Ten By Ten:
Guerilla Architecture of the Salish Sea

by

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Dalhousie University is located in Mi'kmaq'i,
the ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

Contents

Abstract

The region of the Salish Sea represents for many the final frontier and is home to those seeking the alternative lifestyles it provides. The architecture of the area is the product of factors such as the skills of local craftspeople, The availability of materials, and the operation of informal economies. Many structures in the area are built without permits, without professionals and use salvaged materials. This is what I am calling guerrilla architecture. One common way this is done, is by building within a ten square meter footprint to avoid building permit requirements and their associated costs and headaches. These small structures are used as storage sheds, artist studios and permanent residences, and are potential tools for grassroots development. I intend to show through this example, that for architects to positively contribute to social, cultural and environmental sustainability, they must harness local building practices, and act as facilitators and educators.

Acknowledgements

I would like to acknowledge Dalhousie University is located on the unceded territory of the Mi'kmaq people, and that the Salish Sea region, studied here is the unceded territory of the Coast Salish peoples.

I would like to thank my supervisor, Niall Savage, for his support, guidance, and unwavering ability to instil confidence.

I would like to thank my advisor, Diogo Burnay, for his probing questions, words of wisdom and reminders of the important things.

Chapter 1: Introduction

As a field of optimists and dreamers, architects like to think their work touches the lives of all kinds of people. In many ways whether private or public buildings, they do. The service of architects, however, have long been accessible only to the wealthiest and most powerful members of society. It is a fitting story that the first ever architect is thought to be Imhotep, who designed a dramatic tomb for his pharaoh client, Djoser (Kemp 2005, 159). Since it's inception the profession has served the wealthy even in death. This tradition has carried on through the design of powerful brutalist structures for modern governments and luxurious single-family homes for wealthy individuals. In this role, the ability for architects to effect change is limited to their selection of clients and their recommendations of products.

To use Rural Studio founder Sam Mockbee's words, architects are simply "lapdogs for the rich" (Freear et al. 2014, 6). The unique work of Alabama based Rural Studio combines local vernacular architecture, low tech sustainability, and multi-directional education to address and support community needs. In this way the studio emphasizes "incremental, rather than revolutionary change, as revolutions are short lived, evolutions have lasting power" (Freear et al. 2014, 8). This approach to the role of architects, I believe, is how the profession can contribute directly and positively to cultural, environmental, and social sustainability.

Fig.01 The stepped pyramid of Djoser, thought to have been designed by high priest Imhotep (Jarvis 2004).

Fig.02 Joanne's home is one of many home projects built by Rural Studio as part of their 20K house program, made possible largely by the low cost of student labour (Freear et al. 2014, 218).

"The Strait of Georgia, together with the Strait of Juan de Fuca to the west of it and Puget Sound to the south, are now known collectively as the Salish Sea" (Stewart 2017, 13). The name essentially constitutes the body of water between Vancouver Island and the mainland of both British Columbia and Washington. The area is home to a unique climate, culture and landscape that have fostered informal economies and unique building practices. This includes the practice of what I have been calling "guerilla architecture". Construction performed without a building permit, without a professional builder or designer, and employing salvaged materials. One common way this is done, is to build under ten square metres, or ten feet by ten feet to avoid permit requirements entirely. These structures are known locally as *ten by tens*. I intend to show how the practice of guerilla architecture in the Salish Sea, ten by ten or otherwise, are the best architectural tools for addressing local cultural, social, and environmental issues.

Fig.03 A ten by ten built on Saturna Island used as a home office.

Fig.04 A map showing the Salish Sea, the body of water between Vancouver Island and the mainland of British Columbia and Washington. The Salish Sea is made up by the Puget Sound, the Strait of Juan de Fuca and the Strait of Georgia.

To test how this example of a local building practice can be used to support communities, I have prepared the following design project, which consists of three parts: the barge, the port, and the ten by tens. The barge is a mobile architect's studio which moves from island-to-island consulting on local projects, and reframes the role of the architect as accessible, supportive, and secondary to local knowledge. The port is a local community centre with supports existing salvage culture by facilitating the reuse of materials, teamwork between locals and consultation with the architect. The ten by tens are structures built locally by members of the community using the resources of the port, and support from the barge to address local needs. Local issues include housing shortages, environmentally sensitive tourism, and the need for secondary income, to name a few. The following chapters and the design project demonstrate and test the theory that for architects to contribute positively to local cultural, social, and environmental sustainability, they need to harness local building practices and act as facilitators, educators, and public servants.
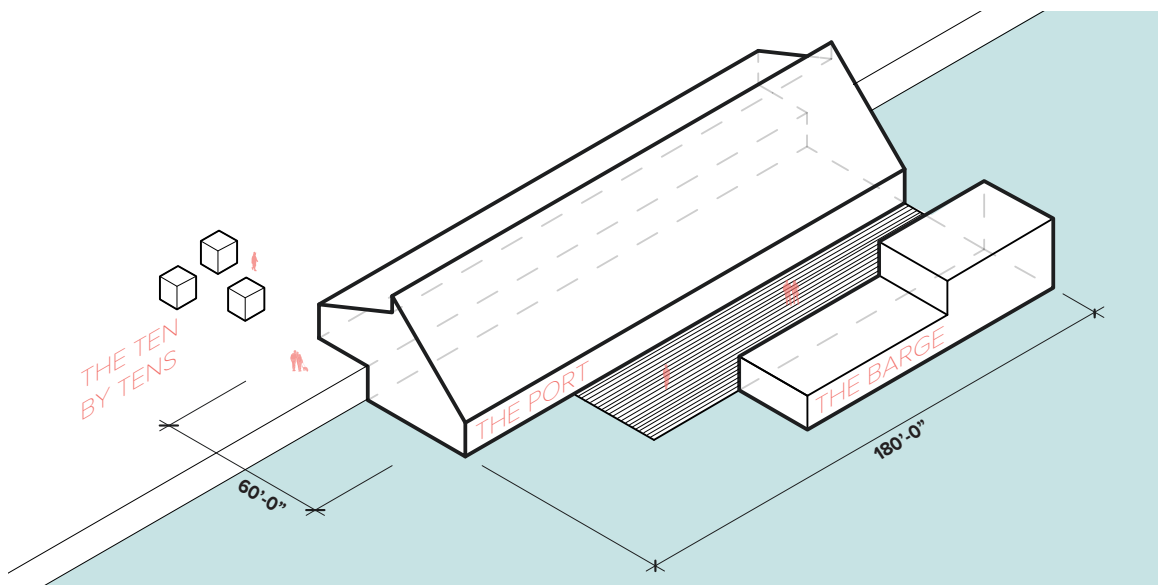
THE TEN BY TENS

THE PORT

THE BARGE

60'-0"

180'-0"

Fig.05 A diagram of the three parts of the design project; the port, the barge, and the ten by tens

Chapter 2: The Role of the Architect

Contemporary

The Canadian Handbook of Practice, published by the Royal Architecture Institute of Canada (RAIC 2020) is the primary resource for Canadian architects looking for answers on the profession, their duties and their responsibilities. In its first chapter titled "The Role of the Architect", the RAIC states; "Today the core role of the architect is usually that of the primary professional design service provider, coordinating the various stakeholders during the planning, design, and construction process of buildings"(RAIC 2020). While this basic description comes as no surprise, it says nothing about who these services are available to. They also go on to say that architect's "work has a major impact on human activity and the planet; hence, they have a tremendous responsibility towards fellow citizens and the environment" (RAIC 2020).

While I agree involvement in the design and construction of our built environment comes with great responsibility, the reality is that architects are involved in an increasingly small fraction of the design and construction of our built environment. As self-proclaimed experts on that subject, how exactly are we handling this responsibility? Architects' clients are limited to institutions, governments, developers and wealthy individuals or families, typically in urban centres. This limits architects ability to contribute to their communities to how they choose clients and how they choose materials. Both of which inevitably are dictated largely by budgets. This approach can certainly lead to amazing projects both in terms of design and effect, but rarely do architects put themselves in a position to dictate the social, cultural or environmental contributions of their work.
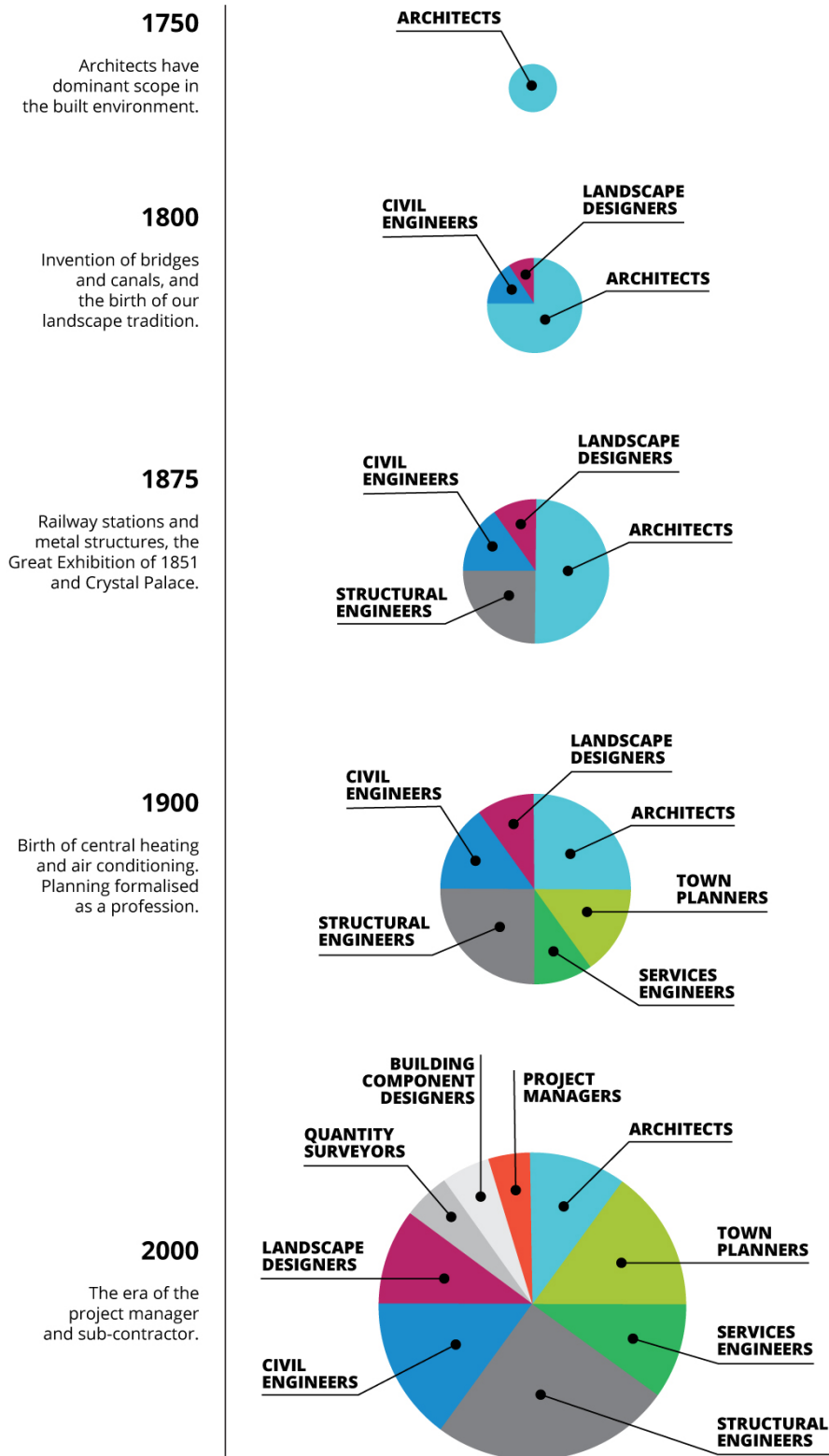
1750

Architects have dominant scope in the built environment.

