The main reason for applying valuation is that if we fail to value these services, the economic systems we rely on will remain biased toward ecosystem degradation and over-exploitation."

~ TEEB (2012)

Worldwide, natural ecosystems and their associated services face tremendous

pressure from mounting human demands. Although we know that natural ecosystems are valuable for the wellbeing of our social and economic systems, as well as for our health and wellbeing, just how valuable they are is seldom well understood. This makes it difficult to evaluate how ecosystem values might be affected by various forms of management. The costs and benefits of certain management decisions are also distributed unequally, with some groups of people either suffering or benefitting disproportionately from some outcomes than from others. The distribution of costs and benefits and how particular groups of people will be affected is therefore also critical to consider.

As population and development pressure continue to grow, it is becoming increasingly critical to develop a more comprehensive understanding of the net value of ecosystem benefits to help inform decisions that could alter the flow of these benefits. Likewise, understanding the baseline distribution of ecosystem benefits is essential prior to making decisions that would alter benefit flows to particular stakeholder groups.

The UN Rio +20 conference in 2010, Green Economy topped the agenda and Green Growth became a key policy focus for UN agencies. The approach emphasizes the integration of social and environmental concerns into all aspects of economic growth. Ecosystem valuation has become a widely adopted tool to advance Green Growth and Green Economy policies, and many organizations have contributed to the development of valuation approaches. Among these groups, the UN Environment Program's TEEB (The Economics of Ecosystems and Biodiversity) has developed guidelines to facilitate the uptake of ecosystem valuation approaches. Their program information is scalable and tailored to governments and organizations at all levels and provides valuable guidance. We have incorporated several of their suggested approaches in this document.

Natural Capital

Natural capital refers to the biotic and abiotic components of the natural world: land, water, atmosphere and biodiversity. It exists within natural systems—ecosystems—which in turn provide beneficial services that enable both natural systems and humans to thrive.

Economic activity inevitably interacts with the environment, using it either as raw resources for production, a waste sink, or for a variety of amenity values (Harris and Fraser 2002). Industrial or economic development projects that extract or use natural resources—whether mines, power plants, logging or oil and gas extraction—have a permanent impact on the landscape and on our collectively-held natural capital. Through our ongoing economic activities we are effectively drawing down natural capital. While some degree of draw-down may be necessary, the conventional economic model lacks a reliable system of

There is a dangerous asymmetry in the way we measure…the value of natural resources…A country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers and hunt its wildlife to extinction, but measured income would rise steadily as these assets disappeared. ~ Repetto 1988

accounts that would enable us to examine and account for these trade-offs in economic terms. This knowledge gap is critical. By drawing down natural capital, we deplete the ability of ecosystems to deliver the benefits we rely on. This can have significant long-term consequences ranging from impacts on the economy and human health to the destabilization of the global climate. It will also limit our economic activities, not to mention health and well-being, in the future. Only by identifying, measuring and monitoring our natural capital can we determine its actual economic value and the full costs of its ongoing decline.

For many years, Statistics Canada (2006) has integrated natural capital into its systems of national accounts. Despite these efforts, and the importance of natural capital both to current and future generations, the concept is only beginning to enter the mainstream of economics or policy. A number of key questions related to natural capital have not yet been publicly discussed: what value will future generations place on natural capital and its derivatives? How will changes in natural resource management practices and priorities affect the future flow of benefits? How much draw-down in natural capital is acceptable? What is the tipping point at which ongoing economic activity causes natural systems to collapse and fail to deliver the natural services we rely on?

The Skeena Watershed Ecosystem Valuation project is a step towards answering these questions. By providing information that allows ecosystem values to be recognized, the project will help to reframe our traditional economic systems and approaches to better reflect contemporary cultural, political and environmental imperatives. At a time when we are increasingly running up against the limits of the natural world, it is vital to build a more complete picture of how natural systems sustain our economic systems and , when our activities impact them, the value of what we are trading off.

Ecosystem Services

Ecosystem services are those aspects of natural ecosystem functioning that are of direct benefit and value to humans. For example, the growth of plants through photosynthesis is a natural ecosystem function. Their importance to humans in terms of primary production or carbon sequestration is an example of how this natural function is also an ecosystem service essential to human well-being.

Although the services provided by natural systems are necessary to support our social and economic systems, we have largely neglected their economic value and significance in our decision-making. Consequently, natural systems that support human activities and wellbeing are routinely undervalued and

Ecosystem functions and processes: ways in which ecosystems operate naturally (e.g. the water cycle, decomposition and recycling of wastes)

Ecosystem services: aspects of natural functions and processes that are useful to people (e.g. water purification, nutrient cycling)

Ecosystem goods: things that people extract and use directly (e.g. water, fish, timber)

often given a default value of zero. However, as studies increasingly show, natural ecosystems do have significant, quantifiable, and often unexpected economic values. Consider a wetland that provides important water filtration services. A decision to drain it in order to build housing may appear to yield an economic gain. Yet this decision may have significant effects on downstream water quality or flow rates that affects other economic sectors or human well-being. When managers and policy makers have the information necessary to fully consider these additional present and future costs, the economic balance—and appropriate policy response—shifts significantly.

Many ecosystem services are economically vital yet have no direct market value, which can make them difficult to measure and account for. Consider the water regulating and filtration services provided by forests. These services play important roles in maintaining water quality, preventing floods and landslides and thereby sustaining the quality of life of communities within a watershed. Although such services undoubtedly have a significant economic value, they have generally been difficult to measure. Add to this the fact that until recent times, ecosystem services have been available in an apparently unlimited supply available free of charge and it becomes clear why their true values have typically been overlooked.

The ecosystem services framework has increasingly been used as a way of addressing this difficulty by demonstrating the value of the natural world to human activities and, indeed, survival (Redford and Adams 2009). However, assigning monetary values to ecosystems has also garnered criticism, particularly from those who feel that the practice uses the same economic system that threatened or eroded them in the first place. Ecosystem valuations can run the risk of portraying the natural environment in a reductionist way, equating it with dollar values representing simplified services. It may also undermine efforts to conserve natural areas for their intrinsic value, which exists independent of human needs and preferences. It is worth bearing in mind that the values identified through these studies are invariably conservative, and are based on our limited understanding of ecosystems and only on services that are of recognized instrumental value to humans.

