Regenerative Communities:
Architecture for Eco-Social Integration

by

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ABSTRACT

Architecture can re-shape the disconnected human-nature relationship by creating spaces that integrate community with ecology. This thesis develops a regenerative community framework that facilitates co-operation among individuals, re-localizing the use of natural resources to foster local economy. Historical analysis of regional connections of land, sea, and community, as well as case studies exemplifying socio-ecologic integration, form a re-interpreted notion of 'living off the land' and the design goals for the project.

A central facility balances social, environmental and economic values by augmenting an inherently strong sense of community and knowledge of local ecologies within a rural fishing village in Prince Edward Island, Canada. The building empowers the community through production as a means of social engagement, and a spatially flexible design allows seasonal and programmatic adaptability. The community engages in building its own space through an iterative process of assessing and re-negotiating local needs and attributes to foster self-reliance.

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CHAPTER 1: INTRODUCTION

> The means by which one man influences another are a part of the ecology of ideas in their relationship, and part of the larger ecological system within which that relationship exists. (Bateson 1973, 512)

Marked both by human progress and its accompanying environmental destruction, modernity has had such a global dominant influence that we now refer to our current geological age as the Anthropocene. A catalyst of our current ecological destruction, the Industrial Revolution and the cultural traits which it simultaneously fed and generated, has resulted in a disrupted and fragmented relationship between humanity and the environment. Geographer and landscape architect, Kathryn Moore (2016, 285) sees this disconnect as a conceptual gap resulting from the rationality of western thought. Detached from the "fabric of our lives," we take the natural world for granted and forget its vital role in shaping identity, culture and self-worth in everyday life (Moore 2016, 289).

The Industrial Revolution is not the single-most factor for our global-wide climate issues. According to anthropologist Gregory Bateson (1973, 495), "this massive aggregation of threats to man and his ecological systems arises out of errors in our habits of thought at deep and partly unconscious levels." To address the destructive actions towards nature by human-beings requires, first and foremost, to develop an ecological consciousness. Researchers have found that socially organized denial through disconnection is at the root of why awareness of major environmental issues does not translate to social action. This research suggests that there is a need for dedicated social spaces for active environmental involvement that create a strong sense of communal action (Syse and Mueller 2015, 29-30). Doing so calls for a radical switch from 'business as usual' towards a socio-ecologic re-awakening.

Ecological Consciousness

The lack of awareness of how direct and integral the human relationship to wider ecological systems is due in part to the spatial and psychological separation from nature that much of society experiences. This condition is linked to many underlying reasons such as religion, unbalanced emphasis on economic development, out of hand consumerism, or the attitude of 'out of sight, out of mind.' There is currently an expectation that science

and technology will solve our big issues. The truth of the matter is that each and every individual has a role to play, but creating a much different way of 'being' on this planet is uncomfortable and riddled with unanswered questions. The one thing that we do know is that this change will require us to begin recognizing the interconnection of humanity amidst a much larger ecological system.

The East and West comprehend the human-nature relationship in two different ways; the first recognizes unity and a living network of interconnection, while the latter is human-oriented and dominant. The Western anthropocentric view elevates humanity as superior to nature and creates a chasm between 'us' and 'it.' The ambition to control nature is rooted in the monotheistic religions which have largely influenced our moral attitudes over the centuries and becoming part of our unconscious perceptions of the world. Well-known landscape architect and writer, Ian McHarg (2006, 24), warns of the anthropocentric man: "he seeks not unity with nature but conquest. Yet unity he finally finds, but only when his arrogance and ignorance are stilled, and he lies dead under the greensward."

Sustainable development tends toward technological solutions; however, Mathis Wackernagel has suggested that we should not rely on technology alone, as it avoids challenging the root issue of over-consumption (1996, 155). Technological supremacy ignores essential social questions, as well as local skills and knowledge, while relying alone on the rationality of science to provide answers, standardized solutions, and environmental management (Guy and Farmer 2001, 142). While technological sustainability increases efficiency of scientific and engineering capabilities, ecological sustainability is concerned with systems of redundancies that enable the adaptability and endurance of natural processes and their biodiversity (Cole 2012, 43). A successful societal transformation towards sustainable functioning requires a complement to the technological optimism that pervades. By apprenticing ourselves to ecology, we can learn from its patterns, strategies, and limits in order to adapt our current systems to increase ecological and social sustainability (Weyler 2013, 194).