ARCHITECTS

1800

Invention of bridges and canals, and the birth of our landscape tradition.

CIVIL ENGINEERS

LANDSCAPE DESIGNERS

ARCHITECTS

1875

Railway stations and metal structures, the Great Exhibition of 1851 and Crystal Palace.

CIVIL ENGINEERS

LANDSCAPE DESIGNERS

ARCHITECTS

STRUCTURAL ENGINEERS

1900

Birth of central heating and air conditioning. Planning formalised as a profession.

CIVIL ENGINEERS

LANDSCAPE DESIGNERS

ARCHITECTS

TOWN PLANNERS

STRUCTURAL ENGINEERS

SERVICES ENGINEERS

2000

The era of the project manager and sub-contractor.

BUILDING COMPONENT DESIGNERS

PROJECT MANAGERS

QUANTITY SURVEYORS

ARCHITECTS

LANDSCAPE DESIGNERS

TOWN PLANNERS

SERVICES ENGINEERS

CIVIL ENGINEERS

STRUCTURAL ENGINEERS

Fig. 06 A diagram showing the diminishing role of architects in the design and construction of the built environment (RAIC 2020).

Fig 07 "The Pierre" by Olson Kundig Architects is one of many high end, custom single family homes in MacKay-Lyons' Book. (MacKay-Lyons and McCarter 2015, 79)

Critical of Critical Regionalism

A common response to this crisis is to look to small scale, local clients and contributions, rightly so. One such approach is "critical regionalism", a term coined by Kenneth Frampton in 1983, referring to the union of modernist ideologies and local context. When I came to Dalhousie University with limited experience in architecture, and exposure only to the placeless blue glass towers of Vancouver's skyline, this alternative approach to architecture appealed to me greatly. The teachings of Brian MacKay-Lyons and the examples of works of architects such as Glenn Murcutt, Tom Kundig and Rick Joy showed me how architecture can be rooted in place in terms of landscape and climate but also in terms of social systems and material cultures. There are many aspects of critical regionalism that make great steps towards architecture as a tool for building community and identity.

I was disappointed however, upon a closer reading of MacKay-Lyons' *Local Architecture; Building Place, Craft and Community* to find most of the work to be custom single-family homes for an elite few clients. In a somewhat redeeming statement of self awareness the otherwise self aggrandizing text says "The wealth required to fund such work, though, has largely arisen from the global economy's concentration of money and power in the hands of a relatively dew, placing our profession in the awkward position of depending on the profits of perpetual growth even as we recognize the unsustainably of this model" (MacKay-Lyons and McCarter 2015, 15).

By choosing to apply their well intended approach to architecture to the same functions and clients as mainstream designers, proponents of critical regionalism have advocated for little more than an experiment in aesthetics. Cultural appropriate refers to "when members of a majority group adopt cultural elements of a minority group in an exploitative, disrespectful, or stereotypical way" (Encyclopedia Britannica 2020). While there are much more egregious and damaging instances of cultural appropriation, the use of architectural elements, taken from vernacular buildings, and applied to multi-million dollar single family homes constitutes a form of architectural appropriation. I could not then lean on the work of critical regionalism to find an architecture that employed local building practices to support local communities.

Fig 08 "Two Hulls House" is another example in the book, designed by the author himself. (MacKay-Lyons and McCarter 2015, 83)

The Citizen or Town Architect

One studio mentioned by MacKay-Lyons which stood out from the rest was Alabama based Rural Studio. In a book about their work titled *Rural Studio at Twenty; Designing and Building in Hale County, Alabama*, studio director Andrew Freear describes the difference between their studios and most others;

> Ultimately what differentiates the studio from other design/build programs is its deep engagement with its place. To explain the studio, Freear contrasts it with activist organizations that fly into a disaster area, build a clinic, and fly back out, usually without evaluating their work, learning from it, or fixing its mistakes. In contrast, the studio stays put, taking the rap for its missteps, and drawing lessons from what it builds. (Freear et al. 2014, 7)

Fig. 09 The Akron boys and girls club is one of Rural Studio's many community projects (Freear et al. 2014, 123).

The studio operates predominantly as opportunity for hands-on education for architecture students at Auburn University. The studio teaches practical construction and ethics in architecture while learning from local vernacular and completing necessary projects for the community. They partner with local craftspeople, engaging in two-way learning, and employ low-tech approaches to environmental sustainability. By doing so, "the studio has influenced architectural discourse in the United States and abroad by offering an alternative solution to architectural gigantism. The Studio's work shows that small-scale architecture, produced with modest budgets and low-tech methods, can make a big impact" (Freear et al. 2014, 8).

While Rural studio is just one example of an alternative approach to the role of the architect, I think their model is one to emulate. In both their approach and ethics, the model of citizen or town architect as described by founder Sam Mockbee and current director Andrew Freear serves as the primary example of what I propose could be implemented at a local level all around the world, and specifically in the Salish Sea region.

Fig. 10 Students at Rural Studio work together to build Rose Lee's house (Freear et al. 2014, 70).

In the Salish Sea Region

I previously described the work of most architects as serving institutions, governments, and wealthy individuals. On the Gulf Islands and small communities around the Salish Sea, there are very few institutions and government buildings. This leaves only single-family homes as the major space for architects involvement. Most of these projects, however, are completed by design-build companies, often run by builders with little design experience. The few remaining projects are those for wealthy retirees, or vacation homes for working professionals from Vancouver or Victoria. These projects, while they can be beautiful and well integrated into the landscape and climate, are rarely integrated into local culture, or economy. They typically employ off island builders with whom the architect has an existing relationship, use imported, standardized, virgin materials, and are built away from streets to maximize privacy and the sense of wilderness. Indeed this sense of isolation, retreat, luxury, and wilderness is precisely what their clients are paying for.

Fig 11. Gulf Island house by Vancouver based architect Tony Robins is architecturally and economically disconnected from its local context (Robins 2014).

Fig 12. A map showing RAIC members, building stores, and recycling centres in communities around the Salish Sea
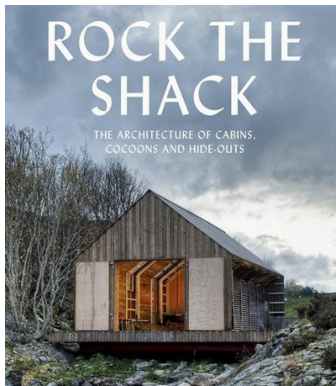
Fig 13. An example of a book that covers cabin porn (Borges 2016).
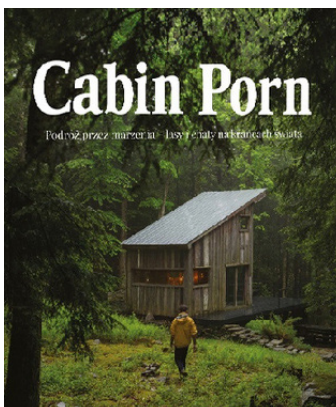

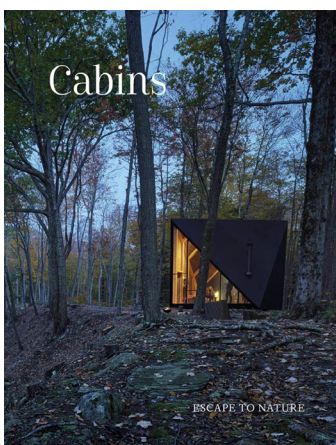Fig 14. An example of a book that covers cabin porn (Klein, Leckart and Kalina 2021).

Fig 15. An example of a book that covers cabin porn (Kylloe 2008).

"Cabin Porn" Culture

The aesthetics of these projects often fall into the relatively new craze of *cabin porn*, images of architecture in the wilderness that temporarily satisfy a viewer's desire for retreat and simultaneous luxury and simplicity. One catalogue of such images, *Rock the Shack; The Architecture of Cabins, Cocoons and Hide-outs* describes this juxtaposition;

> The way we define luxury, and luxury living as evolved considerably. . . . Treading lightly on the earth, this new ecologically minded, luxury housing typology strips off its shiny veneers and downsize its elaborate floor plans in favor of a model much more akin to the classical primitive hut than a contemporary McManson. Rejecting the insatiable urge to always acquire and want more, the revival of the cabin, shack, and rustic hut demonstrates the power and value of leaving things behind. (Borges 2016, 5)

This statement of course ignores the fact that the majority of these projects do constitute "wanting more" and don't replace suburban Mcmansions, but provide instead a weekend getaway for suburbanites to play hippie. The expanding popularity of cabin porn in the era of Instagram, Pinterest and seldom read coffee table books, has led to cabins in areas like that of the Salish Sea with an increasingly global aesthetic that could be transplanted to just about anywhere. The primary driver for these projects then becomes this aesthetic rather than integration with local vernacular, culture, and economy. This is what sets these projects apart from the Salish Sea's regional practice of guerilla architecture.

Chapter 3: Guerilla Architecture of the Salish Sea

The Salish Sea

I have heard no better description of the region than that by writer, curator and educator Kimberly Phillips in an introduction to a work of art titled "Deadhead" produced by Cedric, Nathan and Jim Bomford in Vancouver, 2015. She writes;

> For me, the most compelling descriptions of the pacific northwest coast are ones that refer to its abrupt edge - the way the continent itself appears to have been torn off right here, sometime near yesterday, with its communities precariously tacked to its shoreline. For the regions colonizers, even well into the twentieth century, that edge signified both the conceptual and geographical limit of European civilization. . . . This unceded indigenous territory has, like some powerful magnet, attracted wave after wave of fortune seekers, beachcombers, draft dodgers, dreamers, self proclaimed prophets, believers and hermits. (Brown et al. 2015, 9)

Fig. 16 "Deadhead" a floating architectural installation by artist Cedric Bomford, inspired by the regions industrial and squatter history. (Brown et al. 2015, 20)

The landscape is identifiable by its rainy, fertile and almost Mediterranean climate, and rocky, sandstone shores and evergreen boreal forests. It is home to many communities on the mainland coast, east coast of Vancouver Island, and the many islands between them. This includes the northern and southern gulf islands on the Canadian side, and the San Juan Islands of the United States. The architectural manifestation of the romance described by Phillips blossomed sometime in the 70s and 80s when "you could live on very little money, land was cheap, building codes few" (Kahn 2008, 6). The local structures of that era where built by Canadians and by "Americans who emigrated to Canada to avoid being drafted for the war in Vietnam" (Kahn 2008, 6).