Taking Nature's Benefits into Account

Decision-makers need information about the quantity, quality and value of natural resources to be able to make appropriate natural resource decisions. TEEB - The Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers (2010) offers guidance for those who want to take nature's benefits into account when developing policies and making decisions at a local and regional scale. Six steps are proposed for including ecosystem services and thereby natural capital in local policy:

Step 1 – Specify and agree on the problem

Determine if all stakeholders perceive the problem in the same way.	Coordinated by decision-maker but can be driven by a stakeholder/NGO

Step 2 – Identify which ecosystem services are relevant to the decision

Identify relevant ecosystem services and time/spatial	Undertaken by technical

scope, determine whether the decision relies on the services and/or if the decision might affect the services.	staff/consultants
STEP 3 – DEFINE THE INFORMATION NEEDS AND SELECT APPROPRIATE METHODS	
The type of decision determines the type of information and level of detail needed.	Determined by decision-maker with support from technical expert(s)
STEP 4 – ASSESS THE EXPECTED CHANGES IN THE FLOW OF ECOSYSTEM SERVICES	
Consider reliance/impact on ecosystem services. Consider whether any tipping points will be passed.	Undertaken by staff/NGO analysts consulting with decision-maker and stakeholders
STEP 5 – IDENTIFY AND ASSESS POLICY OPTIONS	
Evaluation using SWOT, risk assessment, cost-benefit, etc.	Policy expert in collaboration with decision-maker
STEP 6 – ASSESS DISTRIBUTIONAL IMPACTS OF POLICY OPTIONS	
Identify which stakeholders are likely winners or losers from a policy proposal and the extent of impact.	Analyst with input from decision-maker

The steps above were designed to provide an improved basis for local decision makers when considering projects and policies that impact upon natural ecosystems. According to the specific situation, some steps are more important than others and steps may need to be adapted to meet specific needs.

Different Approaches to Valuing Ecosystems

TEEB for Local and Regional Policy Makers identifies a range of possible frameworks that can provide input to the above implementation steps:

- Ecological frameworks (Key Biodiversity Areas and Critical Natural Habitat) represent the ecologist's priorities and perspectives;
- Economic framework (Total Economic Value) reflects the economist's priorities and perspectives;
- Developmental framework (Sustainable Livelihoods Approach) addresses the needs of the development planner;
- Socio-ecological framework (Millennium Ecological Assessment) is a generalist approach

TEEB suggests beginning with the ecosystem service categories of the Millennium Ecological Assessment. Then consider whether developmental, ecological and economic issues are covered adequately in the analysis and supplement the Millennium Ecological Assessment framework accordingly.

Role and limitations of the Millennium Ecosystem Framework

In 2005, the Millennium Ecosystem Assessment (MA), a task force of over 1350 researchers, released its final report detailing the current state of the world's ecosystems and environmental changes anticipated in the future. In establishing the definition of ecosystem services ("the benefits that people obtain from ecosystems"), the MA propelled the ecosystem services concept from a niche field of academic inquiry into a mainstream framework able to guide environmental and land management policy (Redford and Adams 2009). This framework is increasingly being taken up as a way to envision and balance the full effects of policy and resource management decisions.

The MA provides a useful format for conceptualizing ecosystem services, categorizing them into four key types as shown in Table 1. Of these, provisioning services are the most straightforward to value. They are often directly related to tangible ecosystem goods with market values that can be linked to the services in question. Values of regulating, supporting and cultural services are much more difficult to determine. These exist almost entirely outside the traditional market and their measurement requires specialized valuation techniques.

"There is often a divergence, or wedge, between the market prices of goods and services…and the social opportunity cost of using them. In particular, many services provided by ecosystems tend to be underpriced or not priced at all, leading to the inefficient and, often, unsustainable use of resources. By showing the existence and magnitude of differences between these private and social costs and benefits, valuation can help reveal policy and institutional failures (such as open access, public goods and externalities, or missing or incomplete markets), providing useful policy information on alternative intervention options for correcting them, such as creating markets or improving incentives."

Millennium Ecosystem Assessment, 2005

Despite the framework's value and increasingly important role as a policy and decision-making tool, many studies fail to make explicit the ways in which these decisions could affect human well-being and what the intensity of these effects might be (Chan et al. 2012). The development of methods to incorporate cultural services into ecosystem services frameworks continues to lag far behind the development and uptake of methods of measuring more tangible services.

Chan et al. (2011) define cultural services as "ecosystems' contributions to the non-material benefits (e.g. capabilities and experiences) that arise from human-ecosystem relationships." Assessing and valuing these services is a source of particular difficulty in ecosystem valuation studies, which by and large remain focussed on economic and ecological perspectives.

Table 1. Classifications of ecosystem services established by the MA

Provisioning Services *Products obtained from ecosystems*	Regulating Services *Benefits obtained from regulation of ecosystem processes*	Cultural Services *Non-material benefits obtained from ecosystems*
• Food • Fresh water • Fuelwood • Fibre • Biochemicals • Genetic Resources	• Climate regulation • Disease regulation • Water regulation • Water purification • Pollination	• Heritage and Place • Recreation/Activity • Spiritual • Inspirational/Educational • Existence/Altruistic/Bequest • Contribution to Social Capital/Cohesion • Option and quasi-option • Identity and sense of place
Supporting Services *Necessary for the production of all other services* • Soil formation • Nutrient cycling • Primary production		

Rationale for Ecosystem Valuation

Ecosystems worldwide face enormous pressure from growing human demands. Yet our demands are conflicting: even as we increasingly extract environmental goods and convert natural landscapes to suit human activities and preferences, we also require greater capacities for waste absorption, water regulation and climate stabilization.

