



## Coast Information Team

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The Coast Information Team is pleased to deliver the final version of the *CIT Cultural Spatial Analysis (March 2004)*.

The Coast Information Team (CIT) was established to provide independent information for the central and north coasts of British Columbia and Haida Gwaii/Queen Charlotte Islands using the best available scientific, technical, traditional and local knowledge. The CIT was established by the Provincial Government of British Columbia, First Nations, environmental groups, the forest industry, and communities. It is led by a management committee consisting of representatives of these bodies; and is funded by the Provincial Government, the environmental groups and forest products companies, and the Federal Government of Canada. The technical team comprises nine project teams consisting of scientists, practitioners, and traditional and local experts. CIT information and analyses, which include this *CIT Cultural Spatial Analysis*, are intended to assist First Nations and the three ongoing sub-regional planning processes to make decisions that will achieve ecosystem-based management (as per the April 4th 2001 Coastal First Nations – Government Protocol and the CCLRMP Interim Agreement).

In keeping with the CIT's commitment to transparency and highly credible independent analysis, the *CIT Cultural Spatial Analysis* underwent an internal peer review and the CIT's independent peer review process chaired by University of Victoria Professor Rod Dobell. Peer reviews of the draft document and the authors' response are found at <http://www.citbc.org/abostru-comm.html>. The final document reflects changes made by the authors to address peer review comments.

We encourage all stakeholders involved in land and resource management decision-making in the CIT area to use the information and recommendations/conclusions of the *CIT Cultural Spatial Analysis* in conjunction with other CIT products as they seek to implement EBM and develop EBM Land Use Plans. We are confident that the suite of CIT products provides valuable information and guidance on the key tenets of EBM: maintaining ecosystem integrity and improving human wellbeing.

Sincerely,

Robert Prescott-Allen, Executive Director  
on behalf of the CIT Management Committee:  
Ken Baker, Art Sterritt, Dallas Smith, Jody Holmes, Corby Lamb  
Graem Wells, Gary Reay, Hans Granander, Tom Green, Bill Beldessi



# Coast Information Team

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## **Cultural Spatial Analysis of the Central Coast, North Coast, and Haida Gwaii/Queen Charlotte Islands**

**Dr. Robert Lee**

**March 2004**



Coast Information Team

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and Haida Gwaii/Queen Charlotte Islands**

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## 1.0 Summary of Principal Findings

Spatial analysis of both First Nation and non-First Nation cultural features associated with land and water areas on the Central Coast, North Coast, and Haida Gwaii/Queen Charlotte Islands produced the following key findings:

1. Over 86 percent of recorded cultural features are located in places that would not likely yield a positive return from timber harvesting.
2. Over 87 percent of recorded cultural features are located outside designated protected areas.
3. First Nation records of cultural features are incomplete and, as a result, may at this time not provide sufficient spatial information for making ecosystem-based planning decisions.
4. More investment in gathering and analyzing cultural information is needed to fully implement an approach to ecosystem-based management that integrates cultural, economic, and ecological values.

Analysis of more detailed information for non-First Nation communities on the Central Coast and North Coast revealed that:

5. Places of cultural importance on the North Coast are in better shape and have far fewer threats than places on the Central Coast.
6. Recreation features, natural features, and sustenance features are in the least modified environments, yet are also the features exposed to the greatest threats.
7. Ratings of threat and condition of places can be used to prioritize protective or remedial actions, with most action needed to protect or manage recreation sites, sustenance areas, and natural environments.

## 2.0 Purposes and Limitations of the Analysis

This report summarizes results from an analysis of cultural features associated with land and water surfaces in British Columbia's Central Coast, North Coast, and Haida Gwaii/Queen Charlotte Islands (QCI). Features of cultural significance were mapped by members of First Nation and non-First Nation communities (hereafter referred to as "Other Community"). Other Community features were supplemented by recreational and visual quality features obtained from the Ministry of Sustainable Resource Management. Coastal Resource Mapping of Nanaimo, B.C., analyzed spatial data using geographic information systems (GIS) technology to produce tables and maps representing cultural features associated with identified places. This report includes summary tables and figures to accompany maps stored in electronic files. All resulting statistical data and maps are available on the following site: <http://www.citbc.org/anacult.html>. To facilitate access to the results, this report is structured by the logic of hypertext. It was designed to present the methodology and key findings, and to guide the reader to look up detailed information or maps, as dictated by the reader's interests and needs.

Because emphasis was placed on the spatial analysis of generalized cultural features, the primary product is a set of maps and, where possible, a summary of features associated with mapped places. Qualitative information was used to delineate places and identify selected attributes, and was not otherwise recorded. Far more intensive sampling and data collection would be required to record the specific meanings associated with places, particularly because these meanings have a rich texture and vary both within and among places, communities, and cultures.

Information on cultural features was intended to provide regional planning tables and other decision makers with knowledge needed to examine compatibilities, conflicts, and trade-offs when making ecosystem-based sustainable development plans for the region, both now and into the future. The purpose was to make possible a "conversation of maps" to provide a level playing field on which cultural values could be considered along with ecological and economic values. Unfortunately, incomplete information on First Nation cultural values have made it impossible to establish a level playing field. Far more work needs to be done to achieve the worthy goal of intercultural equity in information used for ecosystem-based management.

A partial remedy for the lack of information was to use third order watersheds as the primary unit of analysis. In British Columbia, a third order watershed is the basin of a stream resulting from the joining of two second order streams that are, in turn, formed by two unbranched tributaries. Use of watersheds as units of analysis attributed cultural significance to areas much larger than identified places. The practice of attributing values to more encompassing units of analysis is used routinely by social scientists when data at a small scale are unreliable or unavailable, but with the full recognition that generalizations drawn from such data cannot be used to claim that all of the larger unit possesses the value attributed to its component parts (Frankfort-Nachmias and Nachmias 2000). In this case, all that can be said is that features attributed to a watershed can be found somewhere within it.

This report is limited to introducing the reader to a substantial body of information, only some of which is summarized and interpreted. It does not attempt to interpret the significance or use of this information for ecosystem-based management, because the relevance of this information must be established within the context of decisions to sustain "...component species and human,

social, economic, and cultural activities (CIT 2002, p. 6; also see Wilson 2002). Ecosystem-based decisions are inherently synthetic, and cannot be formed from information provided by only one of the components of ecosystems. The objective of this analysis was to provide the best available information for such decisions.

Regardless of the problems of incomplete information, the analysis described in this report represents a significant advance in developing an information base suitable for ecosystem-based management. It has demonstrated a viable way to establish cultural analysis as an information base spatially compatible with economic and ecological information (Lee 2001). By doing so, the method has met the requirements for integrating cultural, ecological, and economic information as described by Reed (n.d.) and other conservation biologists.

In addition, it has begun to answer some of the concerns with inadequate cultural information reflected in ecosystem-based planning for Clayoquot Sound and other regions of British Columbia (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995). Development and application of a methodology for spatially representing cultural values is an advance over the largely non-spatial social and cultural information recently used in ecosystem planning methods in the United States (FEMAT 1993; Doak and Kusel 1996; Harris et al. 2000).

## 3.0 Methodologies for Gathering Information

The cultural spatial analysis was implemented separately for information obtained from First Nation communities and Other Communities. In both cases, the process of mapping values was conducted by individuals selected collaboratively by the CIT and representatives of local communities. The overall purpose was to represent in generic categories how people value land and water by representing these cultural values on maps that can be compared with economic and ecological values. Valued attributes of places are referred to as “cultural features” or as “features.” The geographic areas with which these features are associated were delineated on maps. These delineations are referred to as “places” when talking about how community residents felt about them and as “polygons” when represented spatially in the data sets.

### 3.1 Procedures for Gathering “Other Community” Features

#### 3.1.1 Overview

A methodology was designed to spatially represent the cultural concerns of Other Communities not represented by the ecosystem or economic spatial analyses.

Dr. Bob Lee from the University of Washington collaboratively developed the methodology for mapping Other Community cultural values through consultation with representatives of local communities. He visited the Central Coast and north Vancouver Island in the last two weeks of August 2002 to accomplish three objectives: (1) consult with local representatives on a proposed methodology, (2) acquire first-hand knowledge of the diversity of people who live in these communities, and (3) brief community representatives who assumed responsibility for implementing the mapping of cultural features. During these visits, he retained the services of local people and trained them to use the methodology for mapping important places and describing the attributes of these places that made them valuable. The method, described in detail below, involved asking key informants in local communities to identify and delineate on a map every important place of which they were aware, and then to describe attributes of the place by answering specific questions. Informants were encouraged to overlap their own or other informant’s delineations (creating overlapping polygons) to represent multiple cultural features in a general location. Sometimes a given place would be assigned multiple features.