Today the island communities are known for their idyllic beauty, and for being home to many artists, craftspeople and those living off the grid. It is also a common place for recreation and vacation homes for those living in the urban centres of Vancouver or Victoria.

Fig. 17 A waterfront home on Saturna Island

Fig. 18 An outhouse on Cortes Island.

Fig. 19 A boat shed on the beach on Gabriola Island.

Fig. 20 A water mill in Lund, on the Sunshine Coast.

Guerilla Architecture

These communities operate through a number of informal economies such as the local production and sale of produce at farmers markets and road side stalls, production and sale of art and craft through at home studios, and the provision of often unlicensed services for cash found through word of mouth advertising. Their particular economy, the skills of local craftspeople, the availability of materials and the local climate are the primary drivers of their architecture. Much like those of the draft dodgers of the 70s, many of these buildings are made without permits, without professionals and out of salvaged materials. This is what I am calling *guerilla architecture*.

Built without Professionals

Unlike the highly specialized economies of urban centres, life in rural island communities requires a certain level of handiness, and independence. Author and builder Lloyd Kahn writes about the regions inhabitants; "There were people who shared many of my interests: building, growing food, fishing, using natural materials, renewable energy, doing as much for yourself as possible, treating nature with respect, beachcombing—to name a few" (Kahn 2008, 7). This do-it-yourself culture leads to both a genuine ability to build and a lower standard of perfection and a rustic, natural, non-precious aesthetic.

Fig. 21 A recycling shed at a retreat on Cortes Island.

Built without Permits

The communities of the Salish Sea fall under several permitting jurisdictions, and some under no jurisdiction at all. Many amateur builders in the area will be unfamiliar with dealing with the code and its bureaucracy. For these reasons, and to avoid costs, many structures in the area are built without permits. In general, this is easy to get away with, especially in less inhabited areas. Many kinds of structures of various sizes are built illegally, without permits including agricultural buildings, studios, and housing. Sometimes they are made of materials not "up to code" such as cob houses, built of earth and straw, that would never pass inspection. However, those looking to avoid building permits, but not risk being ratted out by a neighbour, resort to building at or below a ten square metre footprint. There is also the option of what is locally referred to as a ten by ten. It is common to find ten by tens employed as studios, offices, agricultural buildings, storage sheds, guest houses and even permanent residences.

Fig. 22 An abandoned cabin on Cortes Island.

Fig. 23 A cob house on Gabriola Island.

Fig. 24 A guest house on Saturna Island.

Fig. 25 A storage shed in Lund, with shingles cut into a forced perspective around the window.

Built with Salvaged Materials

The region has long had a culture of salvaging and recycling. Many arts and crafts and buildings are made from salvaged, re-used, found or natural materials. The most important such material of course being wood. As Lloyd Khan writes about regional structures from the 70s and 80s; "Due to high rainfall and fast growing forests, there's a large amount of wood available for building. Its abundance has given many of these builders the material and inspiration to crate these structures. A lot of the wood used in these buildings came off the beach, or at least from very close by" (Kahn 2008, 6). Likewise, acclaimed Saltspring architect Hank Schubart put it plainly; "this is the west coast - you build with wood" (Dunkerley and Schubart 2012, 79).

This salvaging culture is in part to do with affordability, part to do with sustainability concerns, part to do with a culture of resourcefulness and partly to do with aesthetics. In an interview with Alina Cerminara, creator, and editor of local cultural magazine *Folklife*, she told me that her preference is for goods, products, and materials that each have an individual history or story to create a whole, rather than new products or virgin materials. While predominantly an informal economy of machines kept on lawns and old windows kept in sheds awaiting someone in need, there is also formal infrastructure that supports this economy. Recycling centres form one of the few institutions on many islands and their opening hours operate as one of the few events on a weekly cultural calendar, alongside farmers markets and ferry schedules. These places support both the physical aspects as well as the social aspects of recycling.

Fig. 26 A home on Gabriola Island using reclaimed cedar shingle siding.

Fig. 27 A handmade gate on Cortes Island made from driftwood

Fig. 28 A arm stand on Gabriola Island made of driftwood and local lumber

Chapter Conclusion

Unlike those of critical regionalism or cabin porn coffee table books, these structures defined by the aforementioned factors are both of their place, and supportive of their communities. They are of their place by virtue of being built by locals with local techniques, and made with locally sourced materials. They are supportive of their community by addressing community needs, integrating with local economies and preserving cultural identity.

Fig. 29 A detail of siding and foundations of a recycling shed for a retreat on Cortes Island.

Chapter 4: Design of Port, Barge and Sheds

The purpose of the design project is to demonstrate the thesis statement that for architects to contribute positively to social, cultural and environmental sustainability they must harness local building practices and act as facilitators, educator and public servants. To this end, the design project consists of three parts, the barge, the port and the ten by tens. The barge is a mobile architects studio which docks at various communities providing support, materials and facilitating construction. The port is a local community centre which supports existing salvage culture while facilitating the reuse of materials, teamwork between locals and consultation with the architect. The ten by tens are structures built locally by members of the community using the resources of the port, and support from the barge to address local needs.
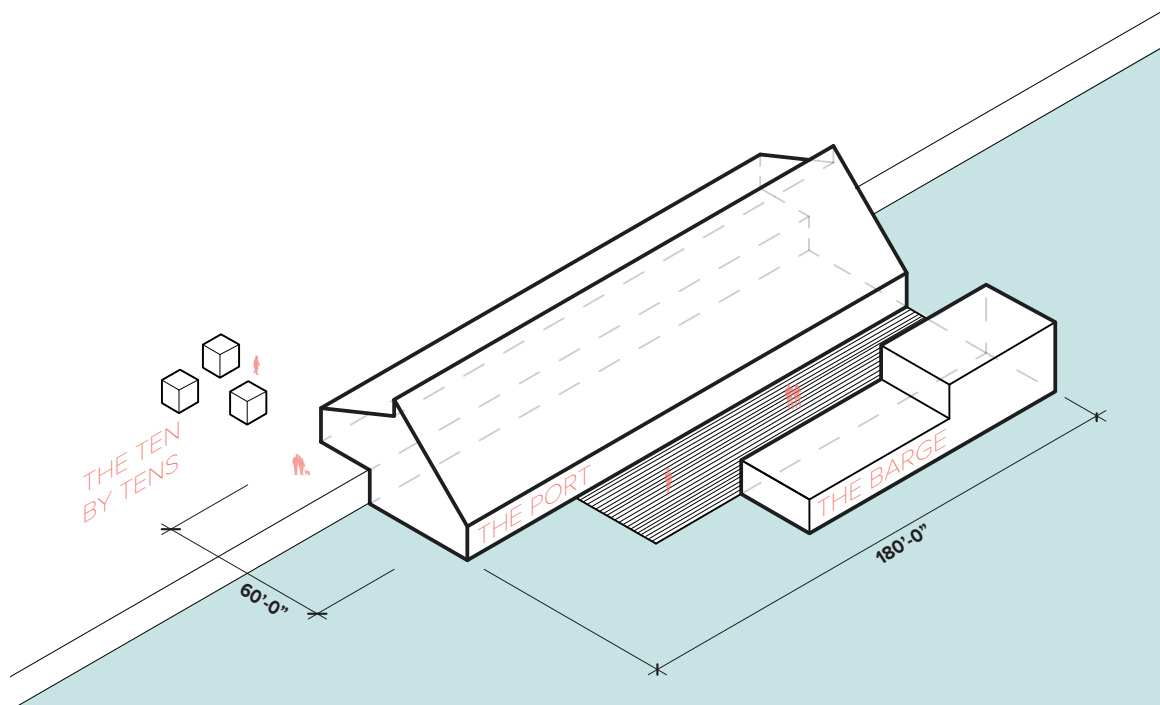

Fig. 30 A diagram of the forms of the three parts of the design project.

The Barge

The barge is envisioned as a mobile architect's studio. In this way the expertise of the architect is made available to greater numbers by moving between communities. The studio, somewhat paradoxically, is rooted in the culture and landscape of the Salish Sea rather than being based in an urban core and visiting for the duration of a project before moving on. The mobility of the barge also facilitates the movement of found and salvaged materials between communities. Somewhat poetically, the barge acts like a tree fallen from one island, becoming driftwood upon the shore of another, only to be picked up and re-used. In this way the barge operates as a sort of shepherd of architectural flotsam and jetsam. The barge will house the architect's studio space and public workshop, as well as individual housing units and shared living quarters for its temporary inhabitants.
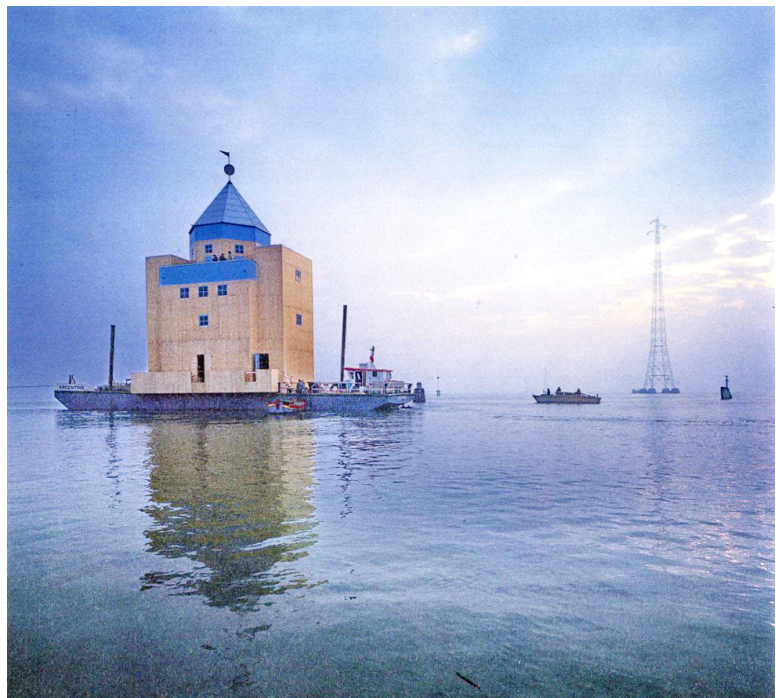

Fig. 31 The Theatro del Mundo by Aldo rossi and example of mobile, barge based architecture. (El Poder de la Palabra 2022)

Fig. 32 This map shows the proposed location of ports and route for the barge. This includes ports in Victoria and Vancouver.

Much like how rural studio can operate and propagate its teachings through its partnership with auburn university, I would hope the barge studio could act as an opportunity for students for the School of Architecture and Landscape Architecture, University of British Columbia. They could spend a summer learning about west coast vernacular, something seemingly absent in architecture discourse in Vancouver, while gaining hands on skills in construction, and developing as Sam Mockbee calls it "an ethical backbone" (Freear et al. 2014, 35). The facilitation of this two-way learning would educate students about the importance of vernacular architecture and educate locals on the significance and preservation of the region's architectural identity.