The steady degradation and consumption of natural capital and the subsequent declines in ecosystem services have tremendous impacts on social and economic systems. Loss of regulating services can result in unpredictable water quality and flows, reduced air quality and climate instability. A reduction in provisioning services decreases current and future resource availability. Changes in cultural services can significantly impact human health and well-being. Yet just as we have failed to account for the full costs of changes to natural capital, we have largely overlooked the full cost of alterations to ecosystem services.

Both ecosystem valuation and natural capital accounting can help inform policy, planning and land use management. In particular, it can complement emerging management and decision-making frameworks such as cumulative effects indicators, the federal Wild Salmon Policy and climate change adaptation plans. It can also incorporate and support aspects of existing management frameworks such as Land and Resource Management Plans, Sustainable Resource Management Plans and fish sustainability plans.

THE SKEENA WATERSHED CONTEXT

Skeena Watershed Ecosystem Valuation Project

This project is a first step towards developing quantitative estimates of natural capital values in the Skeena watershed and the many associated ecosystem goods and services. Beginning with a participatory phase to identify and prioritize ecosystem services, the study will explore robust methods of assessing these services and incorporating the results into planning and decision-making. The research will illustrate the importance of these values and sound methodologies for measuring them. In addition to contributing to policy and management decisions, the increased information relating to non-market environmental values will assist in developing sustainable economic opportunities for the region's communities.

This ecosystem valuation project is a component of broader initiatives to seek sustainable, long-term economic solutions for northwest BC and improve accounting of the environmental effects of industrial projects in northwest BC. The project is also likely to be valuable in developing baseline information on quantities and distributions of ecosystem benefits, sparking more careful scrutiny of how these may be altered through future industrial development, and describing economic impacts of such alterations.

As mentioned previously, any economic estimates produced through this work are necessarily conservative. Actual values—both economic and intrinsic—probably far exceed any estimates the study can produce. The estimates developed through this ecosystem valuation research will provide a starting point for developing more holistic economic information on which to base future economic development planning and land-use decision-making.

Using the Skeena Ecosystem Valuation Documents

The outputs generated through the Skeena ecosystem valuation project will build on previous efforts in other regions to identify and prioritize ecosystem services and ecosystem values held by the public. Using established approaches, the Skeena ecosystem valuation results will enable the inclusion of ecosystem services in local, regional and provincial policy, planning and land use management. Skeena ecosystem valuation documents will assist decision processes such as the TEEB six step approach. It can provide either direct input or foundational knowledge that can be built on. The results of this project will be useful and influential in broad policies as well as specific development decisions.

The ecosystem valuation project could draw on and support complementary studies such as the cumulative effects monitoring recently piloted by the provincial government and community wellness projects piloted by regional First Nations. It can help improve the economic outcomes of resource management interventions where asymmetrical payouts exist (e.g. in estimating the impacts of

variations in salmon harvest levels). It will also assist in ongoing efforts to assess the full costs and benefits of industrial development together with the distribution of these costs and benefits, helping to ensure that this distribution is equitable. By strengthening these dimensions of management and planning, the work can help build social license for economic development initiatives. It can also assist decision-makers in conceptualizing and managing landscapes as natural infrastructure, as vital to our long-term societal well-being as communities and civil infrastructure.

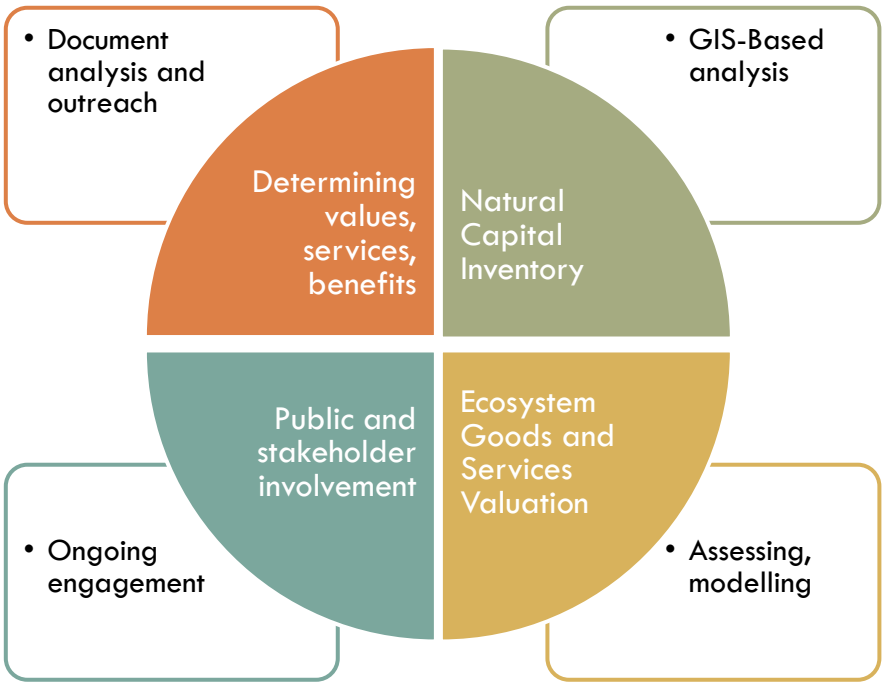
PART II: PROJECT PLAN

PROJECT SCOPE AND FRAMEWORK

Decision-makers need information about the quantity, quality and value of natural resources to be able to make appropriate natural resource decisions. Ideally, the collection and analysis of information should be designed to meet the needs of a specific problem or policy decision. However, the Skeena watershed is faced with a large number of large project proposals and the current shortcomings of available resource information could harm the ecosystem services which have not been inventoried or valued. This project strives to identify the full range of ecosystem services that are valuable to society, compile an inventory of existing data about natural capital and prioritize ecosystem services requiring further study and/or special attention.

The project will start with a generalist approach covering the whole Skeena watershed and will consider all ecosystem services. More detailed information will be collected as opportunities allow and/or as needed to build knowledge that can be applied to other areas of the watershed. Figure 1 below illustrates the components of the overall project, which are incorporated into different project phases.

