Sensitive Ecosystems Inventory: An Effective Conservation Tool?

Peggy Ward
Canadian Wildlife Service, Pacific and Yukon Region, Environment Canada.

Abstract
The purpose of this project was to determine the effectiveness of the federal-provincial *Sensitive Ecosystems Inventory (SEI) of East Vancouver Island and Gulf Islands.*[1]

The SEI was the first of its kind in British Columbia and was designed to provide a scientific ecosystem-based tool for land use planning. Remnant rare and ecologically fragile terrestrial ecosystems larger than one-half hectare were mapped and selectively ground truthed from 1993 – 1997 followed by a comprehensive outreach program from 1998 – 2003.

The effectiveness of the SEI is currently being evaluated (winter 2002/2003) by measuring the area of ecosystem loss since the original inventory was conducted and by interviewing users to determine the extent to which the SEI influenced conservation actions. Preliminary results of this evaluation are presented here.

Introduction
By the late 1980s it was clear that ecologically significant lands and important wildlife habitats were fast disappearing throughout the lowlands surrounding the Strait of Georgia due to intense development pressures fueled by population and economic growth. Teams of ecologists, biologists and soil scientists applied photo interpreting skills and field survey techniques to map small remnants of former ecosystems that once defined the character of East Vancouver Island and the Gulf Islands. Even many of these mapped remnants had been somewhat degraded by fragmentation, human use, and introduced species.

Sensitive ecosystems typically have high biodiversity and are home to many rare and endangered animals, plants and plant communities. They are also a vital part of the overall landscape, providing ecosystem services that support a healthy economy and social wellbeing. For example, sensitive ecosystems regulate climate, clean our fresh water, generate and clean our soils, recycle nutrients and pollinate our crops.

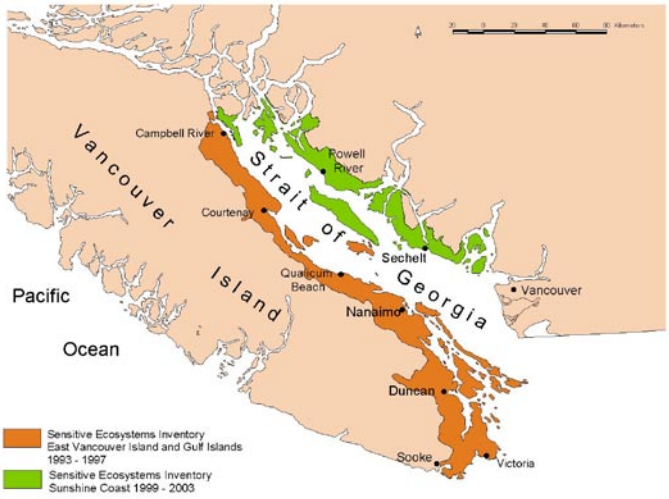
East Vancouver Island and Gulf Islands Study Area: Original inventory results

Primarily based on 1990-92 air photos
Study area: 4,120 km^2
Population 600,000—86% of total Van Island population
Mostly private land with little Crown (public) land

Sensitive Ecosystems: 7.9% of study area
6500 sites—median polygon size 1.6ha
2039 sites (31%) field checked

Other Important Ecosystems: 11.6% of study area
888 sites—median polygon size 15ha
133 sites (15%) field checked

Sunshine Coast Study Area
The SEI currently underway on the Sunshine Coast will be completed in 2003



Sensitive Ecosystems[2]

The following seven *sensitive ecosystems* once defined the character of East Vancouver Island and Gulf Islands. The primary goal of the inventory and outreach project was to conserve these sensitive ecosystems in a relatively natural state.

Wetland ecosystems[3] (1.7% of landscape[4])—Nearly half of the remnant wetlands measure less than 1ha in this relatively warm and dry area of coastal BC; rare plants include graceful arrow-grass *(Triglochin concinna)* and northern adder's tongue *(Ophioglossum pusillum)*

Riparian ecosystems (1.6% of landscape)—The remaining fragments are predominantly immature or young forests; only 12 sites are older than 250 years. One of the rare plants found here is Scouler's corydalis *(Corydalis scouleri)*.

Older forest ecosystems (2.6% of landscape)—Once the dominant ecosystem type, forests older than 100 years now cover only 2.6% of the landscape with a median patch size of only 7ha; numerous rare plant communities occur here such as grand fir/dull Oregon grape *(Abies grandis/Mahonia nervosa)* and Douglas-fir/sword fern *(Pseudotsuga menziesii/Polystichum munitum)*.