Robert Prescott-Allen retained Dr. Charles Menzies, from the University of British Columbia, to implement this methodology for Other Communities on the North Coast. Dr. Menzies also hired local people to identify cultural features and describe attributes. However, he departed from the protocol used on the Central Coast by attributing multiple cultural values to larger geographic areas delineated as important to local communities. He later used a unique and more refined set of categories to classify the values assigned to these places. To make the North Coast feature information compatible with the Central Coast and Haida Gwaii/QCI, we ignored Menzies’s categorizations and assigned only named features to the delineated polygons. While this rendered the named features and associated attributes comparable with what was produced for the Central Coast and Haida Gwaii/QCI, it could have resulted in a greater number of features being assigned to delineated places than found on maps produced on the Central Coast. This might have resulted from Menzies’s attempt to group features into a greater number of categories than were used for the other regions. As a result, *absolute* measures of feature density cannot be

reliably compared between the North Coast and the Central Coast and Haida Gwaii/QCI. Regardless, relative feature density measures are reliable. Absolute measures of density are valid if made within regions, because the same methodology was always used within a region.

Robert Prescott-Allen also retained a person to implement a modified version of the methodology for gathering Other Community information on Haida Gwaii/QCI. The procedure used on Haida Gwaii/QCI was comparable with that used on the Central Coast, but was limited to delineation of important places and the values that made them important. Questions about these procedures should be directed to Robert Prescott-Allen.

### **3.1.2 Purpose**

The guiding purposes of mapping cultural features was to (1) identify local knowledge of places, and (2) spatially represent this knowledge on maps. People know about particular places because these places are meaningful to them. In short, they value some places more than others, and generally know *why* they value these places. They may also know how long these places have been valued, whether other people also value these places, and what has happened to these places over time.

Knowledge of the cultural values associated with places included a wide range of human meanings and sentiments, but did not include their monetary value (market potential) or ecological value (contribution to biodiversity or ecosystem functioning). However, cultural values included human sentiments or symbolism sometimes associated with places valued for their economic or ecological significance. For example, a physical stand of timber might symbolize economic security to a community concerned with its future income and jobs from logging and sawmilling, even though “woodshed” maps prepared by economists might exclude areas lacking current net market value for timber extraction. Similarly, the nesting sites of a rare or endangered species of bird might be assigned ecological value by biologists, yet also have long-standing cultural significance for naturalists.

Some of the more easily identified features identified by Other Communities included meanings assigned to places because their potential or existing use for recreation, tourism, historical appreciation, community festivals, ritualistic observances, or symbolism (places re-presenting important shared values).

### **3.1.3 Data Gathering**

The data gathering procedure was designed to efficiently identify and map knowledge of valued places by focusing on the people most likely to hold such knowledge. Visits to communities revealed that knowledge of valued places was distributed throughout society rather than concentrated in the minds of a few “keepers” of this knowledge. This was somewhat unlike the situation often found in First Nation communities, where elders are respected as keepers of traditions and repositories for memories of important places and events. Interviews with informants were conducted in or near the following communities: Bella Coola, Port Hardy, Port Alice, Port McNeill, Sayward, and Campbell River.

The most efficient way to capture local knowledge was to locate informants (individuals, groups, or institutions) possessing knowledge of land and water areas valued by people. No protocol

existed for locating those who knew about land and water. Such knowledge was most likely to be concentrated among people who live near the land and water areas of concern, people who recreate or tour these areas, people who provide guide or charter services, people who have lived in an area for a long time, people who engage in resource appropriation activities, or members of local groups with a history of using land and water.

This method did not involve an attempt to randomly sample individuals, since the purpose was to identify the individuals who possess the most local knowledge. The strategy for identifying knowledgeable individuals was to use a technique social scientists refer to as “snowball sampling” (Frankfort-Nachmias and Nachmias 2000). It involved asking people to refer to the most knowledgeable individuals in a given domain (recreation, historical sites, etc.). The objective was to develop a chain of referrals that closes back on itself when the same names keep coming up at subsequent interviews. This assured “saturation” of the knowledge network.

The number of times a place or feature was identified was not important, so no frequency data on individual places or features were gathered. Redundant information on a places and features was used to improve the accuracy of their location and better describe their attributes.

Every effort was made to elicit *distinctions* between *places* with the purpose of representing features on maps. General references to the value of the “whole” territory was noted, but not mapped. The objective is to identify and map places. This method worked well for members of Other Communities, and individuals rarely identified a larger landscape as important. When a larger feature (such as a recreationally attractive group of islands) was named, the interviewer delineated a larger landscape unit that encompassed (overlapped) multiple specific places. As explained above, the latter practice was more prevalent in the gathering of North Coast Other Community data.

Because people who provided information on features associated with places generally drew directly on base maps, separate base maps were used to represent different groups when confusing lines would result from conflicting multiple features being assigned to particular locations. Both rational and emotional responses to questions were accepted, and, to elicit all available information, people were encouraged to express their *feelings* about the territory represented by the map.

The specific procedures used for gathering this information are found in Appendix A. In addition to the location and specific cultural identification of each feature, these data sets include the following attributes: threats (if any) affecting the feature, condition of the feature, the length of time that the community has valued the feature, and approximate proportion of the community valuing the feature. Figure 1 displays the questions that were asked to generate the raw data.

**Figure 1** Questions asked to generate Other Community data.

- |   |
|---|
| <ol style="list-style-type: none"><li><b>1</b> <b>Where are the <i>most important</i> (most irreplaceable) places?</b><ol style="list-style-type: none"><li>a Why is each place important?</li><li>b How large an area for each place needs to be considered to protect opportunities or values for members of the local community? (Show on map and ask people to take a pencil and delineate the area valued.)</li></ol></li><li><b>2</b> <b>Are there any threats to these places?</b><ol style="list-style-type: none"><li>a What makes them sensitive to threats?</li></ol></li><li><b>3</b> <b>For how long have each of these places been of value to people living in the community (not special to individuals, but special to the "community")?</b></li><li><b>4</b> <b>What proportion (rough percentage) of the people in your community value, use, or engage in practices at each of these places?</b></li><li><b>5</b> <b>What is the condition of each place (e.g., extent of degradation or loss in realizable value)?</b></li></ol> |
|---|

The analysis for the Central Coast and North Coast Other Community data involved only the condition and threat attributes, because it was impractical to assign the other attributes to watersheds. The threat and condition attributes became the basis for rating the priority of protection or remediation needed for these features. The Other Community data collected for Haida Gwaii/QCI were not included in the threat and condition analyses, because only the identification and location of each valued feature had been recorded.

This method was successful in recording the *most important* cultural features valued by members of Other Communities. As such, it may not provide a complete record, since there may be additional features valued by people who were not contacted, especially those residing in remote hamlets. The method also did not measure the cultural features valued by people living outside the region studied. The closest measures of these values may be reflected in the Ministry of Sustainable Resource Management's recreation and visual management inventories, discussed below.

### 3.2 Procedures for Identifying First Nation Features

The Central Coast, North Coast, and Haida Gwaii/Queen Charlotte Islands have been occupied by First Nation peoples for thousands of years. This resulted in a very densely populated cultural landscape. Formal recording of cultural features is very recent and incomplete. First Nation communities have only begun to map and describe these cultural features. Cultural inventories are incomplete, and have not explored many of the predicted archeological sites protected under the *BC Heritage Conservation Act*. In recognition of the extensiveness of historic use, whole landscapes are often described as culturally significant.

The CIT made a pragmatic decision to acquire existing cultural information about places from First Nation communities rather than initiate the method used for Other Communities. Some communities provided CIT with all known and recorded information about the cultural significance of specific places. Others provided part of available information. A few communities chose not to participate. First Nation communities varied greatly in the sort of information used

to describe features. Some communities only supplied a count of features contained in the third order watersheds provided by CIT. Others provided polygon data describing individual features, while some provided point data for features and did not delineate polygons. Limitations on disclosure prohibit dissemination of cultural information provided by First Nation communities. Information on participating communities and the extent of their involvement can be obtained from the CIT and Robert Prescott-Allen.

First Nation data for the Bella Coola area were not available from the Band authority or hereditary chiefs in the Nuxalk community. Two members of the Nuxalk community who were cooperating with the CIT offered their services, and were retained to gather information from other members of Nuxalk community. They followed the same protocol used for Other Communities on the Central Coast and North Coast. As a result, the First Nation features they identified are compatible with Other Community records, but, as with other First Nation data, were used only to provide a count of features by watershed.

As a result of differences among methods used by First Nation communities, the only common denominator for all communities was a count of the number of identified features located in each third order watershed. An attempt was made to buffer (draw circles around point data) to provide measures of spatial magnitude for cultural features identified by a point on a map. Unfortunately, these measures underestimated the extent of features and were not compatible with polygon data produced for Other Communities. As with the Other Communities, polygon data that spanned watershed boundaries was counted more than once.

Use of existing and available First Nation data resulted in significant under-representation of First Nation cultural features in the analysis and limitations on the extent to which these data could be analyzed. Therefore, this analysis used only what was known, recorded, and available. The First Nation results reported below are based on an incomplete representation of First Nation cultural features.