Figure 1. Core components of Skeena watershed ecosystem valuation research



A Phased Approach

In order to address the various aspects of ecosystem values, the Skeena ecosystem valuation takes a phased (though not strictly sequential) approach as follows:

- Phase One: Scoping
- Phase Two: Naming What Counts
- Phase Three: Taking Stock
- Phase Four: Building on the Foundations

The work began with a scoping phase, which produced this project plan as a blueprint for the project. The subsequent "Naming What Counts" phase will identify and prioritize ecosystem benefits through both document review and participatory public processes. "Taking Stock" involves an inventory of natural capital using currently available data and a preliminary ecosystem services valuation. These three initial phases will inform, inspire and provide a solid foundation for integrating the value of ecosystem services into decision-making as well as further studies.

Phase One: Scoping

Timeframe	January to June 2013
Budget	$15,000
Activities	Five working group meetings/conference calls, two public presentations, partnership building, research
Outputs	Project plan
Status	Complete

The scoping phase took place between January and June 2013. During this period, a seven-member working group came together to discuss options for the scope and methods of the ecosystem valuation research and to develop a project plan. Group members had diverse backgrounds and included academics, consultants and representatives from the provincial government and several non-governmental organizations. Over the course of the scoping phase, the working group reviewed papers documenting recent natural capital inventories and ecosystem services valuation studies, using these as a springboard for the present project plan. The draft plan was then sent out to a larger network of reviewers prior to being finalized here.

The final project plan presented here draws on commonly-used methodologies and tackles some of the more difficult recurring issues encountered in previous studies.

Principles, Opportunities and Challenges

Working group discussions emphasized the importance of balancing social/cultural, economic and ecological considerations, both in terms of ecosystem services and values examined and in terms of the research process and methods. The group recognized that data collection and valuation methods need to encompass the diverse worldviews and cultural understandings in the region. The group

tackled methodological questions including geographical scope, priority ecosystem services and values to study, appropriate measurement metrics, data availability and methods of addressing current data gaps. Based on these discussions, the group determined that priority activities included further work (including community-based, participatory processes) to identify and categorize ecosystem services and benefits along with a geospatial analysis of natural capital and a preliminary ecosystem services valuation. Together, these initial phases can provide a much-needed foundation on which future work by other organizations could be based.

Table 2. Factors that could contribute to or inhibit project success

	Driving Factors	*Restraining Factors*
Internal	**Strengths** • Strong relationships and relevant skill set among project partners • Project partners developing new methods for naming/prioritizing values	**Weaknesses** • Funding for Phase Three and beyond not yet secured
External	**Opportunities** • Appetite for discussion on this topic (project could catalyze further discussions and research) • Topic is current – considerable current work in this field elsewhere • Increased social license needed by government and industry • Wellness studies being undertaken by regional first nations	**Threats** • Status quo favours industry • Lack of detailed ecosystem data – gaps not yet known or understood • Lack of political will in current provincial and federal governments to gather and curate data on an ongoing basis • Uptake/influence of project results uncertain

Naming what counts versus counting what's named

Natural resources with recognized economic value have been named, categorized and inventoried in significant detail, allowing the resource value to be fully considered (counted) when policy and land use decisions are being made. Early in the discussions, the working group recognized that important ecosystem services were not being named and measured within the current resource management framework. The ecosystem valuation work would need to shift away from the conventional approach of measuring previously identified values. Instead of counting what has already been named, a "naming what counts" approach would involve bottom-up, participatory processes of identifying community values and priorities. In this way, the project will begin to address one of the principal shortcomings of previous ecosystem valuation projects that neglected to incorporate grassroots, community driven processes and values, particularly as a means of identifying social and cultural ecosystem services.

Phase Two: Naming What Counts

Timeframe September 2013 to January 2014
Budget $16,000
Activities Applied approaches to determining ecosystem benefits
Outputs Report: Priority Ecosystem Services and Benefits
Status Finances for Phase Two activities secured

Background and Rationale

The purpose of this phase is to identify and prioritize ecosystem services which are of value to residents and users of the Skeena watershed. Some ecosystem services have already been recognized in legislation and land use plans (e.g. Land and Resource Management Plans). Various studies have also identified and estimated values for certain ecosystem services. While it will be essential to utilize these documents, their shortcomings must be recognized. Most were developed within a narrow focus and a number of years ago and did not involve First Nations perspectives or consider the ongoing impacts of climate change. First Nations, communities, stakeholders and the public must be involved in confirming, adjusting and adding to the ecosystem services. Undertaking both analysis of public documents and community-based processes will help ensure that this phase of the study is rigorous and reflective of public sentiment.

Environmental Assessment processes clearly identify values to be assessed usually at a much finer scale than is practical for ecosystem services valuations. These documents, which are often compiled by First Nations and represent their concerns and perspectives, will also guide the identification and prioritization of ecosystem services and can be considered another means of incorporating participatory processes into the ecosystem valuation study. Together with LRMP analysis, this work will cover much of the identified need for better integration of communities, stakeholders and the public in ecosystem valuation work, particularly in determining which aspects of ecosystem goods and services should be measured.

The participatory part of Phase Two builds on the data aggregation undertaken through the document analysis described above. During small focus group meetings held at several selected communities within the watershed, researchers and participants will discuss community values and reflect on the accuracy of information drawn from the EA and LRMP documents.

Undertaking both analysis of public documents and community-based processes will help ensure that Phase Two: Naming what Counts of the study is rigorous and reflective of public sentiment. Placing publicly-held values and priorities front and centre will help ensure that the research proposed here and further ecosystem valuation research using these values as a starting point has the highest likelihood of influencing policy. It will also root future related work in participatory, community-based practices.