The barge studio would be constructed on a decommissioned 30' by 120' flat deck barge, using typical wood frame construction, clad in corten steel and corrugated aluminum siding. The form of the studio is imagined as a rectilinear one-story volume in the image of typical shipping barges that houses the living quarters, topped by a second storey volume designed with sloped roofs to match those of the port buildings. The barge will also facilitate the construction of each of the port buildings, acting as temporary housing and workshop space during construction.
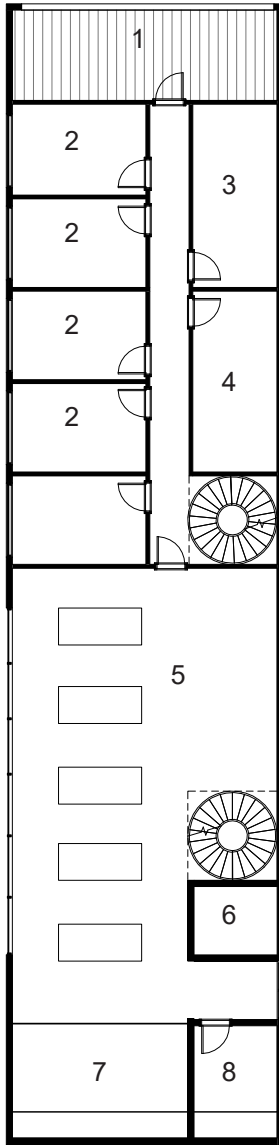
First Floor
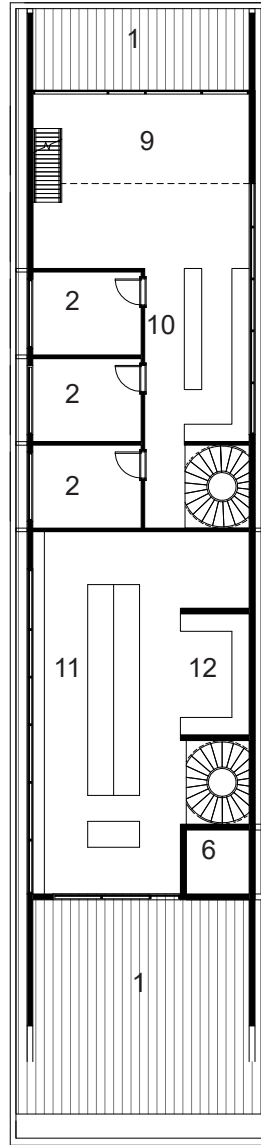
Second Floor
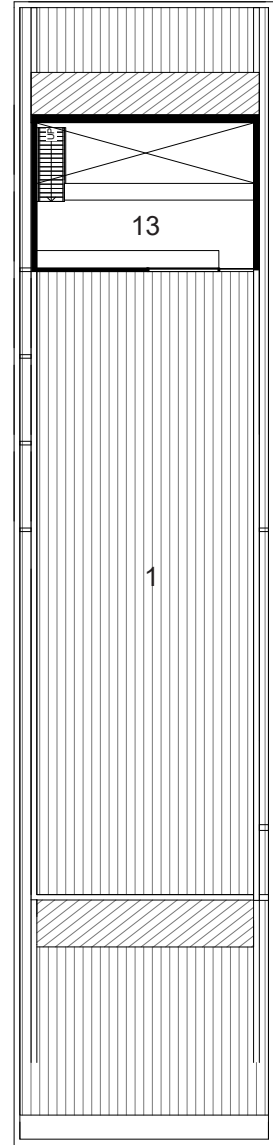
Third Floor

1	Deck	6	Elevator	10	Kitchen
2	Cabins	7	Meeting Room	11	Office
3	Shared Washroom	8	WC	12	Printing
4	Mechanical/storage	9	Living Room	13	Bridge/Control
5	Workshop				

Fig. 33 The floor plans for the barge, built onto a reclaimed 30 foot by 120 foot flat deck barge.
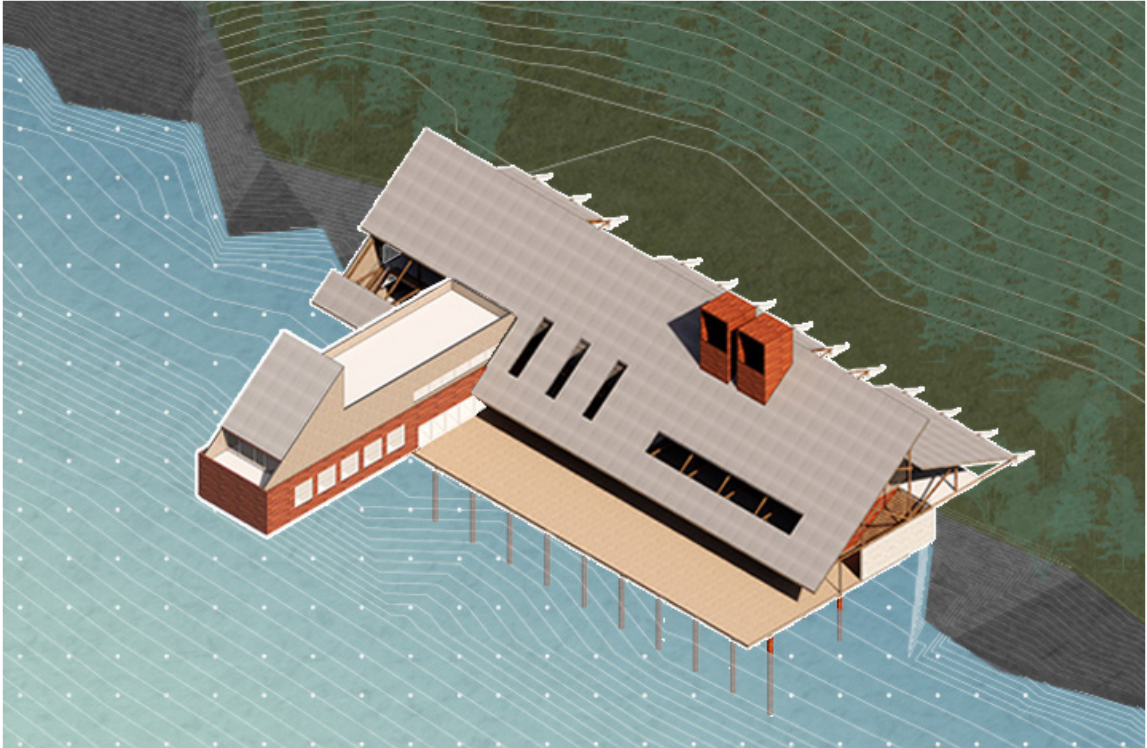
Fig. 34 Axonometric of the largest version of the port with the barge docked.

The Port

Fig. 35
The logo for a home and garden store on Gabriola Island. This shows the clerestory roofline so common to the area it is used as a symbol for a house rather than a gable roofline.

After the arrival of the barge prior to construction, the shoreline is cleared of useable lumber, making sure to protect as many unusable trees as possible and retain iconic and culturally significant arbutus trees. Useable cedars are cut and milled on site into 4" by 6" trusses held together with dowels. Given the abundance of large trees in the area heavy timber construction is common to the area especially for community buildings. This system also reduces the building embodied carbon footprint by 77% compared to a standard wood I-beam system, as shown by the calculations in figure 36. The shape of the trusses also create the form of a clerestory roof typically seen in the area that sheds heavy rainfall and allows in maximum sunlight in dense forests.

"BUSINESS AS USUAL" APPROACH | EMBODIED CARBON CALCULATIONS

For the purpose of this study, only the embodied carbon of the framing, fasteners and foundations will be calculated, as the de-carbonized approach will focus on the reduction of these elements.

FRAMING   13,690.80 KgCo²e
FASTENERS   168.44 KgCo²e
FOUNDATION   4,202.40 KgCo²e
TOTAL SYSTEM GWP   **18,061.64** KgCo²e

FRAMING	Dimensions (Ft. + In.)	Unit Volume (Cu.In.)	Required (#)	Total Volume (Cu.In.)	Total Volume (M³)	Density (Kg/M³)	Weight (Kg)	GWP (kg Co²e/Kg)	TOTAL GWP (KgCo²e)
I-Joists			240						6554.87
2X4 Pine	1.5" X 3.5" X 30'	1,890		453,600	7.43	500	3,715	0.263	977.05
OSB	14" X 0.75" x 30'	3,780		907,200	14.87	680	10,112	0.455	4600.78
2X4 Pine	1.5" X 3.5" X 30'	1,890		453,600	7.43	500	3,715	0.263	977.05
Floor Joists			120						2140.82
2X12 Pine	1.5" X 11.52" X 40'	8,280		993,600	16.28	500	8,140	0.263	2140.82
Structural Wall									4070.66
2X8 Studs Pine	1.5" X 7.5"X 24'	3,240	120	388,800	6.37	500	3,185	0.263	837.66
2X8 Plates Pine	1.5" X 7.5" X 1,080'	145,800	-	145,800	2.40	500	1,200	0.263	315.60
Plywood Sheathing	96"X48"X3/4"	3,456	120	414,720	6.80	630	4,284	0.681	2917.40
Ridge Beam									924.45
16"X8" Beam	16"X8"X180'	276,480	-	276,480	4.53	500	2,265	0.263	595.70
8"X8" Posts	8"X8"X18'	13,824	11	152.064	2.50	500	1,250	0.263	328.75
FRAMING TOTAL									13,690.80

FASTENERS	Dimensions (Inches)	Unit Weight (Kg)	#Required	Total Volume (Cu.In.)	Total Volume (M³)	Density (Kg/M³)	Weight (Kg)	GWP (Kg CO²e/Kg)	TOTAL GWP (KgCo²e)
3.5" Steel Framing Nails	3.5" Long	0.010	5,760	-	-	-	56	3.03	168.44

FOUNDATION	Dimensions (Inches)	Profile Area (Sq.In)	Length (Ft + In)	Total Volume (Cu.In.)	Total Volume (M³)	Density (Kg/M³)	Weight (Kg)	GWP (KgCo²e/Kg)	TOTAL GWP (KgCo²e)
Concrete Perimeter Foundation	-	480	180'-0"	1,036,800	17.00	2,400	40,800	0.103	4202.40

"DE-CARBONIZED" APPROACH | EMBODIED CARBON CALCULATIONS

For the purpose of this study, only the embodied carbon of the framing, fasteners and foundations will be calculated, as the decarbonized approach will focus on the reduction of these elements.