### **3.3 Utilization of Existing Data on Recreation and Visual Quality**

Existing information was obtained from the Ministry of Sustainable Resource Management for describing outdoor recreation and visual quality features. This information included the Sector Recreation Features Inventory and the Visual Management System Inventory. The following information on recreation features was acquired: the inventory of recreation features, sensitivity of recreation to resource development activities, and the recreation opportunity spectrum classification. Visual quality designations for any visual quality ratings were included. These data are available under *Database and Metadata* at <http://www.citbc.org/anacult.html>.

Because the analysis was done at the third order watershed scale, most of the acquired data could not be reliably used in the analysis. Summaries of data at the watershed scale required that input data be organized in a form that facilitated its assignment to watersheds. This was not always possible.

We identified three variables for purposes of analysis: HSR (number of hectares of a watershed designated as highly sensitive to resource development), MSR (number of hectares of a watershed designated and medium sensitivity to resource development), and VSA (number of hectares in a watershed rated for visual quality and designated P-preserve, PR-partial retention,

R-retention, or V-visually significant). These features were all available as polygon data, and all could be unambiguously summarized as feature counts at the watershed scale. When combined with the information on cultural features, they provided a robust measure of how the overall landscape varied in its value to people living in the three regions.

In addition, for analyzing the significance of total feature densities, we acquired from the Ministry of Sustainable Resource Management spatial data sets describing legally designated “Protected Areas” and “Woodsheds.” The woodshed data were partitioned to represent only those woodsheds where the net value of timber stands was positive (the estimated costs were less than the estimated recoverable value). These were referred to hereafter as “positive timber value.”

### **3.4 Information Disclosure**

Disclosure of local knowledge about features found at particular places could pose risks to depreciation or overuse, especially places valued by First Nation communities. For this reason, identification and mapping of sensitive knowledge were handled with care, and conformed to any protocols governing the acquisition, use, publication, and disposal of information. Robert Prescott-Allen developed several protocols governing data sharing by First Nation communities, and oversaw the acquisition of data governed by these protocols.

Respect for limitations on disclosure was observed in recording information whenever those who possessed information felt its disclosure could pose a risk of depreciation or loss. For this reason, First Nation data are reported at the scale of third order watersheds, and are generally not available at a smaller scale.

Other Community data are also summarized at the level of third order watershed to facilitate comparison of maps, but are also recoverable at the level of the original feature polygons under *Database and Metadata* at <http://www.citbc.org/anacult.html>.

## 4.0 Digitizing and Classification of Data

### 4.1 Digitizing and Creation of GIS Representations

All raw information was reported in the form of maps and accompanying attribute tables. The content of the attribute tables varied with the type and extent of information gathered for features, as described above. Maps of all Other Community features were digitized by Coast Resource Mapping in Nanaimo. With the exception for First Nation features gathered by CIT contractors for the Bella Coola area, all First Nation features were supplied as electronic files by First Nation analysts. All the data acquired from Ministry of Sustainable Resource Management were also supplied as electronic files, including economic information of “woodsheds” and ecological information on “protected areas.”

Attribute tables for polygons identified for Other Communities on the Central Coast and North Coast were developed by coding raw data and storing results in an Access file. This file was later coupled to maps through GIS analysis. The polygon Access file is available under *Database and Metadata* at <http://www.citbc.org/anacult.html>.

All data were summarized for third order watersheds designated by the CIT. Some landscapes are actually marine areas, but are grouped with watersheds for analysis. The reader should refer to the maps to distinguish watersheds from marine areas when interpreting the results. Watersheds constituted the basic unit of analysis for all calculations.

Watersheds and corresponding marine units were aggregated by CIT to form landscapes and seascapes. While summaries of the analysis are generally provided for watersheds, landscapes, and seascapes, the results summarized in this report will be restricted to watersheds. Results for landscapes and seascapes are available at various phases of the analysis at <http://www.citbc.org/anacult.html>.

### 4.2 Classifying Feature Attributes

Other Community features were grouped into the following five categories: sustenance, heritage, recreation, natural features (existence value), and other (miscellaneous). First Nation features were not classified because there was so much variation in how features were described by various communities. Moreover, categories such as sustenance, sacred/spiritual, and heritage often overlapped in meaning. For example, salmon might be important for food (sustenance), yet essential to an important sacramental ritual honouring both family/clan and ancestors. Classification schemes that did exist varied among First Nation communities, making it impractical to develop a valid common scheme for all communities.

For the Other Communities on the Central Coast and North Coast, threats were grouped in 144 raw categories and then grouped into the following six categories:

1. Access (lack of)
2. Lack of Maintenance
3. Natural Hazards
4. Inappropriate/Conflicting Use
5. Environmental Impacts
6. Over-development

Similarly, notes about the condition of places were examined and classified as follows:

1. Pristine (undisturbed by modern resource use)
2. Slightly Modified (almost pristine)
3. Somewhat Modified
4. Substantially Modified
5. Completely Modified.

This classification was designed to fit Other Community values, and does not reflect the fact that places on both land and water were used for millennia by First Nation peoples. (See Mann 2002 for a challenge to the myth of “pristine” lands.) What may be described as “pristine” by members of Other Communities may contain signs of previous occupancy and use by First Nation people. Rock carvings, artifacts, and CMTs are all examples of signs of such previous occupancy and use.

The number of years a community had valued a feature was categorized as follows:

1. 1-24
2. 25-49
3. 50-74
4. 75-99
5. 100+

The percentage of a community valuing a feature was categorized in quintiles:

1. 0-19%
2. 20-39%
3. 40-59%,
4. 60-79%
5. 80-100%

The threat and condition data for the original polygons, together with the number of years valued and percentage of community valuing, can be looked up in the Access database contained under *Database and Metadata* at the following address: <http://www.citbc.org/anacult.html>.

## 5.0 Findings

All analysis was conducted by Coastal Resource Mapping at the scale of third order watersheds provided by CIT. Some analysis was also done at the landscape scale by aggregating watersheds. Choice of the watershed as the unit of analysis limited the use of many features, because polygon data collected at a smaller scale could not always be validly assigned to these larger units. The number of years Other Communities had valued a feature and the percentage of a community valuing a feature were both excluded from watershed analysis, as were many of the attributes available from the Ministry of Sustainable Resource Management. All available First Nation features, regardless of whether polygons or points, were assigned to watersheds.

### 5.1 Feature Densities

The total density of all features, expressed as the number of features per 1,000 hectares, was calculated for each watershed. Any polygon or point representing a cultural value was counted as a feature. First Nation features were assembled from digitized maps provided by First Nation communities and the CIT contractors at Bella Coola. Other Community features were assembled from the CSA Access database and accompanying maps, and combined with recreation and visual data from files sent by the Ministry for Sustainable Resource Management.

Watershed densities were calculated by first dividing the total number of features falling in each watershed by the area of each watershed in hectares. Features represented by polygons were attributed to more than one watershed if they overlapped watershed boundaries. Feature density provided the only common measure of features for all First Nation communities and Other Communities throughout all three planning regions. As a result, it became the most comprehensive basis for making comparisons between First Nation and Other Communities, as well as between cultural values and other values. These calculations are found in feature density tables available at both watershed and landscape scales for both First Nation communities and Other Communities under *Total Feature Density* at the following address:  
<http://www.citbc.org/anacult.html>.

Frequency distributions of these densities were displayed. The distribution was highly skewed to the left (smaller density values), and did not fit an exponential function. Therefore, the following classification was decided upon for purposes of building tables and making maps:

- No Features
- 0.1-0.9
- 1.0-1.9
- 2.0-4.9
- 5.0-9.9
- 10.0-49.9
- 50.0-99.9
- 100.0+

This classification produced clear differentiation of densities on maps, and fit both First Nation and Other Community density distributions for both watershed and landscape scales. The landscape density range did not extend beyond 49.9 for Other Community feature densities and

9.9 for First Nation feature densities. The lower densities for First Nation features very likely reflect incomplete information.

Each watershed and landscape was assigned to one of these classes for both First Nation features and Other Community features. These values were represented on maps. Five total feature density maps were produced: three for Other Communities: Central Coast, North Coast, and Haida Gwaii/Queen Charlotte Islands, and two for First Nation communities: Central Coast and North Coast. No First Nation features were available for Haida Gwaii, so a third map was omitted. All five maps are available under *Total Feature Density* at the following address: <http://www.citbc.org/anacult.html>.

## 5.2 Overlap of Total Feature Density and Protected Areas

As the only common measure of cultural value, total feature densities for watersheds were compared with existing protected areas. Protected areas were designated by polygons that were not coincident with the third order watersheds. This did not pose a problem for displaying these overlaps on maps, because we used green cross-hatching to show the areas occupied by protected areas. However, the lack of a common unit of analysis made it impossible to make precise measurement of feature density overlaps with protected areas. Therefore, we considered a watershed to be covered by a protected area if 50 percent or more of the watershed was occupied by a protected area. This resulted in an underestimate of the number and total area of watersheds overlapping with protected areas. This underestimate was at least partially mitigated by the overestimate in feature area created by using watersheds rather than polygons as units of analysis. Both tabular and spatial representations of overlaps of protected areas and watershed feature densities for both Other Communities and First Nation communities are found under *Protected Areas* at the following address: <http://www.citbc.org/anacult.html>.