Methods

This phase of the project is a two-part process that will ensure that the results are robust and can support decision-making and/or further studies. Using applied approaches to identify, classify and prioritize ecosystem benefits. These methods are currently being refined and used in concurrent work, including community wellness and cumulative impact studies being undertaken by several First Nations in the region and the Provincial Government's Morice Salmon Cumulative Effects Assessment pilot project. By linking with these other projects where possible and appropriate, Phase Two: Naming what Counts will be expanded and strengthened.

Part One: Document Analysis

Part one involves compiling ecosystem services identified in selected legislation, regional Land and Resource Management Plans (LRMPs) and project specific environmental assessments. Legislation has varying degrees of public input but is a product of the democratic process and so should be a key source of established public values. The development of LRMPs involved a broad-based public participatory process to develop guidance and social license for land use and resource development.

The Morice Salmon Cumulative Effects Assessment developed a methodology with which to extract publicly-identified ecosystem values from LRMPs. This resulted in a comprehensive Value Objectives Summary Database of values. In the Skeena Ecosystem Valuation project, we would repeat a similar process that could include the following LRMPs that cover areas of the Skeena watershed: Kispiox, North Coast, Kalum, Bulkley, Morice, Lakes, Fort St. James.

Budget:

Consultant: 15 days at $400/day, all expenses inclusive = $6,000

Part Two: Community-based processes

This component of the project uses participatory approaches and technology to update and further refine the data generated through the document analysis in Part One. Part Two aims to update and overcome shortcomings of the LRMP and environmental assessment documents by engaging directly with First Nations and other Skeena communities, or liaising with current community projects.

The methodology involves conducting a series of up to five small, community-based focus groups in several selected communities in the watershed. Storytelling, graphics and appreciative inquiry methods will stimulate discussion around ecosystem services and values. Following this discussion, participants will be asked to enter thoughts and concepts that they associate with healthy ecosystems into a database. This database is a newly software tool that is currently in the pilot stages. We anticipate that it will enable researchers to compile and measure different dimensions of community perceptions of healthy ecosystems and communities. Using values identified through the document analysis as a starting point, the tool will assist in aggregating public input and quantitatively identify publicly-held ecosystem values. This will enable comparison of current public values with those identified through the document analysis above.

Communities within the watershed that could be involved in this part of the study include Houston, Smithers, Moricetown, Hazeltons, Glen Vowell, Kispiox, Gitsegukla, Kitwanga, Gitanyow, Terrace, Port Edward, Prince Rupert, Metlakatla, Iskut, Topley, Fort Babine, Takla and Bear Lake. The final selection will be determined at the outset of the research based on budget and the project coordinator's recommendation.

Budget:
Software component
Technician to modify software: 4 days at $300/day = $1200
Community meeting component
Facilitator (planning, executing, analysis and reporting): 20 days at $300/day = $6000
Travel, accommodation, venues: $2000
Total: $9200

Phase Three: Taking Stock

Timeframe	January to December 2014
Budget	$62,800
Activities	Natural Capital Inventory
Outputs	Maps, inventory report, gap analysis
Status	Fundraising underway

Background and Rationale

"Taking Stock" involves an inventory of natural capital and a preliminary ecosystem services valuation using currently available data. The natural capital inventory will use GIS technology to compile baseline information about the natural capital/ecosystem services.

The natural capital inventory model would generally follow (with modifications) the methods established by Anielski and Wilson (2005) in their Canadian boreal valuation and elaborated by Wilson (2010) in her natural capital valuation of BC's lower mainland. The framework of the boreal study is based on the UN system of Integrated Environmental and Economic Accounting (SEEA) and Statistics Canada's Canadian System of Environmental and Resource Accounts (CSERA), which tracks fluctuations in the stocks, flows and economic values of Canada's resource wealth.

After determining the value of provisioning and regulating ecosystem services associated with different types of vegetation cover, detailed GIS data from the study region would enable analysis of spatial relationships and composite ecosystem values. It is a given that the GIS data will be appropriate for most ecosystem good and services (EGS) in question; however, some EGS data categories will have to be analyzed at the existing data scales. Data acquisition and clean-up will consume an estimated 50% of the GIS budget. While the available data is considered adequate for this study, the available ecosystem data will determine the rigor of economic decisions. Therefore,

should the study identify dated or less detailed data sets, the research will help identify further work needed in order to increase the economic efficiency of resource decisions in the future.

Methods

Findings from Phase Two will be used to refine this project plan for Phase Three. Once funding for Phase Three is secured, a request for proposals will be issued and a suitably experienced consultant with knowledge of the Skeena watershed will be selected. The consultant will be responsible for acquiring, cleaning up, and warehousing the data; providing draft and final tabular and map outputs. Principal ecosystem service analysis will include water (subsurface, surface, and quality), vegetation (types and extent), land types and processes (floodplain, wetland, riparian, terrace, sidehill, etc), habitat, cultural, soil, land alteration, fish, wildlife, people, and economic. The GIS analysis will breakout this analysis by sub-basin and the overall watershed. Subject to available time, resources and data, this geospatial work could include layering climate change downscaled modelling projections on Skeena ecosystem components and briefly analyzing and indicating results. It is our understanding that a Skeena downscaled climate change projection project is currently awaiting funding support.

Extension: Ecosystem Goods and Services Valuation

This section of the study would use the assembled data and estimates of the value of ecosystem services provided by each unit area of the land cover types to estimate the overall value of ecosystem services in the watershed. The ecosystem services analysed would be based on the Millennium Assessment framework and could include carbon sequestration, air and water purification, water regulation and supply and food supply. This section could include a cursory treatment of recreation and tourism, but further study and specialized methods will likely be needed to determine these values with accuracy (see Phase Four below).

Phase Four: Building on the Foundations

Timeframe Summer 2014 and beyond
Budget Unknown
Activities To be determined
Outputs Further valuation data and reports
Status Early stages of conceptualization

Phases Two and Three would provide a foundation for future work that could be undertaken by the current partners and/or other interested stakeholders and researchers. Subsequent studies and initiatives could address priority ecosystem services and data gaps identified in Phases Two and Three.

Examples of additional ecosystem values that the project may investigate – and possible approaches for assessing these – are outlined below.