Woodland ecosystems (0.6% of landscape)—Woodlands occur in patches averaging 2ha; Garry oak woodlands cover less than 5% of their original extent, have the highest diversity of all sensitive ecosystems and provide habitat for many species at risk.

Sparsely vegetated ecosystems (0.1% of landscape)—Naturally rare dune-and-spit ecosystems occur mostly on the Gulf Islands; cliffs are also rare but occur throughout the study area. Rare plant communities include northern wormwood-Puget Sound gumweed *(artemesia campestris-grindelia integrifo*

Coastal bluff ecosystems (0.3% of landscape)—Naturally rare in this region, this fragile ecosystem supports nationally and provincially rare species such as the *anatum* subspecies of Peregrine Falcon and Macoun's meadowfoam *(Limnanthes macounii)*.

Terrestrial herbaceous ecosystems (1% of the landscape)—These grassy hilltop and wildflower meadow ecosystems support many rare species such as the Zerene Frittilary butterfly *(Speyeria zerene bremneri)* and the Idaho fescue/junegrass *(Festuca idahoensis/Koeleria macrantha)* natural plant community.

Other Important Ecosystems

The following ecosystems were not considered 'sensitive' but were mapped because of their general biodiversity values. Our goal was to maintain their resource use values while minimizing the loss of their ecosystem functions

Older second growth forest ecosystems (10.9% of landscape)—Forests between 60 and 100 years old can serve as important buffers around sensitive ecosystems and provide vital links between habitat patches. If allowed to mature they will become older forest ecosystems.

Seasonally flooded agricultural field ecosystems (0.7% of landscape)—Wet agricultural fields were mapped because they provide extremely important habitat for wintering waterfowl as well as for shorebirds and birds of prey during specific times of the year.

Outreach Program

An extensive outreach program was developed and implemented between 1997 and 2003. The products and services listed below primarily targeted decision makers in municipal and regional governments and senior government agencies. They were also developed in recognition that the information would be useful to members of non-government organizations and consultants who either worked for or made conservation recommendations to decisions makers.

- Maps (1997)—digital (ArcInfo) and hardcopy (1:20,000)
- Technical Report (Ward *et al.* 1998)—methods and inventory results
- Conservation Manual (McPhee *et al*. 2000)—ecosystem values, management recommendations and conservation tools

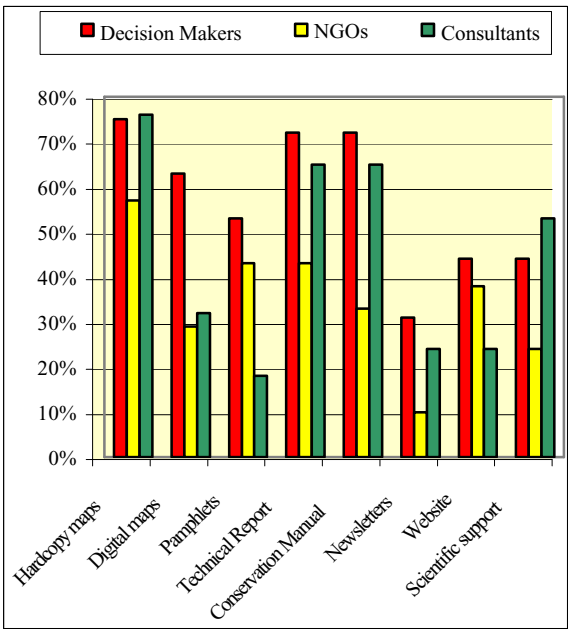


Figure 1. SEI products and services rated 'somewhat useful' or 'extremely useful' by interviewees.

- Pamphlets, website and newsletters (1998 – 2003)
- Training workshops (1999 - 2001)
- Scientific Support (1997-2002)—BC Conservation Data Centre

Figure 1 shows which of the products and services were considered most useful by the SEI users who were interviewed during the recent evaluation (see below).

Evaluation Results

During the winter of 2002-03, Environment Canada's Canadian Wildlife Service conducted an evaluation of the entire SEI program. The evaluation was designed to answer the question: *Has the SEI been effective in influencing conservation-based land-use decisions?* There were two components to the evaluation. The area of disturbance to all original polygons was measured and interviews were conducted with existing and potential SEI users.