FRAMING   3,835.80 KgCo²e
FASTENERS   1.10 KgCo²e
FOUNDATION   274.39 KgCo²e
TOTAL SYSTEM GWP   **4,111.29** KgCo²e

FRAMING	Dimensions	Unit Volume (Cu.In.)	Required (#)	Total Volume (Cu.In.)	Total Volume (M³)	Density (Kg/M³)	Weight (Kg)	GWP (kg Co²e/Kg)	TOTAL GWP (KgCo²e)
Heavy Truss System									3835.80
4X8 Local Cedar Timber	4"X 8" X 315'	120,960	11	1,330,560	21.80	380	8,284	0.263	2178.69
2x10 Local Cedar Joists	2" X 10" X 18'	4,320	234	1010880	16.57	380	6296.6	0.263	1656.01

FASTENERS	Dimensions	Unit Volume (Cu.In.)	Required (#)	Total Volume (Cu.In.)	Total Volume (M³)	Density (Kg/M³)	Weight (Kg)	GWP (kg Co²e/Kg)	TOTAL GWP (KgCo²e)
Local Cedar Dowels	0.5"X 4"	2	330	660	0.011	380	4.18	0.263	1.10

FOUNDATION	Dimensions	Unit Volume (Cu.In.)	Required (#)	Total Volume (Cu.In.)	Total Volume (M³)	Density (Kg/M³)	Weight (Kg)	GWP (kg Co²e/Kg)	TOTAL GWP (KgCo²e)
Pile Foundation	-	6,144	11	67584	1.11	2,400	2664	0.103	274.39

Element	Business As Usual	Decarbonized	Difference	Percentage
Framing	13,690.80 KgCo²e	3,835.80 KgCo²e	- 9,855 KgCo²e	- 71.98%
Fasteners	168.44 KgCo²e	1.10 KgCo²e	- 167.34 KgCo²e	- 99.35 %
Foundation	4,202.40 KgCo²e	274.39 KgCo²e	- 3,928.01 KgCo²e	- 93.47 %
TOTAL	**18,061.64** KgCo²e	**4,111.29** KgCo²e	**- 13,950.35** KgCo²e	**- 77.24 %**

Fig. 36 Material takeoffs and carbon calculations done for a typical I beam system, "business as usual", and a "decarbonized" heavy truss system.

PART TWO

"DE-CARBONIZED" APPROACH | DETAIL DIAGRAM

The majority of de-carbonization will come from the
significant reduction of wood products used with a
heavy truss system, instead of I-joists. The embodied
carbon of the system is further reduced by the use
of dowels instead of metal fasteners, and buttressed
pile foundations instead of perimeter foundations,
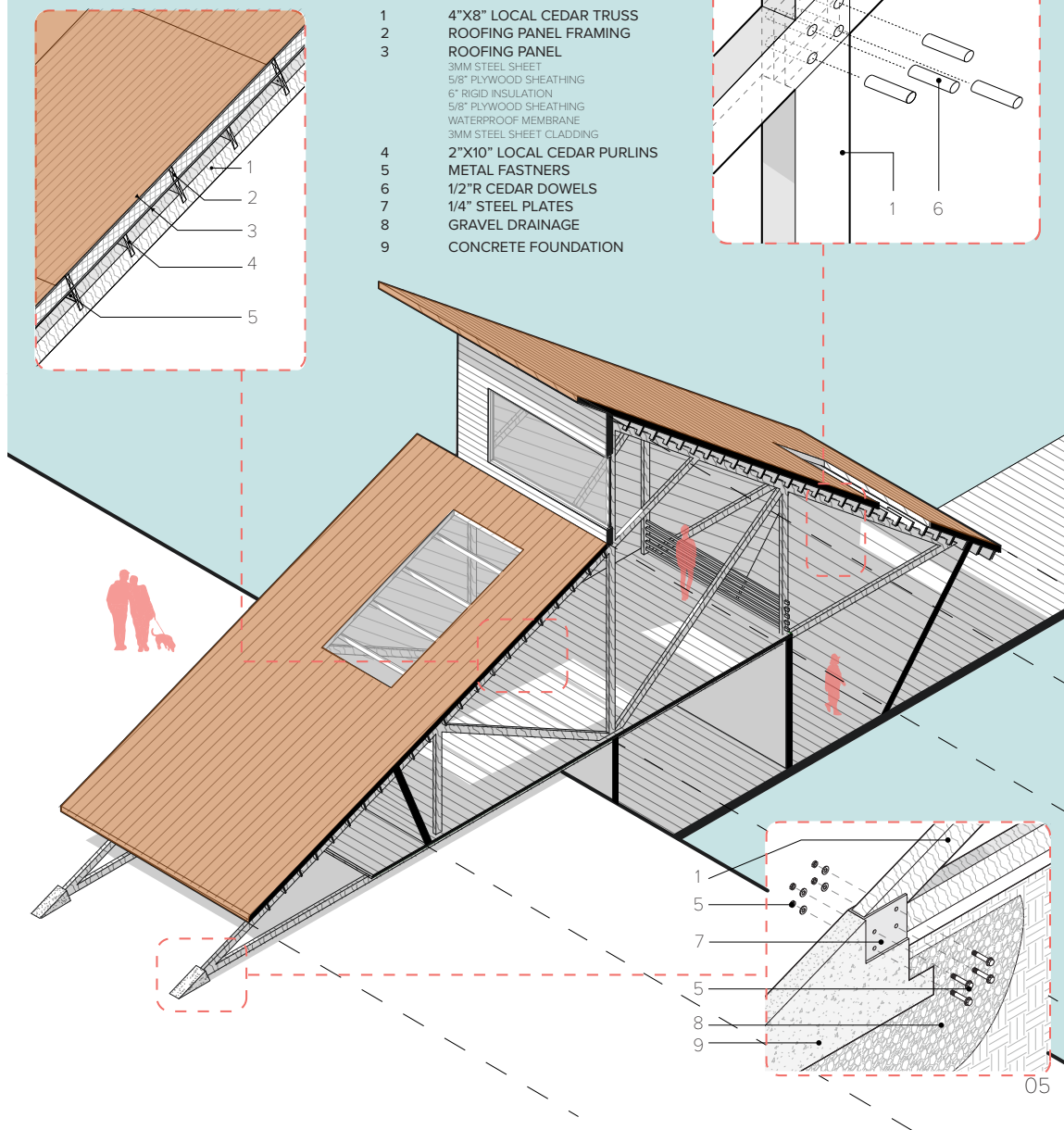reducing the amount of metal and concrete used.

1   4"X8" LOCAL CEDAR TRUSS
2   ROOFING PANEL FRAMING
3   ROOFING PANEL
     3MM STEEL SHEET
     5/8" PLYWOOD SHEATHING
     6" RIGID INSULATION
     5/8" PLYWOOD SHEATHING
     WATERPROOF MEMBRANE
     3MM STEEL SHEET CLADDING
4   2"X10" LOCAL CEDAR PURLINS
5   METAL FASTNERS
6   1/2"R CEDAR DOWELS
7   1/4" STEEL PLATES
8   GRAVEL DRAINAGE
9   CONCRETE FOUNDATION

Fig. 37 Axonometric and details of the heavy truss construction system which reduces the
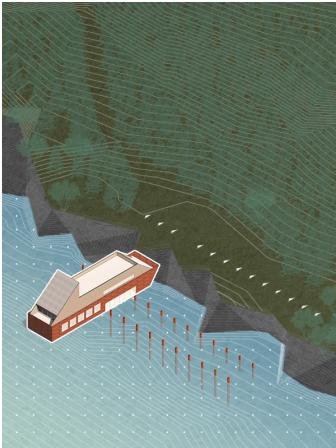buildings embodied carbon footprint by over 77%.
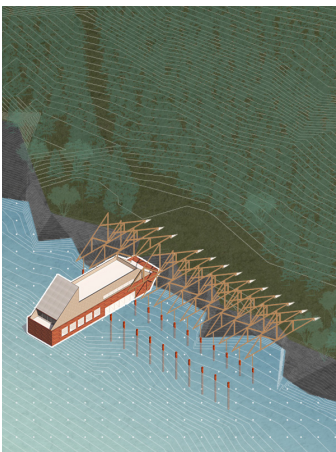
The foundation system of steel piles under water and concrete footings on land are laid in place, and the grid of wood trusses are laid out accordingly. The number of trusses will depend on the individual sites and population of each community. Some may require only docking space for the barge, others a much larger community gathering space. One or two cores of reused shipping containers turned on their ends are installed to house stairs, elevators, and act as light wells during the day and lighthouses at night to signal the presence of the facility and guide the barge. The building is then clad with operable Corten steel panels and shutters on the lower floor, protecting both the building and the shoreline from harsh storms. On the upper level, the building is clad in cedar siding milled from the trees removed on site, and installed in line with the roof slope, as is common practice in the area. The roof structure is all exposed to the inside of the building and is clad in reclaimed corrugates aluminum roofing.

Fig. 38 The barge arrives.

Fig. 39 Foundation system laid in place.

Fig. 40 Locally milled trusses installed.

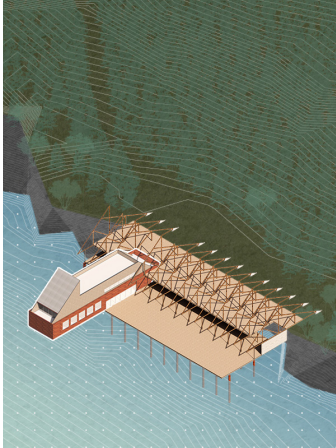Fig. 41 A house on Saltspring Island with diagonal cedar siding.

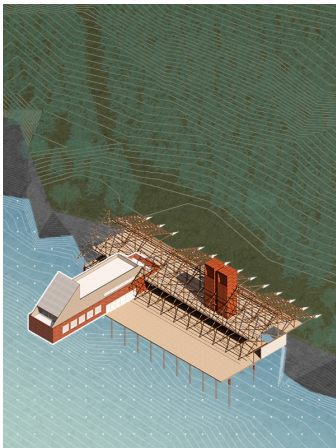Fig. 42 The floor plates are built.

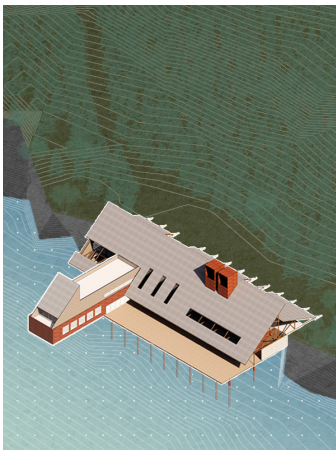Fig. 43 Roof joists and elevator cores and installed.

Fig. 44 The roof structure and finishes are built.

The largest version of the port, shown here is separated into two portions with the barge docked in between them. The small building houses the café, kitchen, and library/gallery space. These functions are essential for facilitating chance encounters and networking between craftspeople and potential clients. They will also facilitate the use of the port as a gallery and public gathering space for cultural events. On the other side the upper level will house the building store/thrift shop that buys and sells building materials and furniture for reuse. The lower floor will house the open workshop space with each bay leasable for individual projects, or the space can be opened for events or large lessons. The large public deck can be used for extra space for the workshop on clear days and can be accessed by the public from around the building. The deck allows the barge to connect directly to the café and building store on the top level, and the workshop on the lower level.