Water values	*Market methods* In many parts of the world, fresh water carries significant market value. Although this market value varies widely from one jurisdiction to the next, assessing this value can provide a snapshot of the value of what is perhaps the most important and undervalued amenity in the Skeena.
Food sovereignty values	*Substitution cost method* Using survey or interview methods, assess the quantity of foods provided by the landscape (e.g. game, berries, fish etc. as well as cultivated foods such as garden vegetables and domestic meats). Express this as the monetary value of the foods if substitutes were required as well as the proportion of household income that the foods represent.
Recreation/tourism values	*Travel cost method* Survey clients of hotels, guide outfitters, fishing guides, hotels and other tourism enterprises to determine total expenditures on travel, accommodation, guide fees etc.
Existence value	*Contingent Valuation Method* The Skeena watershed is increasingly becoming known as a region of exceptional ecological importance. One of a dwindling number of rivers in North America with healthy wild salmon stocks, it is also one of the least industrialized watersheds in Canada. Many Canadians, particularly British Columbians, support the maintenance and enhancement of the Skeena's ecological integrity, even if they aren't able to experience or benefit from it directly. A province-wide contingent valuation could illustrate the region's value as perceived by people living outside of it.
Social/Health values	*Full Cost Accounting* Assess social and health effects that local communities may experience as a result of development. Method to be determined.
Modelling	*Impact of management decisions* A modelling component could examine the impacts of different management decisions on ecosystem service provision. For example, Integrated Valuation of Environmental Services and Tradeoffs (InVEST) is a family of ArcGIS tools specifically designed to map the delivery and distribution of ecosystem goods and services and estimate

their economic value. Using built-in formulas, the program is able to run the scenarios developed through stakeholder engagement and consultation and model potential outcomes. This modelling helps illustrate how the impact of management decisions on the location, quality, delivery and value of ecosystem services could change in the future. The resulting impact analysis can be expressed in either biophysical or economic terms.

Outreach and Participation

Ongoing outreach with the public is a key component of this work. This interaction began in the Scoping Phase with public seminars held in two communities in the Skeena watershed that introduced the project and its concepts. It is also a key component of Phase Two: Naming what Counts. In seeking these opportunities for participation and interaction by the public and local leadership, both the methodologies and results of the project gain credibility.

Future forms of engagement could include the following:

Public involvement	Share the progress and results of the study through a variety of media avenues including newspaper, radio, social media and local magazines. Provide opportunities for members of the public to learn more about and provide input on the research process and results through public meetings and open houses.
Engage skilled professionals within the region	Continue to present research to the professional community during seminars tailored to provide opportunities for interaction and feedback (e.g. BV Centre Seminar Series, UNBC Seminar Series) and present the ecosystem services evaluation results in peer-reviewed journals.
Involve academics and specialists	Attend relevant conferences and present project results where appropriate, network with individuals and share information to obtain further information and insights.
Engage leaders	Present the project to various levels of leadership and staff within the study area (i.e. First Nations, and municipal, regional, provincial and federal governments and NGOs) through workshop settings. Lobby leaders (including both politicians and civil servants) to incorporate ES assessments in planning, decision-making and monitoring processes.

Higher intensity forms of engagement include focus groups (involving either self-selected or invited participants) that would workshop the results of the various project modules. The aim of this work is to verify the methodology and the representativeness of the results or suggest improved methodologies. This feedback is particularly important in the pilot study phases.

BUDGET AND TIMEFRAME

Budget

Project Phase	Cost	Confirmed	Required
Scoping	15,000	15,000	0
Phase Two	15,200	15,200	0
Phase Three	62,800	0	62,800
Phase Four	Project dependent		

Timeframe

	2013												2014											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scoping phase	•	•	•	•	•	•																		
Fundraising			•		•	•			•	•	•													
Phase Two									•	•	•	•												
Phase Three											•	•	•	•	•	•	•	•						
Phase Four															•	•	•	•	•	•	•	•	•	•
Outreach				•					•	•	•	•	•	•	•	•	•	•						

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APPENDIX: VALUATION APPROACHES

Over the past half-century, economists, scientists and policy-makers have increasingly sought methods of incorporating the goods, services and benefits provided by ecosystems into our economic system. This section provides a summary of the principal frameworks and methodologies in current use.

VALUATION FRAMEWORKS

The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative that aims to highlight the economic benefits of biodiversity and the growing cost of biodiversity loss and ecosystem degradation worldwide. It presents information and approaches designed to help decision-makers recognized and demonstrate the values of ecosystems and biodiversity and to incorporate these into policy and decision-making. TEEB stemmed from an initial study of the same name presented at the ninth Convention on Biological Diversity in 2008.

TEEB has identified five valuation frameworks currently in use around the world. Each of these has a specific focus, whether economic, ecological or developmental. The most appropriate framework for a given application depends on specific policy contexts and user requirements.

Table 3. Summary of frameworks for valuing and evaluating ecosystems and biodiversity