Disturbance Mapping

The original 7,388 SEI polygons were identified on air photos taken mostly between 1991 and 1993; approximately 30% were groundtruthed. By digitally overlaying the original polygons on 2002 ortho-photography, visible disturbances—logging, urban or rural use, roads, trail(s), recreation, agriculture or industrial use—were identified. Where delineation of disturbed areas was possible they were deleted from the dataset. Where delineation of the area of disturbance was not possible, for example, the area of encroachment was too small or was dispersed throughout a small polygon (e.g. roads, trails, patchy clearings), the polygons were classified according to the level of fragmentation (<6%, 6-25%); small polygons with >25% fragmentation were deleted. The remaining portions of each altered polygon will be reviewed to determine if they still qualify for inclusion in the SEI and an updated spatial file will be created.

The final results and analysis of this new mapping will be available by the end of 2003. Preliminary results showed that over 5,000 ha (6.6%) of the area occupied by the nine SEI ecosystem types had been disturbed by summer 2002. Over 900 ha of this had been occupied by the seven sensitive ecosystems. Figure 2 shows that of the sensitive ecosystems (green), older forests had the highest rate of loss (5.6%) followed by riparian and wetland ecosystems (3% and 1.5% respectively) and woodland (1%). The largest area of loss (over 4,000 ha) was to older second growth forests, one of the other important ecosystems (orange).

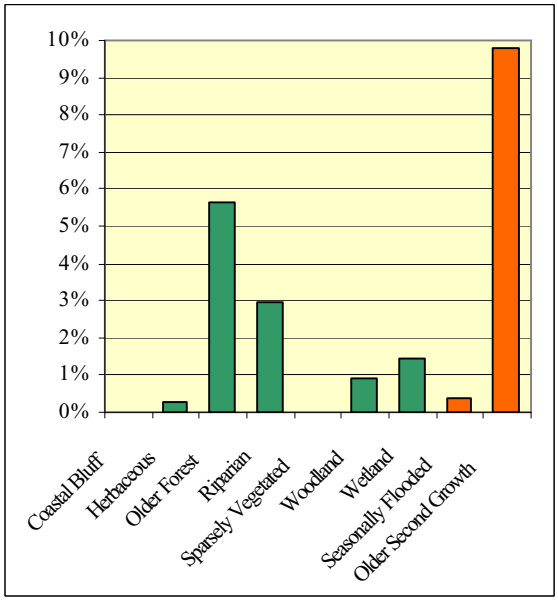


Figure 2: Relative Proportion of SEI ecosystems disturbed by 2002.

The high percentage of loss due to logging is an indication of the large proportion of timber harvest areas that occupy the study area. By contrast, areas targeted for urban and rural development are relatively small. However, development in these areas greatly impacts the smaller pockets of wetlands, native grasslands, open woodlands and the other naturally rare ecosystems

Interviews

Eighty people from three sample groups of existing and potential SEI users were identified and interviewed (Axys 2003).

Decision-makers (38 interviewed):

- Most respondents (96%) from local and senior governments, industry and First Nations used SEI when considering land development, capital works, site enhancement and mitigation.
- All four Regional District governments incorporated SEI into Official Community Plans (OCP), and three used SEI for Development Permit Area (DPA) designation. This was encouraging since they have considerable land use control powers in unincorporated areas, which comprise the majority of the study area.
- One-half of the 24 municipalities on Vancouver Island either declined or did not respond to requests for interviews. This is of particular concern since municipalities have broad planning and land-use control powers within their jurisdictions to assist them in protecting sensitive ecosystems and other important ecosystems.

Non-government organizations (NGO) (24 interviewed):

- 85% used SEI for inventory, stewardship and making land use recommendations.

Consultants (18 interviewed):

- >80% used SEI for inventory and baseline studies and making land use recommendations.
- 70-80% used SEI for Environmental Impact Assessments or management plans.

Interview responses showed that during the past five years, SEI information was used in a variety of land-use planning processes and contributed to the conservation of numerous sites. Figure 3 summarizes the respondents' views on how SEI contributed to the protection of specific sites. Interviewees felt that the SEI was an effective planning and management tool, that it was a good source of ecological information, and that it flagged sites of conservation concern prompting more detailed field studies prior to development projects.

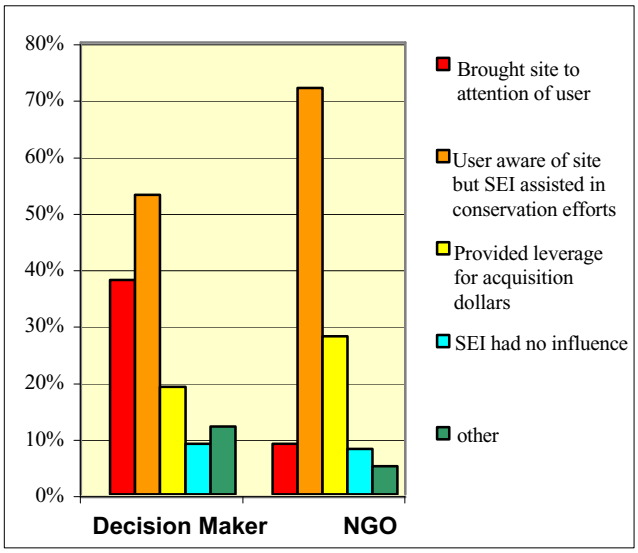


Figure 3: How did the SEI contribute to site protection?