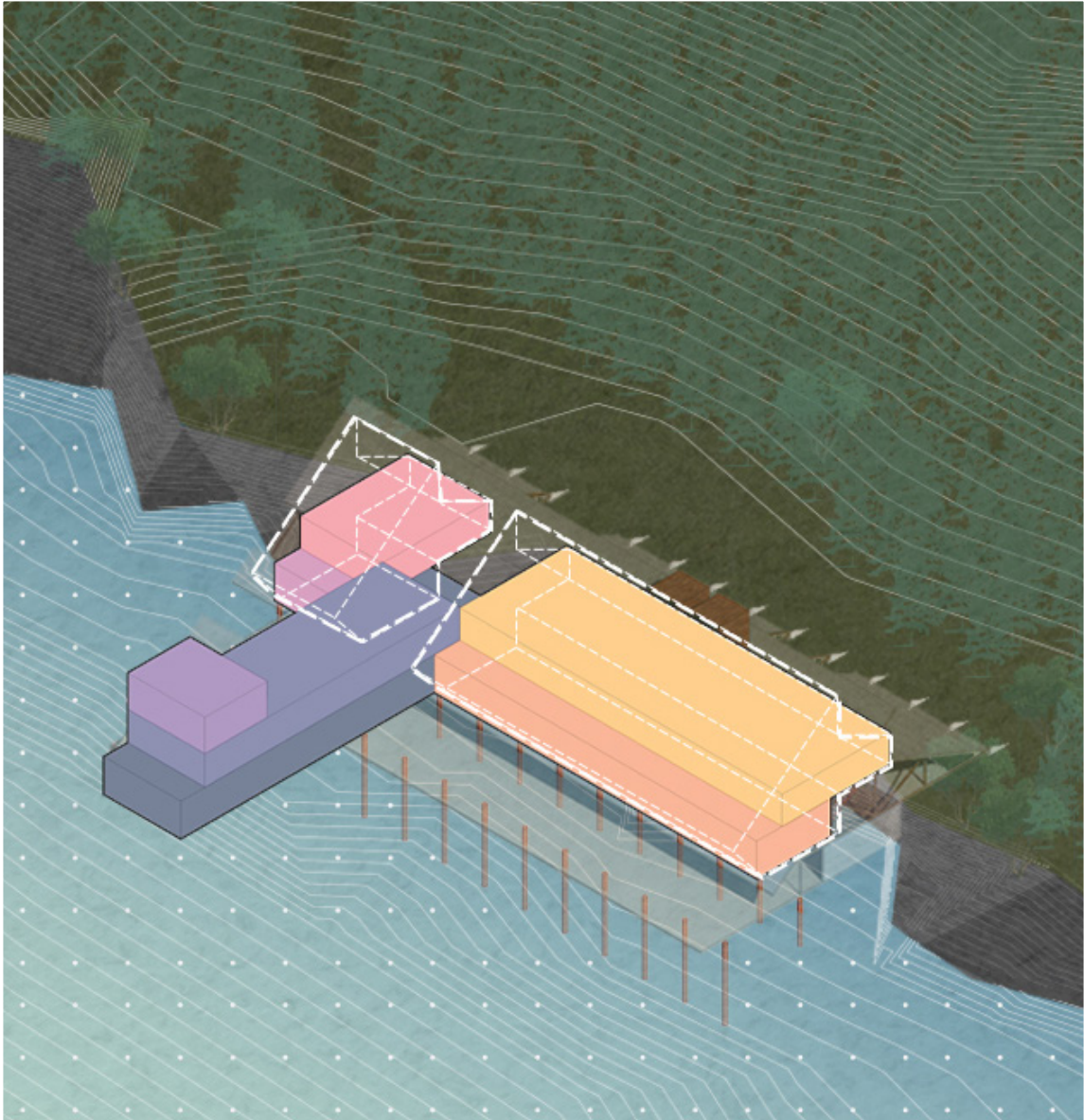|				
🟥	CAFE		🟦	WORKSHOP + HOUSING
🟨	BUILDING STORE		🟪	OFFICE + LIVING
🟧	PUBLIC WORKSHOP		🟪	CONTROL/BRIDGE
🟪	LIBRARY/GALLERY			

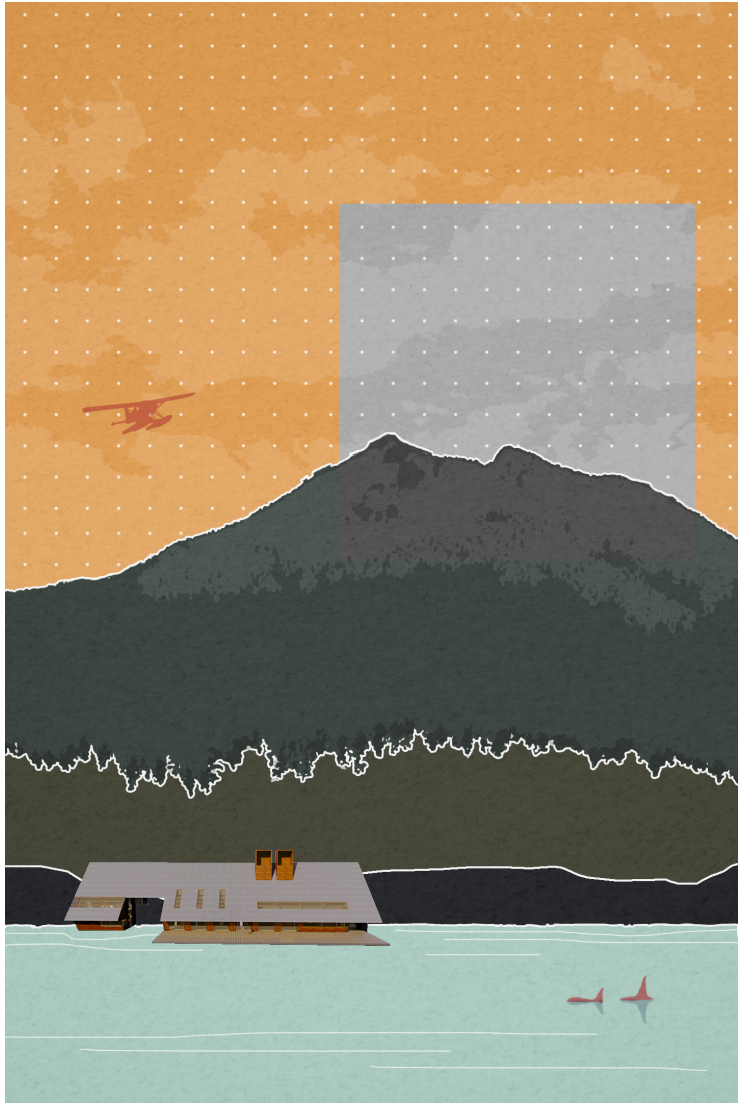Fig. 45 An axonometric program diagram of the port and barge together.

Fig. 46 Waterfront elevation rendering.

Fig. 47 Rendering from the land side of the port building.

Fig. 48 Lower and upper floor plans of the port.

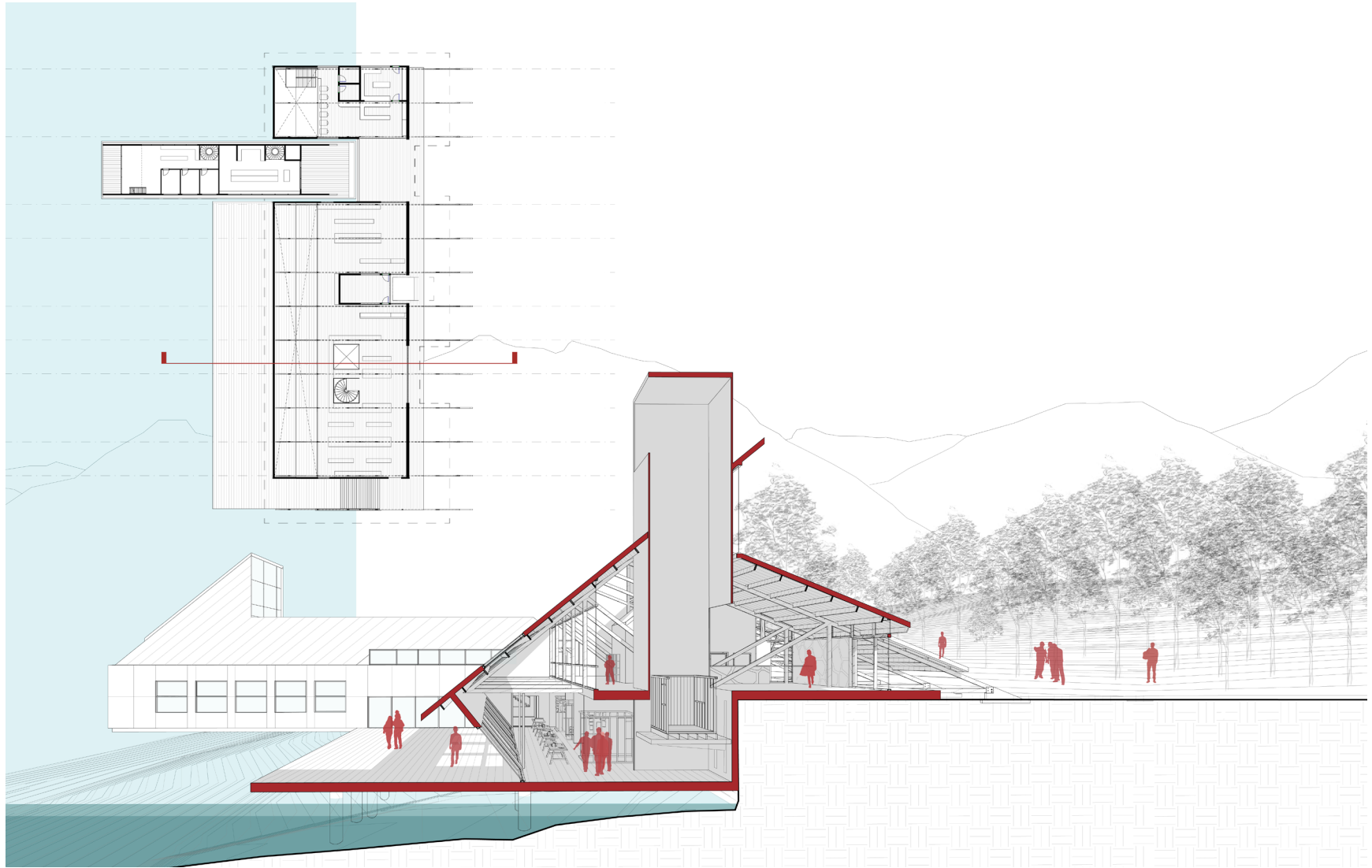|	
1	WC
2	Library/Gallery
3	Rentable Bays
4	Public Workshop
5	Workshop Office
6	Tools Storage
7	Cafe
8	Kitchen
9	Hardware Store
10	Building Store Office
11	Reclaimed Building Supplies
12	Public Deck

Lower Floor

Upper Floor

Fig. 49 Perspective section through the port building.