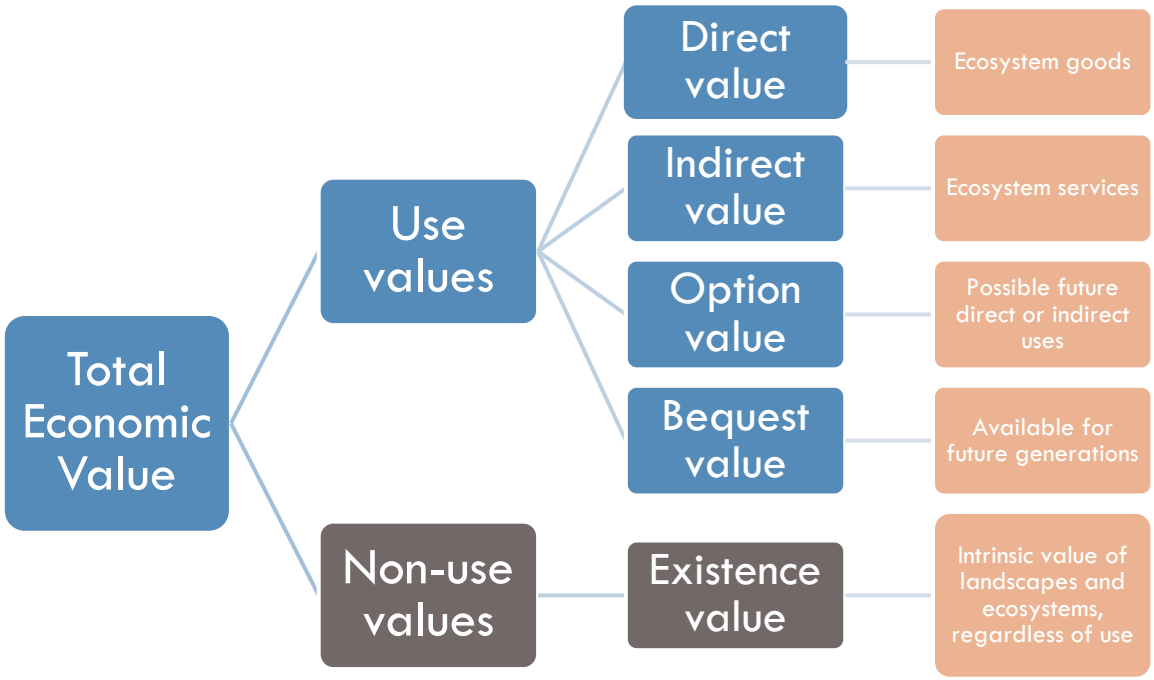
Focus	Framework	Purpose and Objectives
Social-ecological	Millennium Ecosystem Assessment	Classifies ecosystem benefits into categories which in some cases can be monetized
Economic	Total Economic Value	Conventional economic approach to valuing ecosystems in monetary terms.
Ecological	Key Biodiversity Areas	Designates priorities for conservation based purely on ecological criteria
	Critical Natural Capital	System of prioritizing conservation and environmental protection
Developmental	Sustainable Livelihoods Approach	Socio-cultural approach that considers capacity-building and risk-exposure

Adapted from "TEEB - The Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers" (2010).

Total Economic Value

The Total Economic Value framework (Figure 1) is a typical framework used by economists to classify ecosystem services according to their use. Generally it includes direct use values (consumptive or non-consumptive use of environmental goods such as food, timber and water), indirect use values (ecosystem services that provide benefits beyond the ecosystem itself, for example water regulation or carbon sequestration), option values (preserving the option to use ecosystem goods and services in the future, whether or not they are currently being used) and non-use values (the satisfaction or value people may find in knowing that a resource or ecosystem benefit exists even though they do not expect to use it).

Figure 2. Total Economic Value framework



In this diagram, direct values correspond with provisioning services as defined by the millennium assessment, indirect values with regulating and supporting services and existence values with cultural services. Of these values, direct values are the most straightforward to analyse. Direct values are generally synonymous with provisioning services and include tangible goods with market values, such as timber, water, fish etc. Indirect values, however, are more difficult to assess. There is often no market for the corresponding services, which are made even more difficult to measure because the specific quantities of the service—for example water regulation or carbon sequestration—are often difficult to determine.

VALUATION METHODS

Table 4. Summary of valuation methods

Group	Methods	Summary	Services
Direct market prices	Market prices	Observe Market prices	Provisioning
Market alternative	Replacement costs	Cost of human solution to replace lost ecosystem service	Pollination, water purification
	Damage cost avoided	How much spending was avoided thanks to the ecosystem service?	Damage mitigation (flood, drought), carbon sequestration
	Production function	Amount of value-added by the ecosystem service based on input to production processes	Provisioning services water purification, freshwater availability
Surrogate markets	Hedonic Price Method	Considers housing market and extra amount paid for higher environmental quality or environmental amenities	Use values only, recreation, air quality
	Travel Cost Method	Travel costs of visiting a site (flights, fuel, etc.), value of leisure expended	Use values only, recreation and leisure
Stated preference	Contingent Valuation Method	What are respondents willing to pay or willing to accept to avoid or accept a decline in environmental quality?	All services
	Choice experiments	Which item is preferred in a menu of options with different levels of ecosystem services and costs?	All services
Participatory	Participatory environmental valuation	Community members asked to determine the importance of a non-marketed ecosystem services relative to marketed goods and services	All services
Benefits transfer	Benefits transfer	Transferring a value from an existing study to provide a ballpark estimate for a new study or policy	Services valued in the original study

Adapted from "TEEB - The Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers" (2010).

Table 5. Appropriate methodologies vary with on ecosystem value in question

Technique Class	Approach	Environmental Value				
		Use				Non-use
		Direct	Indirect	Option	Bequest	Existence
Revealed Preference	Market Price	✓				
	Productivity		✓			
	Surrogate Market	✓		✓	✓	✓
Cost based	Travel cost		✓			
Stated preference	Contingent Valuation	✓		✓	✓	✓

Revealed Preference Methods

These methods examine the actual economic behaviour of individuals (i.e. their purchases and expenditures) to arrive at dollar-based valuations of ecosystem services. These methods are commonly used for goods and services that are directly traded in marketplaces (e.g. timber) or used as production inputs (e.g. water). Some intangible services such as recreation opportunities or aesthetic views aren't directly bought or sold, however an economic analysis of related goods can be used as a valuation (e.g. how much people pay to travel to a recreation site or to live in a home with a mountain or ocean view).

Market Price Method

This method estimates the economic values for ecosystem goods and services that are traded in commercial markets. From available market data, changes in the quality or quantity of ecosystem services can be determined.

Productivity Method

Where ecosystem goods or services contribute to the production of commercially marketed goods, their value can be determined from their economic contribution to these secondary goods.