Systems thinker Donnella Meadows concluded that we often cannot ascertain, or choose to ignore, how the whole ecological system is affected by our actions. Due to our limited ecological consciousness, we are often unable to make positive long-term decisions, in-

stead opting for those which satisfy us immediately (Meadows 2009, 106). Building a sustainable community fit for the future requires a re-wiring of current social, physical and environmental systems in a way that will reinforce behavioural change both individually and collectively (Robinson 2008, 10). This will require an iterative process of becoming intune with nature (Weyler 2013, 194). Meadows states further that this iterative process will require us to reclaim our intuitions and begin seeing our social and ecological systems as the source of its own problems. She calls us to find the courage and wisdom to begin incrementally building this change by pulling from old ways of doing, and simultaneously seeing through new eyes (2009, 4).

Bateson believes that western culture has developed a dysfunctional value system that, aided by technological process and population increases, threatens our own survival (1973, 498). This has drastically changed the way that humanity relates to its environment, causing an "ecological blindness." He refers to an 'eco-mental system' that underlies all lifeforms, and which incorporates human thoughts and experiences (492). He explains that animism has separated the human mind from the natural world, but when the mind is separated from structures in which it is immanent there is a fundamental error within the overall system (493).

He adds that the total system is man plus environment, and this system engages through trial and error (490). The natural world is formed on a general systemic structure that, according to Bateson, is the appropriate metaphor for enabling our comprehension of this total system of society plus environment (492). The entry point to reversing our current path of destruction is to address our attitude toward the environment (500). Bateson (490) explains that, "The energy for the responses of every organism is supplied from its metabolism, and the total systems acts self-correctively in various ways. A human society is like this with closed loops of causation. Every human organization shows both the self-corrective characteristic and has the potentiality for runaway."

Integrating Community and Ecology

Thinking of sustainability in terms of integration of systems allows us to interpret the basis of life as an interdependence of community elements. Ian McHarg sees, "Each one of these is a source of stimulus; each performs work; each is a part of a pattern, a system, a

working cycle; each one is to some lesser or greater degree a participant and contributor in a thermodynamic system (McHarg 2006, 12)." Moore would add that, our re-evaluation of relationships between community and the land should take on a holistic viewpoint. By strengthening a community's relationship to its place, it locates us in the world as an indispensable part within the whole. As we begin to understand that we are inseparable from the land through building relationships, it "rids us irrevocably of the subject/object dichotomy. We no longer need to reconcile the irreconcilable (Moore 2016, 291)."

In shaping both our values and our behaviours, it is critical that we commit ourselves to community cohesion at both the local and global scale. Mathis Wackernagel (1996, 142) explains that, "It may seem paradoxical, but global security is likely to find its deepest roots in strengthened community and regional economies." Collective functioning within our communities assures us that we can build the future that we want to live in, and that this future is made possible through interconnection with community and environment (McKnight 2010, xiv). Community participation and education has been shown to reinforce a positive message about sustainable lifestyles. Action through participation, knowledge and experience builds compassion in a method of learning by doing while reinforcing the initiative (Warburton 1998, 28).

Viewed as a living entity, communities have the ability to weave people together – their voices, ideas, and actions into a diverse unity. Carrying the potential for profound change, communities operate collectively as an essential operating system for human functioning. The social support that comes with community validates each member as part of society and instills in them a sense of belonging and purpose. Collective functioning is a tangible way of understanding the symbiotic nature of our existence in emphasizing the needs of the larger whole. In strengthening the relationships that communities are built upon, we strengthen community cohesion and begin to see that we are as much a part of our environments as we are a part of our community.

Ecology studies the interrelationships between organisms and their physical environments. Adding to this definition, Bateson states that ecological study is the survival and interaction of ideas and programs in the form of circuits, and that all life is formed on its cyclic nature (1973, 490). The ecological view has socially contributed to our re-visioning

of the world as a creative evolutionary process (McHarg 1992, 53). In times of pressure, nature has a creative tendency to change by re-forming itself within its environmental possibilities, and those not able to do so simply succumb. As humanity faces now, other successful species typically overshoot their habitat capacity but are able to self-correct (Weyler 2013, 191).