The Ten-By-Tens

The workshop can be used to produce any kind of project, but the bay widths and elevator dimensions have allowed for the fabrication of ten by tens within the workshop, to then be lifted out and deployed as necessary. Across several issues of the *Folklife* magazine I pulled out several stories about individuals and their crafts on the Gulf Islands as well and individuals with dreams of starting small businesses in their communities. From these articles I put together the list show in figure 51, that describes some possible uses for a ten by ten. From this list I have selected three examples that demonstrate typical uses, specific needs and are deployed in different parts of the landscape.
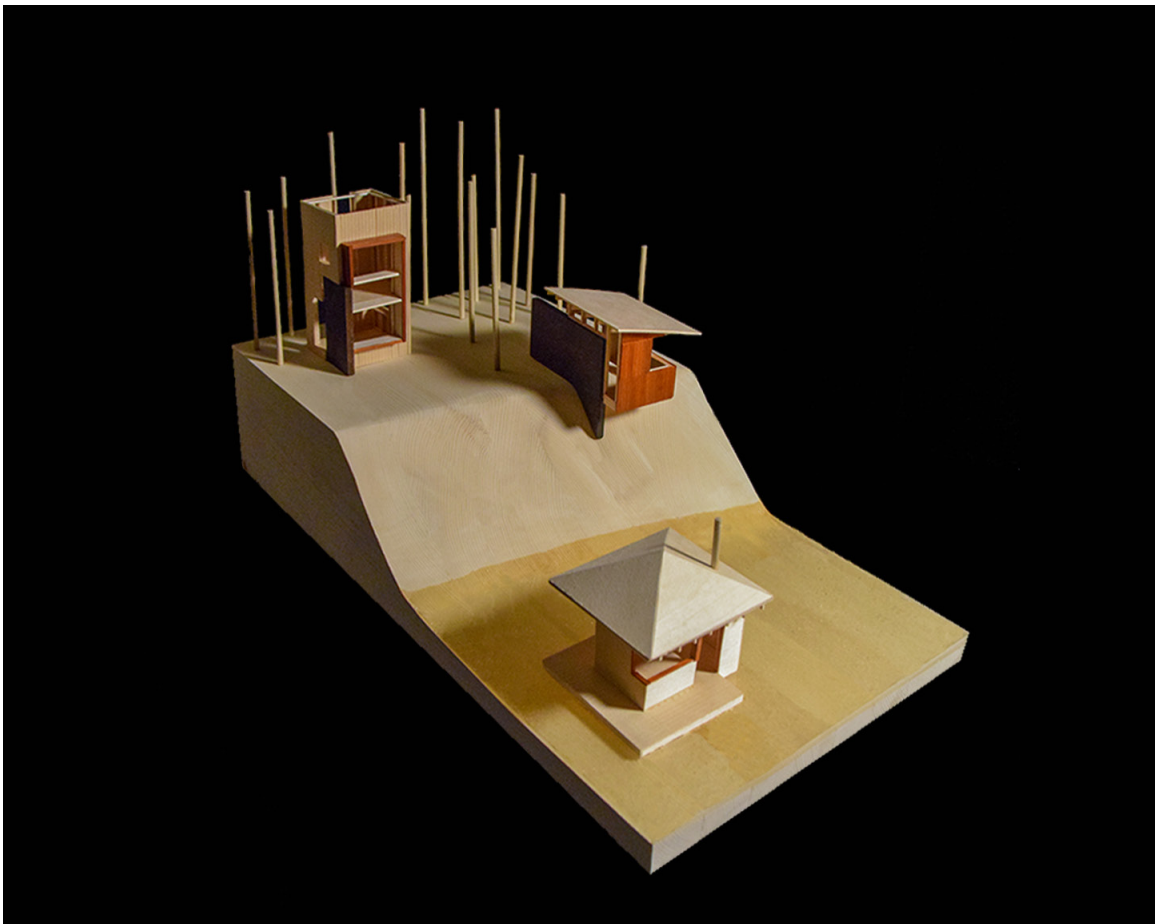

Fig. 50 Model showing all three examples on a typical topography.

ISLAND	DESCRIPTION	POSSIBLE PROGRAM	ISSUE	PAGE
Saltspring	Runs Salty Pear Bnb & Sauna	Sauna/Solarium/Bath	1	19
Denman	Weaver	Weaving Studio	1	15
Galiano	Ceramics	Ceramics Studio	1	16
Pender	Thuja Wood Art	Woodshop	1	17
Pender	Taught totem pole carving to women	Workshop	1	18
Thetis	Habitat Farm Co-op	Sheep Housing/farm stand	1	18
Saltspring	Chef	Kitchen/Resto	1	20
Hornby	Sound Healer (what?)	Sound Healing/yoga Studio	1	21
Quadra	Wilderness Guide	Tourism Hut	1	22
Unknown	Lives in tiny home she built at 17	Permanent Residence	1	52
Unknown	Makes Kombucha	Kombucha plant/store/farmstand	1	93
Unknown	Part of Mudgirls collective	residence/rental	1	61
Gabriola	Wood Sculpturist	Woodshop/studio	1	85
Unknown	Baker	Bakery/Café/Store	1	92
Unknown	Soap maker	Soap Making studio/store	1	94
Unknown	Musician	Music Studio	1	95
Unknown	Retiree	Guest House/rental	1	97
Unknown	Writer	Writing Studio	1	98
Hornby	Swimmer (night swimmer)	Night swimming pavilion/boat house	2	12
Deman	Chocolatiers	Chocolate making Kitchen	2	28
Unknown	Fox Tarot company - Tarot Reader	Tarot Reading Studio	2	36
Unknown	Makes pickled,preserved goods	Pantry/kitchen	2	41
Pender	Musician/recordign artist	Music Studio	2	55
Mayne	Painter	Painting Studio	2	54
Galiano	Dancer (describes ideal studio in text)	Dance Studio	2	56
Pender	Canoe/Kayaker	Kayak Hut/Boathouse	2	56
Gabriola	Tropical Gardener	Green House	2	56
Salt Spring	Has a bar in his backyard	Bar	2	58
Gabriola	Wants a place to bathe outdoors	Bath/spa/sauna	2	59
Gabriola	Writer	Writing Studio	2	60
Gabriola	Cyclist	Home Gym	2	60
Salt Spring	Honey SuckleGathering Fashion Designer	Fashion Studio	2	109
Gabriola	erotica,ocult goods, and alchemy Store	Store	3	25
Denman	Wants to start a mexican or asian food truck	Café/resto/food truck	3	31
Mayne	Wants to start a bookstore/café	Bookstore/café	3	31
Gabriola	Wants to start an apothecary	apothecary	3	27
Salt Spring	Wants to start an outdoor adventure company	Tourism Hut/Fishing Hut	3	32
Gabriola	Wants to start a vegan café	vegan café	3	33
Hornby	Wants to start a letter writing business	Writing studio	3	33
Unknown	Lives Off Grid	residence	3	46
Unknown	Johnson & Mcloead Design Consultants (interior)	Office	3	56
Unknown	Drifter Media (graphic designer)	Office (currently works in 10x10)	3	62
Unknown	Makes Paint out of scavenged items	Paint Making Studio	3	72
Unknown	Two roads farm	Farm Stand	3	93
Unknown	Pink Pamperign Palace (massage)	Massage Studio	3	100
Unknown	Bartender	Bar	3	106
Saltspring	Lives on the water	Residence/houseboat	4	42
Saltspring	Winter Kayaker	Kayak Tourism Hut	4	81

Fig. 51 This list shows examples of personalities from the area, their occupations and their potential needs for a ten by ten. This information was taken from various issues of the *Folklife* Magazine.

The first example is a residence, built with a ten-foot by ten-foot footprint, over two stories and a roof deck, located in and designed for a forested area. The vertical proportion and siding of the structure echo the texture of the surrounding forest. A structure such as this could be used as a rentable suite, bringing secondary income to property owners in the area, and inviting more tourism to support local arts and farmers markets. It could also be used as a permanent residence for those struggling to find affordable housing and looking for a low environmental impact lifestyle.
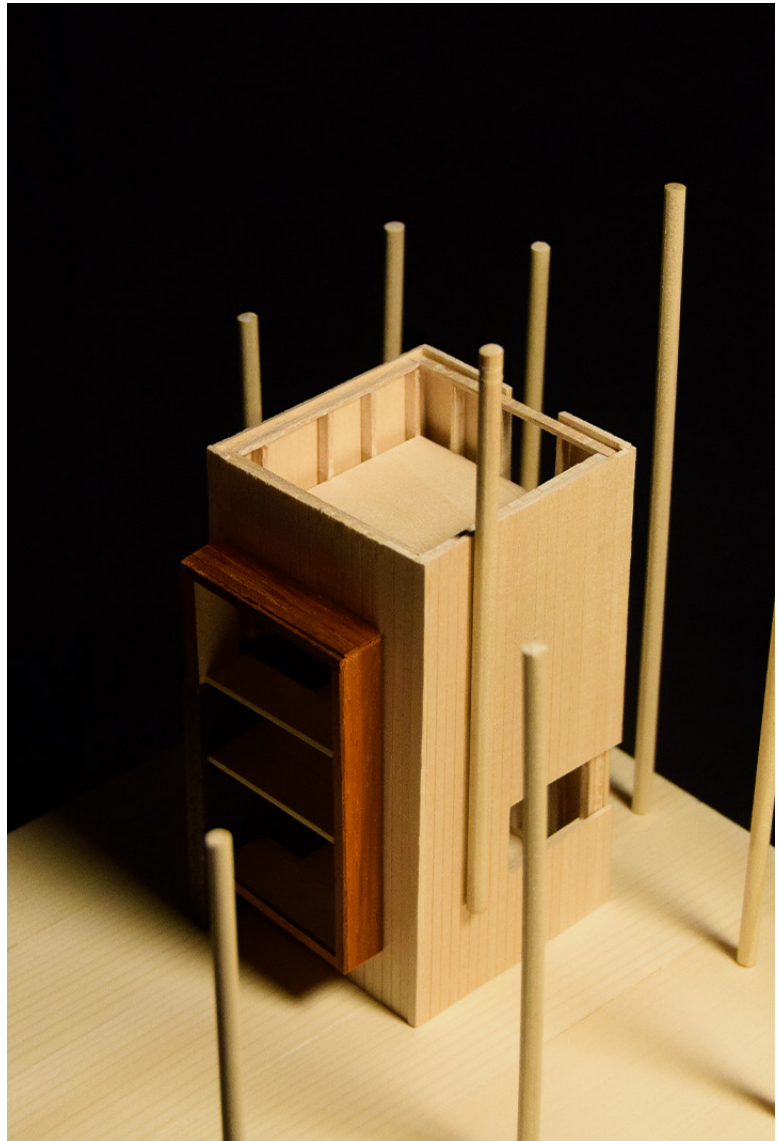
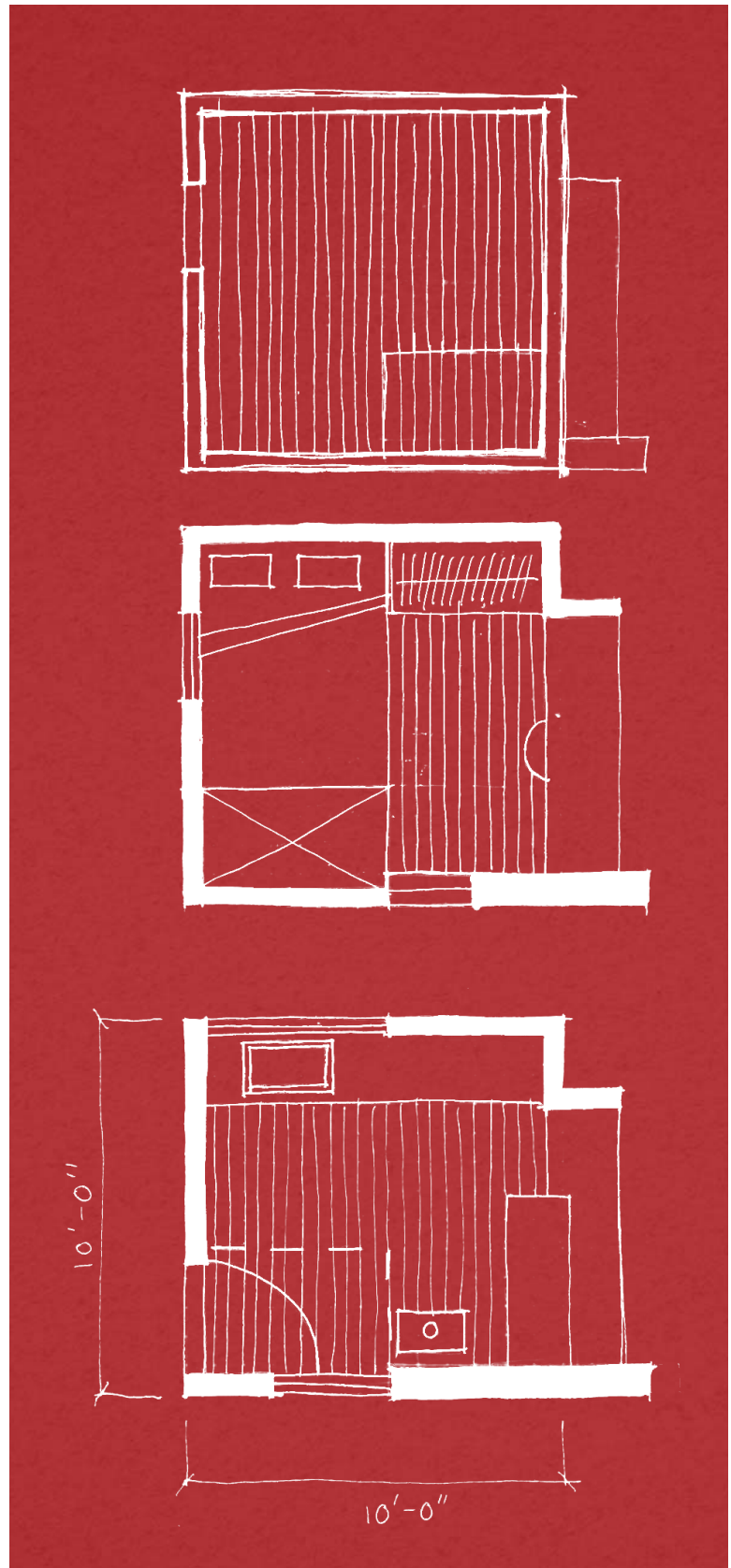Fig. 52 A model of the residence ten by ten example.