Hedonic Pricing Method

This method is used to assess the environmental value of ecosystem services or amenities that directly affect the value of another good. It is commonly used to determine and value the variation in environmental attributes that affect housing prices. It's application to housing prices is based on the

assumption that people will take a variety of environmental attributes into consideration when purchasing a home. These could include proximity to an amenity such as a recreation site, the availability of an amenity such as an aesthetic view, and the economic result of qualitative changes in the amenity or in the quality of the surrounding environment in general resulting from pollution, development, etc. The method is relatively uncontroversial and straightforward to apply because it uses existing information based on actual market behaviour.

To apply the method, researchers must gather measures or indices of the market values in question and data regarding the market good in question over a period of time.

Travel Cost Method

This method estimates the economic value of recreation or aesthetic services offered by a particular ecosystem or site as determined by the total amount that people are willing to pay to travel there. It is determined through an analysis of total costs accrued in visiting the site.

Stated Preference Methods

These methods use questionnaires, surveys and interviews to determine the value of ecosystem services and amenities based on the economic values given by survey participants

Contingent Valuation Method

This method can be used to estimate economic values for almost any ecosystem good or service, whether or not it is associated with goods or services that are commercially traded, and is the most commonly used method for estimating non-use values. Asks people to directly state their willingness to pay for specific environmental services, based on a hypothetical scenario. This is the most controversial valuation method because it is based on hypothetical, rather than actual, behaviour. In this method, people are asked to state what they would be willing to pay to maintain a certain environmental service or amenity, or what they would be willing to pay to avoid an undesirable outcome associated with a particular environmental service or amenity. That is, their willingness to pay is contingent on a hypothetical situation or outcome.

Contingent Choice Method

This method can also be used to estimate the economic value of almost any ecosystem good or service. In the contingent choice method, people are asked to choose between various environmental services. Rather than directly asking people's willingness to pay, this is inferred through stated willingness to make trade-offs.

Cost-Based Methods

These methods estimate the value of ecosystem services based on either the costs of avoiding damages due to lost services, the cost of replacing ecosystem services, or the cost of providing substitute services.

Damage Cost Avoided, Replacement Cost and Substitution Cost Methods

This method estimates the economic value of ecosystem services based on the cost of replacing lost services, providing substitutes for the service in question or repairing damages in order to maintain service provision.

Benefit Transfer Method

This method uses the existing estimates derived from completed studies to estimate the values related to the service in question.

Cultural Value Assessment Methods

Incorporating cultural and social values into the ecosystem valuation work was a key concern for the working group.

Contingent Valuation

The cultural value assessment would also identify cultural values using the contingent valuation method (CVM). The CVM would provide a relatively low-cost way of gathering quantifiable data from a large sample size.

The contingent valuation method (CVM) is a survey methodology used to place an economic value on use and non-use environmental goods and services. Through CVM surveys, researchers determine respondents' willingness to pay (WTP) for particular goods and services or their willingness to accept (WTA) payment in compensation for the loss of a good or service. This enables the valuation of goods and services that are not traded in the conventional marketplace such as water purification or pollution prevention, changes in water and air quality, or natural amenities such as parks and wilderness areas.

The CVM approach is not without its critics. In particular, the validity and reliability of results have frequently been called into question, along with the effects of a variety of biases and errors and the reliability of assumptions inherent to economic theory, for example that consumers are rational actors who seek to maximize utility. In spite of these critiques, the use of CVM has expanded rapidly since the early 1960s. The steady refinement of elicitation methods and the vast body of literature devoted to format and technique (e.g. Davis and Whittington 1998, Whittington 2002, Carson and Hanemann 2005) have allayed the initial misgivings of economists and CVM methodologies have

come to be widely accepted as reliable indicators of social values. The method remains the only established method to determine non-use economic values such as existence values or passive use values and its use has led to dramatic policy shifts in developed and developing countries alike.

A standard CVM study using a mail-out survey would be a relatively low-cost valuation option that could be designed and conducted within a period of several months. Combined with other methodologies such as focus groups, interviews and/or community mapping, it could help support the findings of other methods or indicate where further study is needed. In a further intensified study, group contingent valuation is an additional possible approach. This method involves determining willingness to pay through a group discussion and democratic or consensus-based processes.

Community Mapping

Community mapping is an established tool for community planning and design that recognizes that cultural values of place are comprised of multiple layers of tangible and intangible qualities. This method could add important qualitative descriptions to the overall study. The process of mapping social values can create new layers of spatial data for use in GIS analyses.

Following Klain and Chan (2012), a cultural value assessment could use participatory mapping activities to identify social values. The methodology builds on established landscape valuation methodology and participatory GIS literature and can be adjusted or scaled to suit the available budget.

An interview-based component could involve subjects with a knowledge of the study area and local issues (such as people with land-based livelihoods, as in Klain and Chan) in a process such as the following:

1. *Establish study area and interview sample*
    a. Determine an appropriate study area and sample size based on available resources.
    b. Interview subjects might be randomly selected from within the study area or may be selected based on predetermined criteria (e.g. land-based livelihood, amount of time living in area etc.).
2. *Design semi-structured interviews*
    a. Begin with open-ended questions that enable respondents to express areas and attributes of the study area that are important to them.
    b. Present respondents with a map of the study area. Ask that they identify areas of importance by drawing a polygon around them. Polygons may be colour coded to correspond with different values (e.g. income generation, food sources, recreation, ceremony etc.). Establish the relative importance of each polygon by assigning tokens to each.
    c. Through open-ended questions, encourage the respondent to consider the connections between the place, ecosystem services and qualities such as identity, subsistence, spirituality and intergenerational aspects.

d. Ask respondents to identify areas facing threats to ecosystem services and identify these with additional polygons. Once again, use tokens to indicate the relative severity of the threat.

3. Conduct spatial analysis

a. Convert polygons to shape files. By intersecting these with a grid of numerically-identified cells, spatially summarize the ecosystem values (whether monetary or non-monetary) and/or threat intensity associated with each.

(adapted from Klain and Chan 2012)

Further intensified studies could include focus groups to discuss, map and value community and landscape assets using democratic or consensus-based processes.