A common misconception (or wish) among many respondents was that the SEI would provide detailed site-level data. It is possible that this response reflected users' limited resources for undertaking their own detailed inventories. The interview results also reinforced the importance of keeping the information up-to-date, given the intense development pressures of the study area.

Conclusions

Figure 4 summarizes the interviewees' responses to our original question, *has the SEI been effective in influencing conservation-based land-use decisions?* Interview results showed that the SEI had been reaching its target audiences and that it was well known among decision makers—nearly 75% of respondents within the decision makers group felt that the SEI was meeting their needs. It was also being used for its intended purpose—to flag sites of conservation concern for strategic-level planning, development permitting, and land protection.

However, preliminary results of the disturbance mapping showed that by 2002, 3% (over 900ha) of the area covered by sensitive ecosystems in the early 1990s was gone. Given that the original inventory found that these ecosystems had covered only 7.9% of the study area, it is critical that all possible land use options be evaluated before initiating any further changes to these rare and fragile ecosystems.

In recognition of the value of the type of ecological information provided by the SEI, the Government of British Columbia is currently developing a Rare and Sensitive Terrestrial Ecosystem Mapping standard for the Resources Inventory Standard Committee (RISC). The primary objective of this standard is the conservation of biological diversity, with emphasis on the most vulnerable elements of biodiversity in the landscape under study (Carmen Cadrin, personal communication).

The evaluation results may not be a true indication of the effect of the SEI on conservation since the inventory began 10 years ago. The SEI maps were published and distributed in late 1997 but the full range of products and services was not available until 2000. Monitoring over the next 5 to 10 years will provide a more conclusive evaluation of whether the SEI has made an important difference on the landscape.

In the meantime, several other Sensitive Ecosystems Inventory projects are underway or are being considered. These include the Sunshine Coast, Central Okanagan and the Alberni Valley, areas under considerable development pressures.

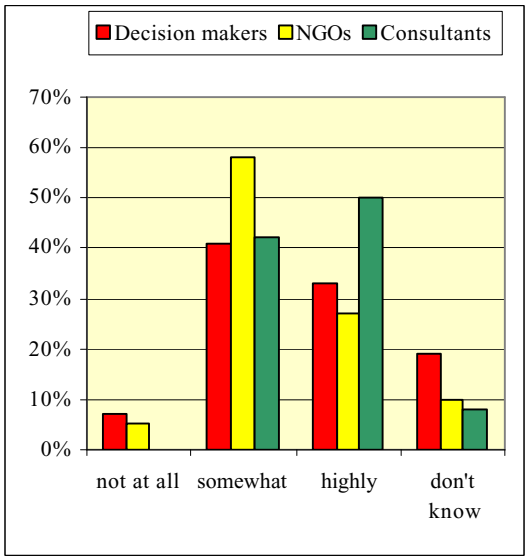


Figure 4: How effective was the SEI in contributing to conservation?

References

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Ward, P., G. Radcliffe, J. Kirkby, J. Illingworth and C. Cadrin. 1998. *Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands, 1993 - 1997. Volume 1: Methodology, Ecological Descriptions and Results.* Technical Report Series No. 320, Canadian Wildlife Service, Pacific and Yukon Region, British Columbia, 160pp.

Notes:

[1] A joint project of Environment Canada (Canadian Wildlife Service) and the British Columbia Ministries of Sustainable Resource Management (Conservation Data Centre) and Water, Land and Air Protection (Vancouver Island Region). Major funding was provided by Environment Canada and the British Columbia Habitat Conservation Trust Fund.

[2] Detailed descriptions of the seven 'sensitive' and two 'other important ecosystems' mapped for the SEI are provided in two reports (Ward *et al*. 1998; McPhee *et al.* 2000). Photographs of ecosystems can be seen on the SEI website: http://srmwww.gov.bc.ca/cdc/sei

[3] Pamphlets are available for each ecosystem type and can be seen on the above website.

[4] 1993 – 1997 inventory results.