Fig. 53 Hand drawn plans of the residence ten by ten example.

Secondly, an artists studio built on the shoreline with one floor and an 8 foot by 12 foot footprint. There is a huge variety of artists and practitioners in the area, but this example has been designed for a paint maker and painter from Saturna Island. She uses found natural materials to produce the paints which she then sells and uses for her own paintings. This is another example of the regions salvage culture. Being on the shoreline, the building is horizontal in proportion and looks out onto the ocean and intertidal zone when the artist collects many of her materials.

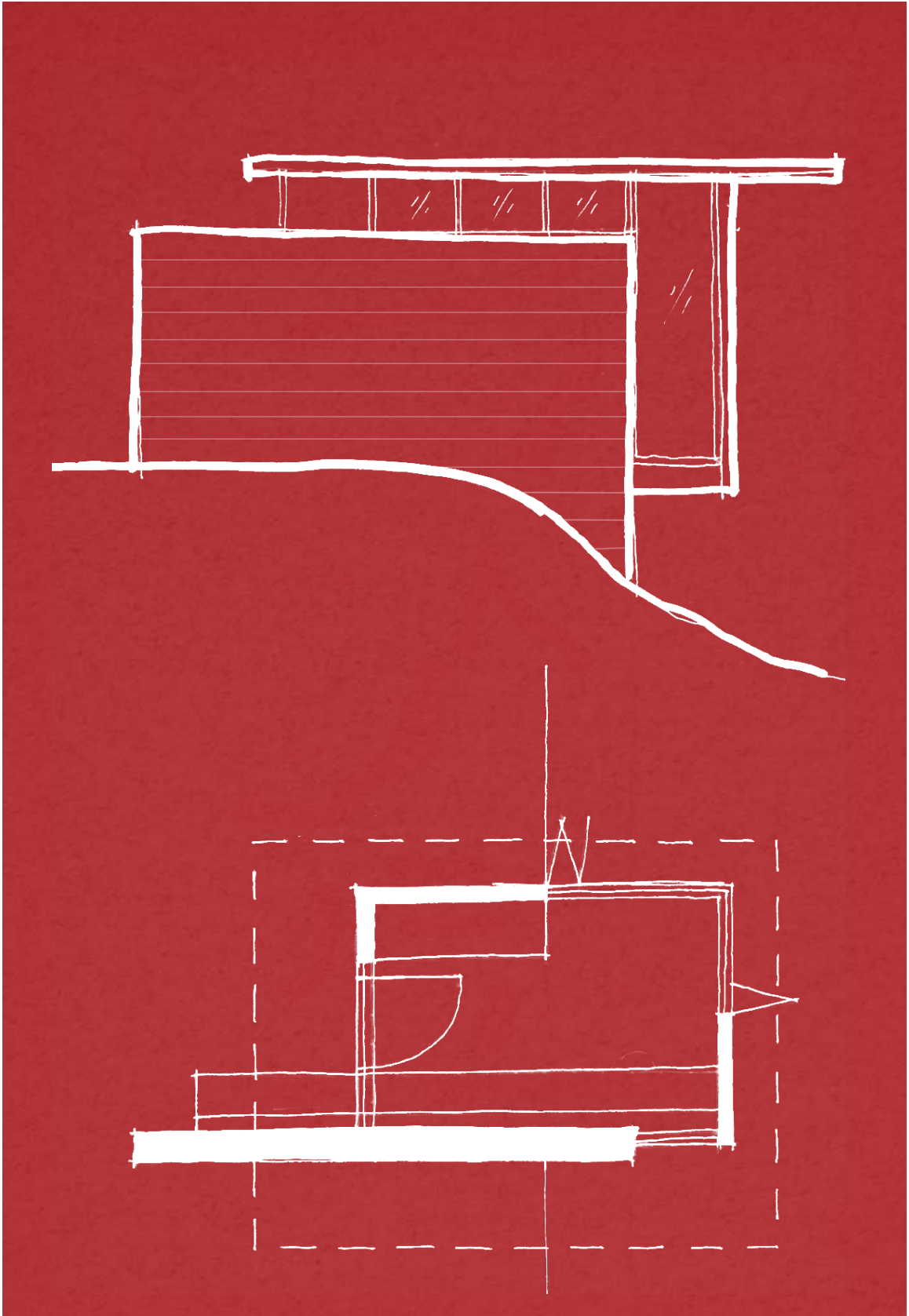Fig. 54 A model of the studio ten by ten example.

Fig. 55 Hand drawn plans of the studio ten by ten example.

Thirdly, a tourism hut floating in a protected bay designed for use by kayakers. Many of the beautiful coves in the area are accessible only by boat. This project would facilitate comfortable access by kayak rather than by motorboat or yacht, providing are more environmentally friendly experience. It would also be part of a locally owned kayak rental and tour guide business. The form is 8 feet by 12 feet with a square roof that overhangs on one side to cover the kayak access and storage area and provide structural support against the wind and waves.

Fig. 56 A model of the kayak hut ten by ten example.

Fig. 57 Hand drawn plans of the kayak hut ten by ten example.

Chapter 5: Conclusion

Currently the role of architects is limited to few project types and few clients, and their involvement in those projects is diminishing as well. Following the leads of architects turned activist and educators like Sam Mockbee and the rural studio, I propose the future of the role of the architect is as educators, facilitators, and public servants. In this way architects can more directly influence cultural, social, and environmental sustainability efforts rather than simply effecting their projects through advice to clients and product specifications.

The region of the Salish Sea is a perfect test site given its strong architectural identity, salvage culture, resourceful and creative population and struggle with future development. The barge restructures the role of the architect and supportive and secondary. The port provides formal infrastructure for existing salvage culture and facilitates community co-operation and knowledge sharing. The ten by tens provide locals with the tools to address local needs and issues. Together as a system, the design project shows how architects can harness local building practices to contribute directly and positively to cultural, social and environmental sustainability.

Fig. 58 A rendering showing the system of ports with their lighthouse cores guiding the barge and connecting communities.

References

Borges, Sofia. 2016. *Rock the Shack: The Architecture of Cabins, Cocoons and Hide-Outs*. Berlin: Gestalten.

Brown, Lorna, Barbara Cole, Jen Weih, Kimberly Phillips, Cedric Bomford, Nathan Bomford, and Jim Bomford. 2015. *Deadhead: Cedric, Nathan and Jim Bomford*. Vancouver, BC: Other Sights for Artists' Projects.

Dunkerley, Michele, and Hank Schubart. 2012. *Houses Made of Wood and Light: The Life and Architecture of Hank Schubart*. Austin, TX: University of Texas Press.

El Poder de la Palabra. n.d. Teatro Del Mundo (1979) by Aldo Rossi. Accessed April 6, 2022. https://www.epdlp.com/edificio.php?id=745.

Encyclopedia Britannica. n.d. "What is Cultural Appropriation?." https://www.britannica.com/story/what-is-cultural-appropriation.

Freear, Andrew, Elena Barthel, Andrea Oppenheimer Dean, and Timothy Hursley. 2014. *Rural Studio at Twenty: Designing and Building in Hale County, Alabama*. New York: Princeton Architectural Press.

Jarvis, Dennis. 2004. "Egypt-12B-021 - Step Pyramid of Djoser." Photograph. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Egypt-12B-021_-_Step_Pyramid_of_Djoser.

Kahn, Lloyd. 2008. *Builders of the Pacific Coast*. Bolinas, CA: Shelter Publications.

Kemp, Barry J. 2005. *Ancient Egypt: Anatomy of a Civilization*. New York: Routledge.

Klein, Zach, Steven Leckart, and Noah Kalina. 2021. *Cabin Porn*. New York: Voracious, Little, Brown and Company.

Kylloe, Ralph R. 2008. *Cabins*. Salt Lake City, UT: Gibbs Smith.

MacKay-Lyons, Brian, and Robert McCarter. 2015. *Local Architecture: Building Place, Craft and Community*. New York: Princeton Architectural Press.

RAIC (Royal Architecture Institute of Canada). 2020. "Canadian Handbook of Practice for Architects." https://chop.raic.ca/.

Robins, Tony. 2014. "Gulf Island House." Aarobins. https://aarobins.com/Gulf-Island-House.

Stewart, Howard MacDonald. 2017. *Views of the Salish Sea: One Hundred and Fifty Years of Change around the Strait of Georgia*. Madeira Park, BC: Harbour Publishing.