Results show that overlaps seldom exceed 10 percent, suggesting that over 90 percent of the watershed area with known and recorded cultural value is not located in designated reserves. Tables 1 and 2 summarize the magnitude of these overlaps for Other Communities and First Nation communities, respectively. Hence, existing protected areas may serve ecological functions, but are seldom suited to protecting known and recorded cultural values shared for either Other Communities or First Nation communities. Another possible interpretation is that protected areas are most valued by the largely urban population of the Province or Nation, while total feature density is a measure of value shared by regional populations.

**Table 1**      **Overlap of protected areas with watersheds containing Other Community cultural features, thousands of hectares**

Region	Non-Overlap	Overlap	Total	% Overlap
Central Coast	9,539	853	10,392	8.2
North Coast	4,593	397	4,990	8.0
Haida Gwaii/QCI	3,822	574	4,396	13.1
All Regions	17,954	1,824	19,778	9.2

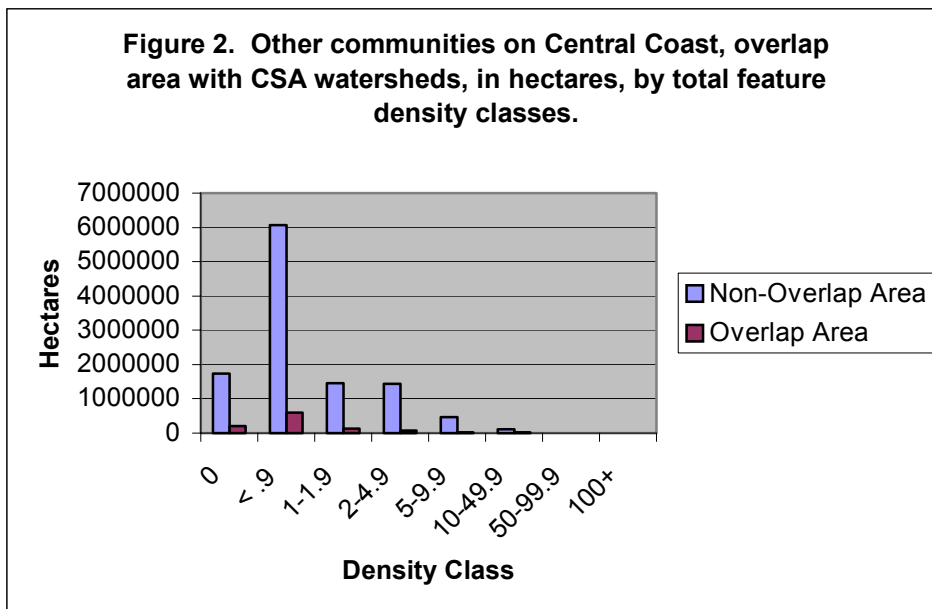
**Table 2      Overlap of protected areas with watersheds containing First Nation cultural features, in thousands of hectares**

Region	Non-Overlap	Overlap	Total	% Overlap
Central Coast	7,366	553	7,919	7.0
North Coast	2,522	242	2,764	8.8
Haida Gwaii/QCI	N.A.	N.A.	N.A.	N.A.
All Regions	9,888	795	10,683	7.4

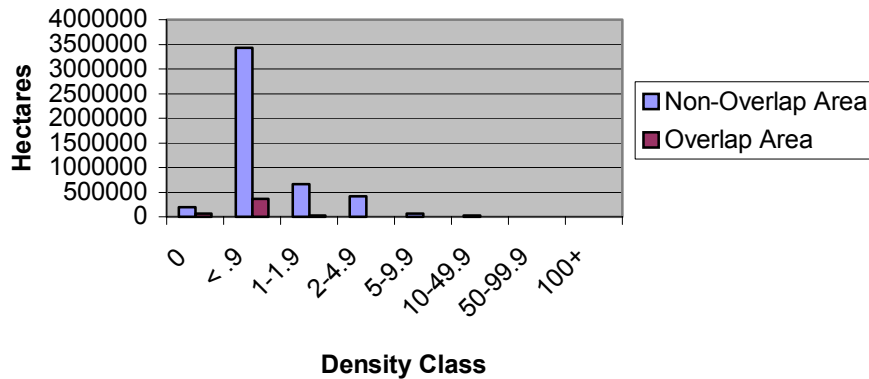
Moreover, where there are overlaps, protected areas tend not to be located in watershed with the highest known and recorded feature densities. Figures 2 through 8 show the distribution of overlaps by feature density classes. Table 3 shows the percentage of protected areas overlapping watersheds with less than five features per 1,000 hectares. The pattern clearly shows that almost all protected areas are located in watersheds with relatively low total feature densities.

**Table 3      Percentage of protected areas overlapping CSA watersheds with less than five features per 1,000 hectares, by region for First Nations and Other Communities**

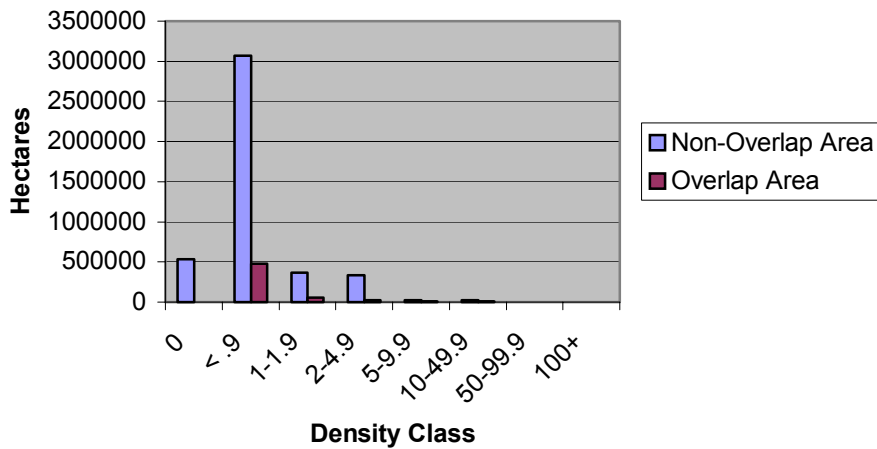
	Central Coast	North Coast	Haida Gwaii/QCI	All Regions
First Nation	97%	100%	N.A.	98%
Other Community	95%	98%	97%	97%



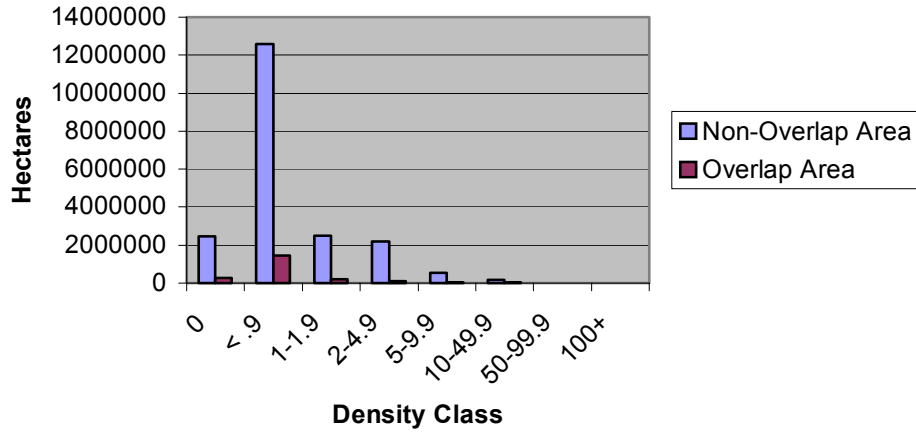
**Figure 3. Other communities on North Coast, overlap of protected areas with CSA watersheds, in hectares, by total feature density class.**



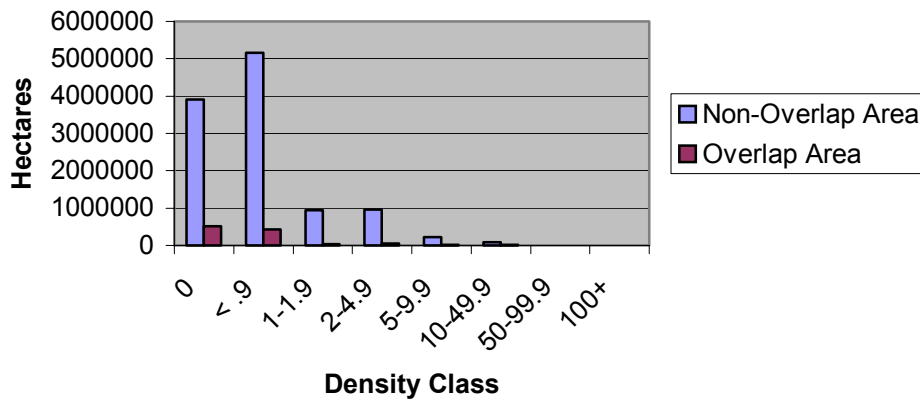
**Figure 4. Other communities on Haida Gwaii/Queen Charlotte Islands, overlap of protected areas with CSA watersheds, in hectares, by total feature density class.**

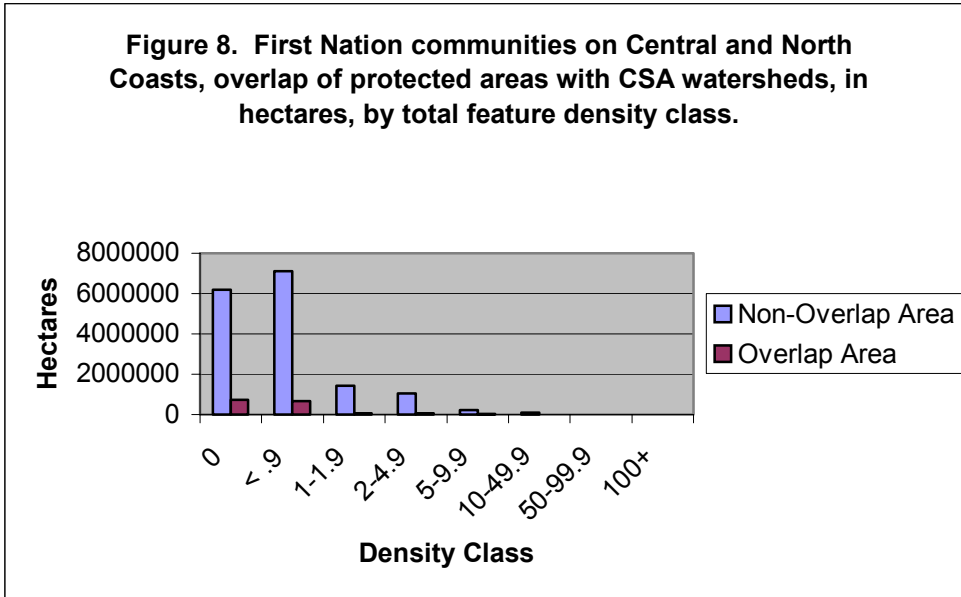
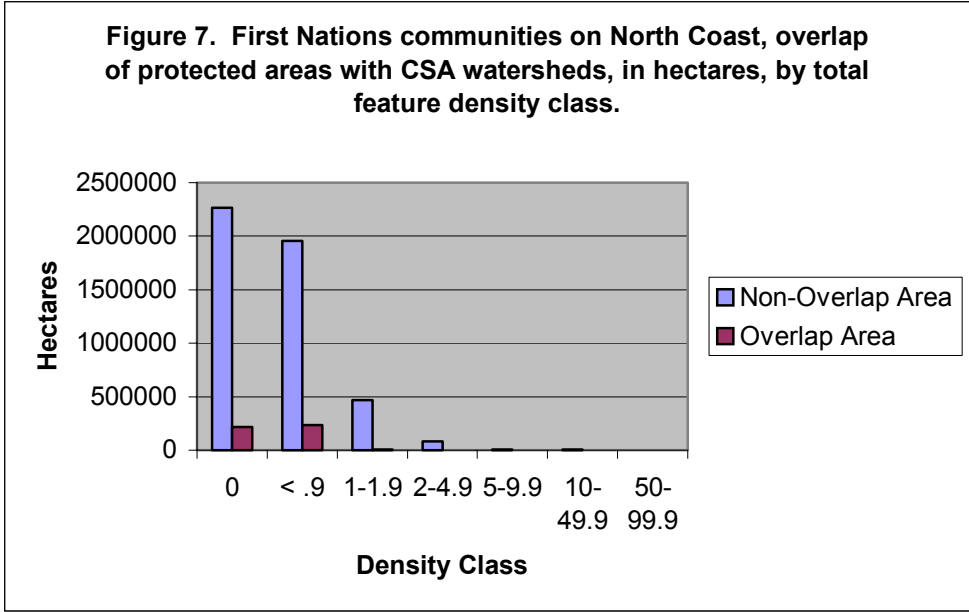


**Figure 5. Other communities in all regions, overlap of protected areas with CSA watersheds, in hectares, by total feature density class.**



**Figure 6. First Nation communities on Central Coast, overlap of protected areas with CSA watersheds, in hectares, by total feature density class.**





We also analyzed the distribution of the number of features by feature density class and protected areas for all three regions combined. The results corroborated the data presented above, leading us to strengthen our conclusion that known and recorded cultural features are seldom found in protected areas. The results of this analysis are found under *Total Feature Density* at <http://www.citbc.org/anacult.html>.

### 5.3 Overlap of Total Feature Density and Woodsheds with Positive Timber Value

The procedures we used for calculating the overlap of protected areas and known and recorded feature densities were also used to calculate the overlap between areas designated as having a positive timber value on the Ministry of Sustainable Resource Management’s woodshed maps and watersheds to which cultural features were assigned. This analysis was more accurate than the protected area analysis because woodshed values had been assigned to third order watersheds. Both tabular and spatial representations of overlaps of positive timber values and watershed feature densities for both Other Communities and First Nation communities are found under *Timber Value* at the following address: <http://www.citbc.org/anacult.html>.

**Table 4 Overlap of positive timber value with watersheds containing Other Community cultural features, in thousands of hectares**

Region	Non-Overlap	Overlap	Total	% Overlap
Central Coast	9,193	1,199	10,392	11.5
North Coast	4,935	54	4,989	1.1
Haida Gwaii/QCI	3,944	452	4,396	10.3
All Regions	18,072	1,705	19,777	8.6

**Table 5 Overlap of positive timber value with watersheds containing First Nation cultural features, in thousands of hectares**

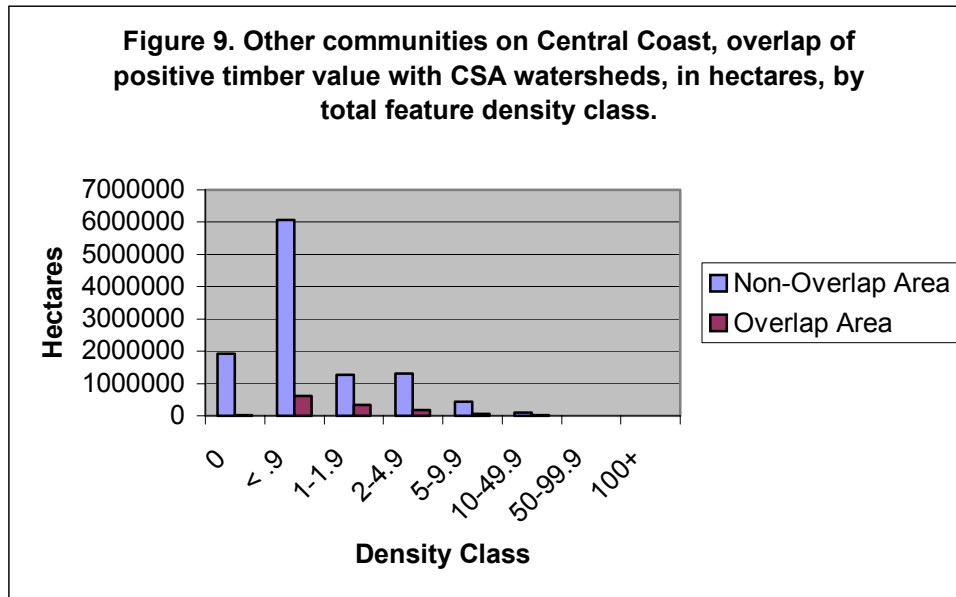
Region	Non-Overlap	Overlap	Total	% Overlap
Central Coast	6,812	1,107	7,919	14.0
North Coast	2,753	11	2,764	0.4
Haida Gwaii/QCI	N.A.	N.A.	N.A.	N.A.
All Regions	9,565	1,118	10,683	10.5

Table 4 shows a less than 12 percent overlap of timber values with watershed containing known and recorded Other Community features on the Central Coast and Haida Gwaii/Queen Charlotte Islands, and only a one percent overlap on the North Coast. Table 5 shows the corresponding overlap on watersheds containing known and recorded First Nation values is 14 percent for the Central Coast and less than one percent for the North Coast. These results demonstrate that areas to which known and recorded cultural values are assigned by either Other Communities or First Nation communities are seldom areas containing timber stands yielding positive returns on investments in harvesting. There is virtually no overlap of cultural features and positive timber values on the North Coast, indicating that, given current wood values and harvesting costs, timber harvesting should pose a relatively minor threat to known and recorded features valued by Other Communities or First Nation communities.

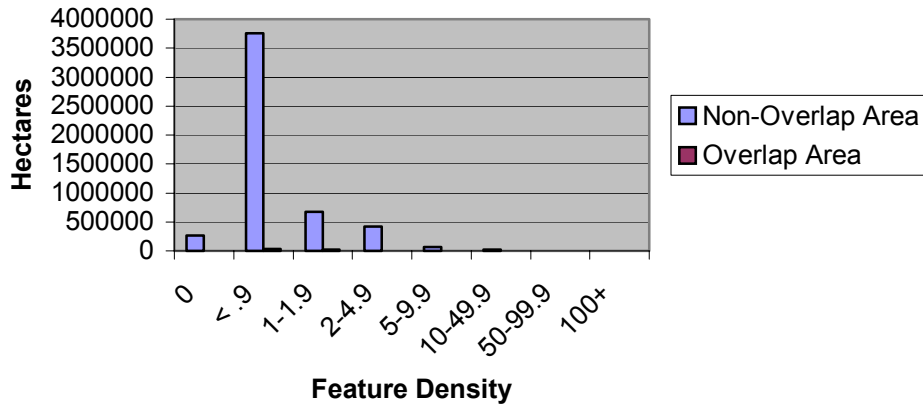
Moreover, where overlaps of positive timber values with cultural features occur, they are heavily concentrated in watersheds with less than five features per 1,000 hectares. Table 6 displays the percentage of positive timber areas overlapping with watersheds with less than five features per hectare. Figures 9 through 15 show the distribution of overlaps by feature density classes.

**Table 6 Percentage of positive timber areas overlapping CSA watersheds with less than five features per 1,000 hectares, by region for First Nations and Other Communities**

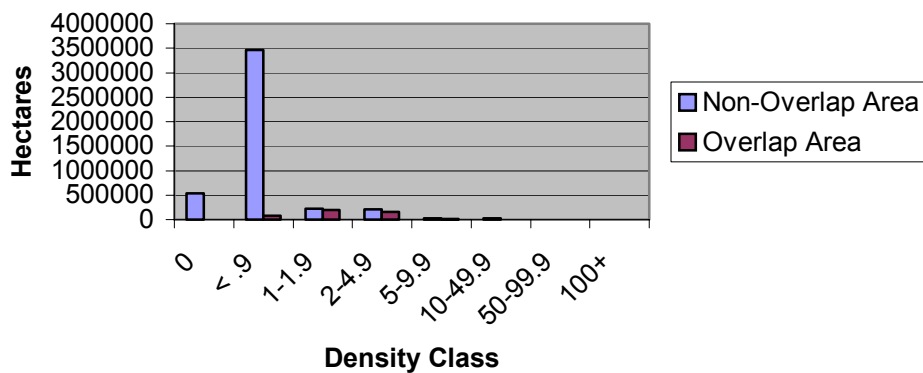
	Central Coast	North Coast	Haida Gwaii/QCI	All regions
First Nation	93%	100%	N.A.	93%
Other Community	94%	98%	97%	95%



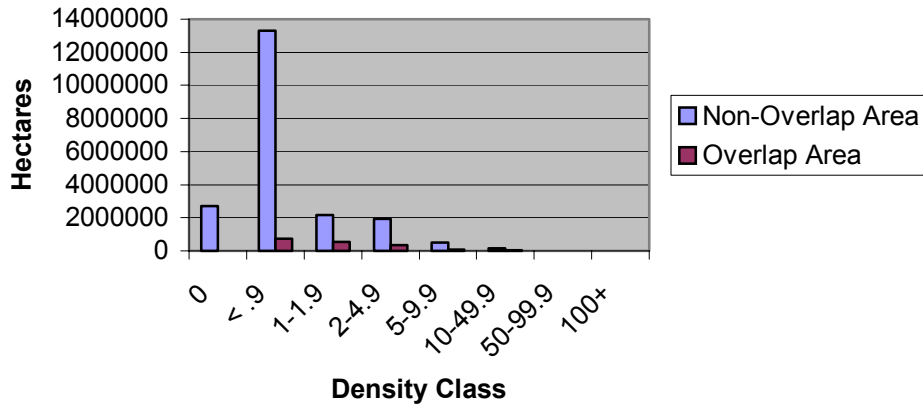
**Figure 10. Other communities on North Coast, overlap of positive timber value with CSA watersheds, in hectares, by total feature density class.**



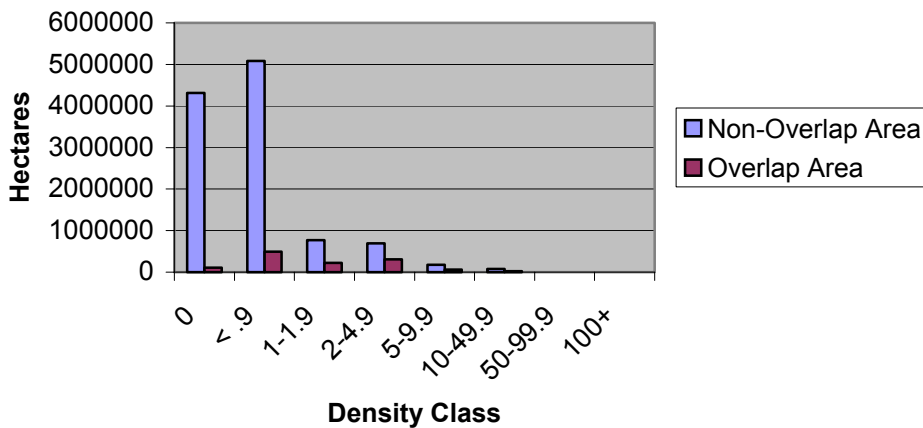
**Figure 11. Other communities on Haida Gwaii/Queen Charlotte Islands, overlap of positive timber value with CSA watersheds, in hectares, by total feature density classes.**

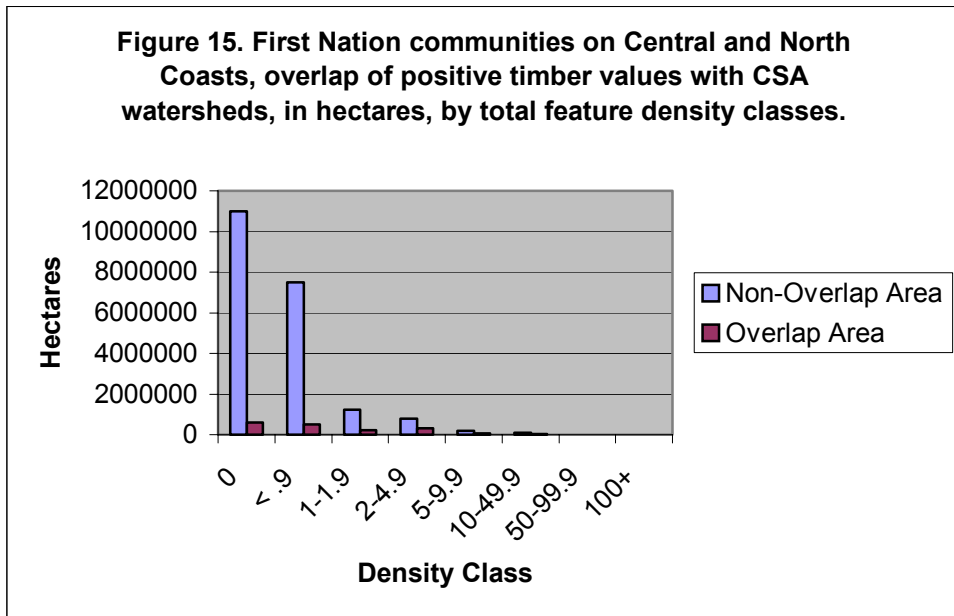
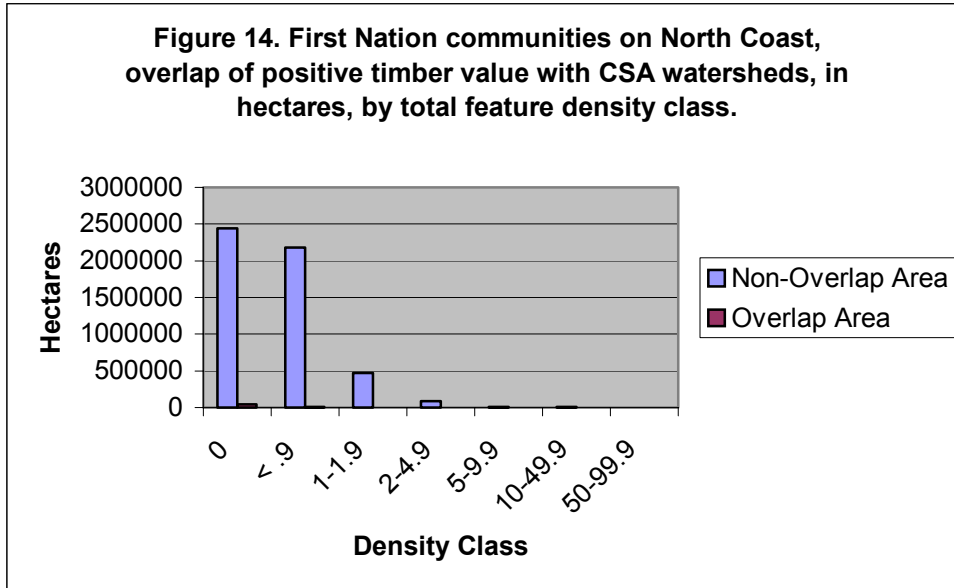


**Figure 12. Other communities in all regions, overlap in positive timber values with CSA watersheds, in hectares, by total feature density class.**



**Figure 13. First Nation Communities on Central Coast, Overlap of Positive Timber Value with CSA Watersheds, in Hectares, by Total Feature Density Class**





We also analyzed the distribution of the number of known and recorded features by feature density class and positive timber value for all three regions combined. The results corroborated the data presented above, leading us to strengthen our conclusion that cultural features are seldom found in areas most suitable for timber harvesting. The results of this analysis are found under *Total Feature Density* at <http://www.citbc.org/anacult.html>.

The results of the woodshed analysis reflect the assumption that timber will never be harvested where the current costs of harvesting wood are greater than estimates of the recovered value of the wood. Overlap with cultural features will be greater if sub-economic harvesting takes place, harvesting costs are reduced, or market values increase.

## 5.4 Rarity and Abundance

The geographic distribution of feature rarity or abundance was measured for the five primary Other Community feature categories: sustenance, heritage, recreation, natural, and other. The three measures of recreation and visual quality obtained from the Ministry of Sustainable Resource Management – HSR, MSR, and VSA – were also measured. Because these attributes were all expressed as polygon data, we calculated the area in hectares occupied by these features within all third level watersheds. The total area occupied by each feature in the three regions was obtained by summing the hectares for each feature in each watershed. The relative share of the total regional “supply” of each feature available in each watershed was calculated by dividing the regional total into the hectares available in each watershed, and expressing the result as a percentage. This measure was referred to as “Rarity-Abundance,” and constituted a metric representing the share of a category of features found within each watershed.

Rarity-Abundance scores for all feature categories exhibited enormous variation. For example, heritage feature Rarity-Abundance scores ranged from 0.000000001 to 15.7, and had a mean of 0.48. The distribution was heavily skewed toward smaller percentages, suggesting an exponential distribution. Therefore, we classified Rarity-Abundance scores as follows:

1. < 0.001
2. 0.001–0.009
3. 0.01–0.09
4. 0.1–0.9
5. 1.0–9.9
6. 10.0+

This classification produced clear differentiation of classes on maps for the three regions.

Both tabular and spatial representations were developed, and are reported separately under *Rarity and Abundance* at: <http://www.citbc.org/anacult.html>.

We had hoped to use the Rarity-Abundance scores to assess the extent to which cultural features may be threatened or protected by overlapping with watersheds the designated protected areas and woodsheds with a positive return on timber harvesting. Given limited funding for analysis, we found no efficient way to control for how variation in the size of polygons designated to represent cultural features influenced measures of percentage shares in any watershed.

Designation of large polygons introduced the possibility that larger areas would be overrepresented and smaller areas would be under-represented in the percentage distributions. Appropriate analysis might involve normalizing the area distribution (using Z-scores or another statistical transformation) and then calculating the rarity-abundance of each feature category. As a result, relationships between Rarity-Abundance classes and positive timber values or protected areas remains an unfulfilled task. (Tables containing raw values may be examined under *Rarity and Abundance* at: <http://www.citbc.org/anacult.html>.)

Regardless of this deficiency, maps displaying the spatial distribution of Rarity-Abundance classes remain useful because they visually represent the scale of polygons. This enables the reader to judge the size of polygons while assessing the relative spatial distribution of features. These maps clearly show the relative location of the five categories of features within each region.

## 5.5 Threat and Condition

We combined measures of threat and condition for Other Community features to assess the priority for action on watersheds. Watersheds with high threat and condition were thought to be the highest priority for protective or remedial action, while watersheds with low condition and low threat were lowest priority.

The Central Coast and North Coast combined contained 2,246 watersheds for which a condition rating was available for Other Community features. A condition value for a watershed was calculated by averaging the condition of all features for which a condition rating was available. Watersheds without a condition rating were excluded. A threat value for a watershed consisted of the count of the number of features for which a threat was noted, and included zero to represent features for which not threat was entered. Most of the zeros were interpreted to represent no threats, although some may instead represent missing data.

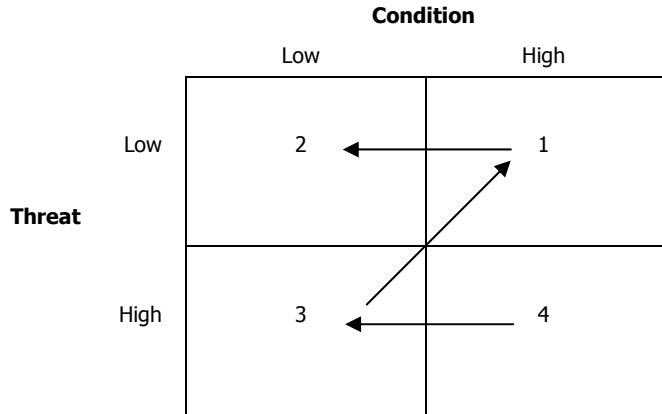
The average condition of watersheds ranged from one to five, with a mean of 2.1, a mode of 2. The average threat of watersheds ranged from 0 to 89, with a mean of 3.2, mode of 1. This distribution was skewed heavily to the right.

Figure 16 illustrates how threat and condition attributes were analyzed by constructing a classification system appropriate for assigning relative priority of action to watersheds. This use of a classification scheme for prioritizing action was developed from biological conservation strategies described by Noss (n.d.) and Pressy and Taffs (2001).

High Condition was defined as a watershed average condition rating of 1 or 2 (1,666 watersheds), Pristine or Slightly Modified, respectively. Low Condition was defined as a watershed average condition rating of 3, 4, or 5 (580 watersheds), Somewhat Modified, Major Modification, and Completely Modified, respectively.

The Threat distribution exhibited a natural breakpoint at five threats per watershed, so Low Threat was defined as 1–5 threats (1,908 watersheds), and High Threats was defined as 6 or more threats (338 watersheds). Table 7 displays the number of watersheds falling into each Threat/Condition category.

**Figure 16 Threat and condition classes.**  
 Arrows designate priority assigned, with 4 as highest priority



**Table 7 Number of watersheds by threat and condition class**

Threat and condition class	Number of watersheds
High Threat & High Condition	191
High Threat & Low Condition	147
Low Threat & Low Condition	433
Low Threat and High Condition	1,475
All Threats and Conditions	2,246

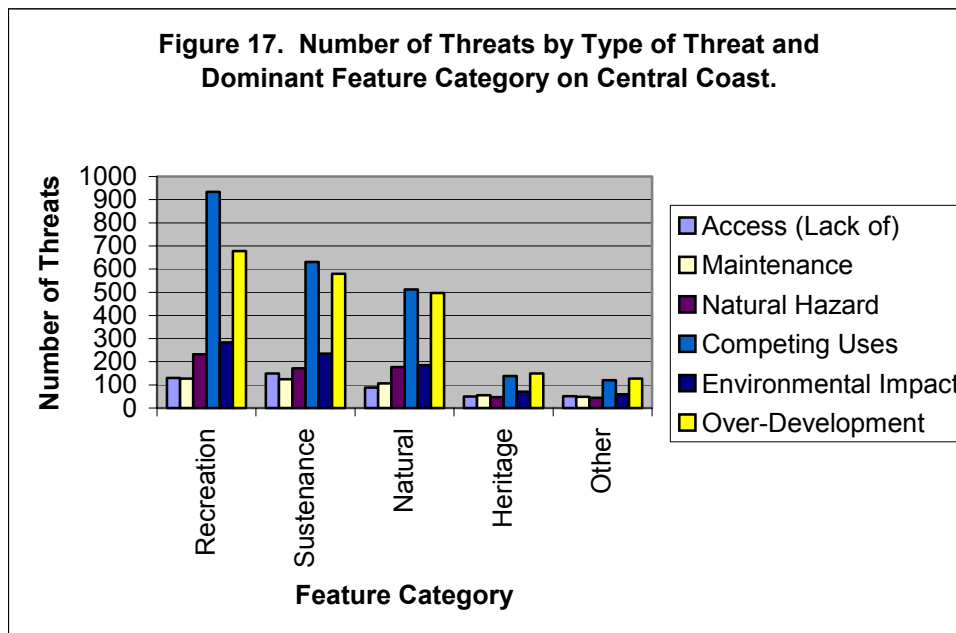
For purposes of planning, we considered Class 4 (High Condition/High Threat) as highest priority for protection of cultural values. Class 3 (Low Condition/High Threat) was considered next highest in priority. Class 1 (High Condition/Low Threat) was third in priority, and Class 2 (Low Condition/Low Threat) was the lowest priority. Because threats varied enormously between features and sites, no overall conclusions can be drawn from the results. Specific protective or remedial actions can be identified by referencing the threats noted for particular polygons within watersheds. Assignment of threats and conditions to watersheds is found under *Threat and Condition by Region* at <http://www.citbc.org/anacult.html>. *Database and Metadata* at the same address contains the look-up tables for identifying threats and conditions for the original polygons.

These results are displayed on the Condition/Threat map covering the Central Coast and North Coast, with the darkest colours representing the highest priority watershed for protection of Other Community cultural values.

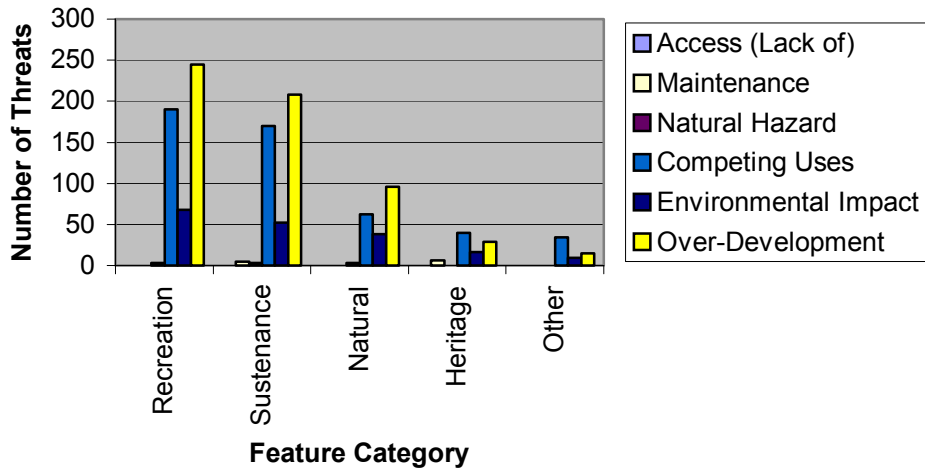
Figures 17 to 20 are included to assist in interpreting these maps. Figures 17 and 18 show the distribution of threats by dominant feature category. Competing uses are the dominant threat, and affect recreation, sustenance, and natural features the most. Over-development, the second

most important threat, affects these same features in the same order of importance. Heavily used recreation and natural areas on Vancouver Island, particularly near Campbell River, represent a large share of these threats.

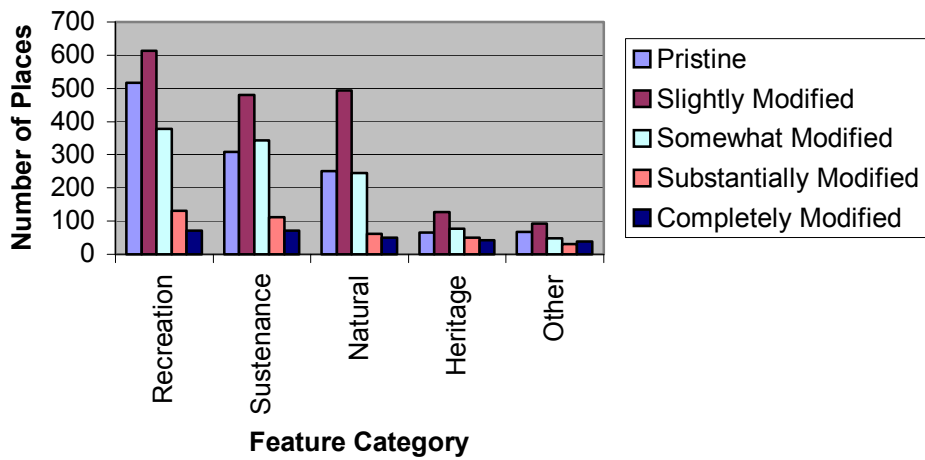
However, Figures 19 and 20 show that places associated with recreation, sustenance, and natural features are also most likely to be the least modified. These distributions of threats and conditions suggest that recreation, sustenance, and natural areas, in that order, are most likely to be considered as priorities for protective or remedial action. Actions appropriate for specific watersheds or places can be investigated by accessing the “look-up” tables under *Database and Metadata* at <http://www.citbc.org/anacult.html>.

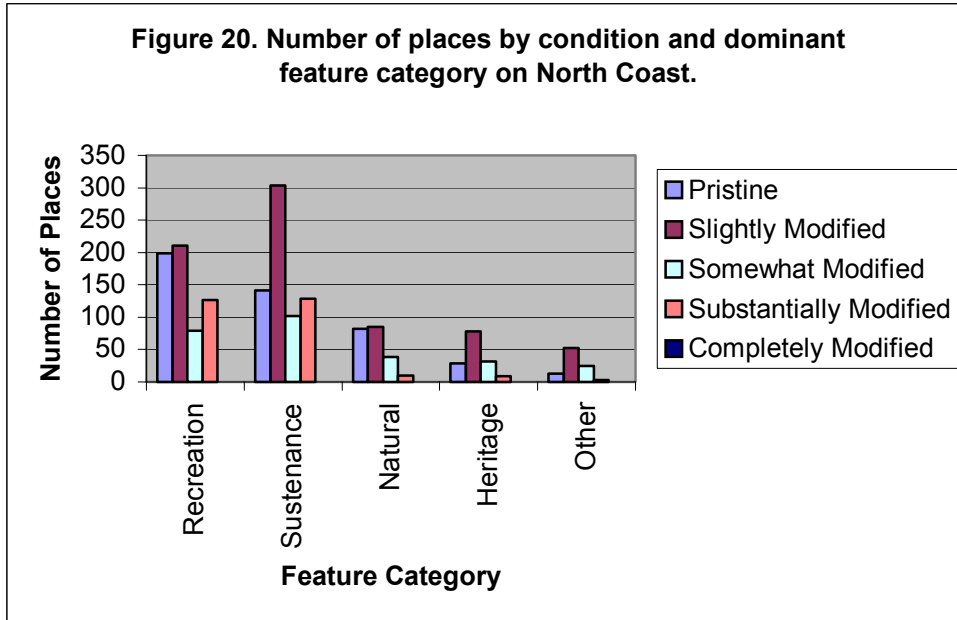


**Figure 18. Number of threats by type of threat and dominant feature category on North Coast.**



**Figure 19. Number of places by condition and dominant feature category on Central Coast.**





## 6.0 Recommendations for Further Analysis

The spatial databases created by this project provide a rich storehouse of information for currently known and recorded Other Community and First Nation cultural features. The databases have been structured to facilitate inquiry by interested parties with particular questions. Yet, such inquiry must be accompanied by data acquisition where information is incomplete or inaccurate.

The information used in this report has only begun to tap the extent and value of cultural information, particularly for cultural features delineated by First Nation communities. Limited funding and the uniqueness of First Nation data sets made it impossible to examine additional relationships. Spatial data for First Nation cultural features can be best examined at the scale of individual communities, because each community used a unique method for collecting and organizing information. Access to First Nation data is restricted by data sharing agreements, and can only be obtained with the permission of the First Nation communities holding rights to the information. Identification, recording, and sharing of additional First Nation cultural information rightfully remains the prerogative of First Nation communities.

Other Community data sets are more complete and available. The content of the existing database for the Central Coast, North Coast, and Haida Gwaii is limited to the delineation of polygons and the assignment of features, since Haida Gwaii/QCI coverage does not include the other attributes assigned to polygons. The Central Coast and North Coast spatial data include additional attributes, and were collected using a common methodology. This database warrants considerably more analysis and would benefit from the addition of cultural information to fill in gaps, particularly in remote hamlets.

Metadata are available for all spatial information, and should be consulted before proceeding with any analysis. All metadata are available by consulting <http://www.citbc.org/anacult.html>.

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## APPENDIX A

### Procedures for Other Communities on the Central Coast and North Coast

1. Present individuals with maps of the region(s) of concern to representatives of social groups in the community.
2. Allow people time to orient themselves and fully understand the territory the map is representing.
3. Ask people five major questions. Each of the main questions may have several sub-questions.
4. Provide people with coloured pencils or pens to delineate the “most important places,” with different colours to represent different values. The same place may be mapped twice or more to represent different values assigned to it. Each value of each important place must have a unique number associated with it. Enter numbers on both the map and matrix to designate each important place, and preserve the identity of all answers to questions by summarizing answers on the matrix. Be sure to make multiple copies of the matrix to fill out as people identify important places. If working with a group, use a flip chart to summarize answers to the sub-questions, by number. You may also want to use a tape recorder to capture the full explanation of these answers. This will make it possible to connect stories, dreams, and hopes to particular places, permitting the map to be read as hypertext representing sentiments, histories, fears, and ambitions.
5. Your objective is to elicit the information needed to produce as complete and accurate a map as possible. The best strategy is to always seek new information rather than to spend time obtaining repeated information on similar values for a particular place. But use such redundant information to improve the accuracy of the map (in both location and area involved).
6. When delineating places on the map, use a scale appropriate to what people say about the place. For example, people may say that an important clamming beach may depend on fine sediments deposited by an undisturbed watershed. They may claim that logging in the watershed could diminish clam production by depositing large organic and inorganic debris, as they have seen in other areas. In this case, delineate the watershed as well as the beach, and attach notes to explain the logic for this delineation. Another example: people may say that the economic feasibility of a given timber harvest unit requires combining several operating areas in a planned harvest, and that one unit by itself would not cover the costs of access and transportation. In this case, all of these operating areas should be delineated, along with the proposed road access.