Ecology offers a holistic lens for seeing that life is only transmitted through life, and that each living entity is physically linked to the origins of all life (McHarg 1992, 29). In seeing our world in this way, we gain a level of consciousness that denies us the ability to act against our environment, because we see that in doing so, we are acting against ourselves. Sustainable inhabitation of the world requires that we gain a deeper wisdom that is informed by the patterns of the earth's dynamic fabric. Getting to know our regional ecologies unveils the flow of natural systems that will re-educate us on how to thrive in that area. "Ecological design requires us to once again engage our places, their joys and idiosyncrasies, their wind and water, their pulse and history (Van der Ryn 2007, 78)."

McHarg urges designers to become informed by ecology through studying the interactions and patterns between natural phenomena, and associating value to both social and natural processes. He developed an approach wherein data is collected chronologically, developed from a regional scale to a site scale, to understand the abiotic processes and systemic connections. These mappings were layered to achieve a model for determining potentials for opportunity as well as constraints (McHarg 2006, xix); in order to discern an appropriate morphology, McHarg's method creates an ecosystem inventory with a description of its natural processes. Limiting factors are identified and values assigned to processes. From there, indicators of stability or instability are identified, and possibilities for change are determined (34).

More recently, Alan Berger has developed an ecologically-based design methodology which he and his research team, P-REX lab, refer to as systemic design wherein mapping and visualization techniques are used to reveal systemic relationships (Berger 2009 14). Employing a generalist strategy for greater malleability, Berger emphasizes that projects be understood from the bottom-up, swaying away from the rigid and prescribed nature of a top-down approach (17). Embedding larger-scale logic in smaller-scale proposals allows

projects to live without expensive and infinite inputs, thus making them more sustainable. The process that he and his team have refined begins with an expansive but general study of literature and knowledge from which they form, “connective bundles based on compatibilities and synergies (15).” From here, they form systemic diagrams that illustrate regional to local relationships. The bottom zone represents regional frameworks, while the top zone is concerned with local frameworks. In-between these zones are the systemic bundles that represent the regional flows and energies connecting region to site (15).

Thesis Question

This thesis asks if architecture can facilitate a re-connection between society and ecology to create regenerative and self-reliant communities in rural Prince Edward Island. It explores how architecture can begin revising the human-nature relationship through physical and symbolic re-connections of society and the larger ecological systems of which it is part. Developing an ecologically sustainable community framework, it envisions a co-operative approach to meeting human needs through the re-localization of natural resources. In utilizing the unbound potential of collective action within our communities, we can begin aligning our daily lifestyles to the ecological capacities and opportunities within our regional environments. By participating in collective efforts that develop ecological sustainability, our individual actions in a co-operative format engrain within the individual a renewed sense of relationship with ecology and community. This reinforces the inherent nature and significance of interconnection within a living ecosystem.

The rural fishing village of Murray Harbour, Prince Edward Island serves as an appropriate example to test the design of a regenerative community framework. Situated amid a five-river watershed in the most south-easterly point of the Island, the village has its roots in ship-building and later became one of the most lucrative fishing enterprises. However, for reasons of over-fishing and increased regulations, economic activity has steeply declined here, as it has in many other rural villages in the last fifty years. As it became harder to make a living the younger generation has moved away, leaving behind an aging population of about 250 people. In recent years, ‘come-from-aways,’ the local reference to non-native Islanders, have found an inexpensive and quiet place to re-settle. The slow nature of life on Prince Edward Island has also been the attraction for a large group of Buddhist monks, and two groups of Amish who have relocated in search of cheaper farm land. As

Prince Edward Island seeks to replenish its population due to rural erosion, these groups of newcomers offer an interesting new cultural fusion and learning opportunities for the future of the Island.

The methodology taken in this project aims to develop a re-interpreted notion of “living off the land” that is appropriate for modernity. Although this notion is deeply rooted in the spirits of Islanders, it now takes a form such that people make their livings off the land, but these products no longer stay local and the majority of profits go to big business. To inform how a new society shaped on environmental stewardship might operate, a series of case studies which illustrate community self-sufficiency and an integration of social participation with regional ecologies are analyzed. An in-depth, time-based study of place is conducted at both the regional and local scale to understand how this village once operated with a high degree of self-reliance, why it fell apart, and how it might begin to regenerate itself. Looking to ecological patterns throughout time, and how Island society has been able to sustain itself in relation to these patterns begins to indicate an informed approach to re-adapting our patterns of living to match the flows of our regional environment.

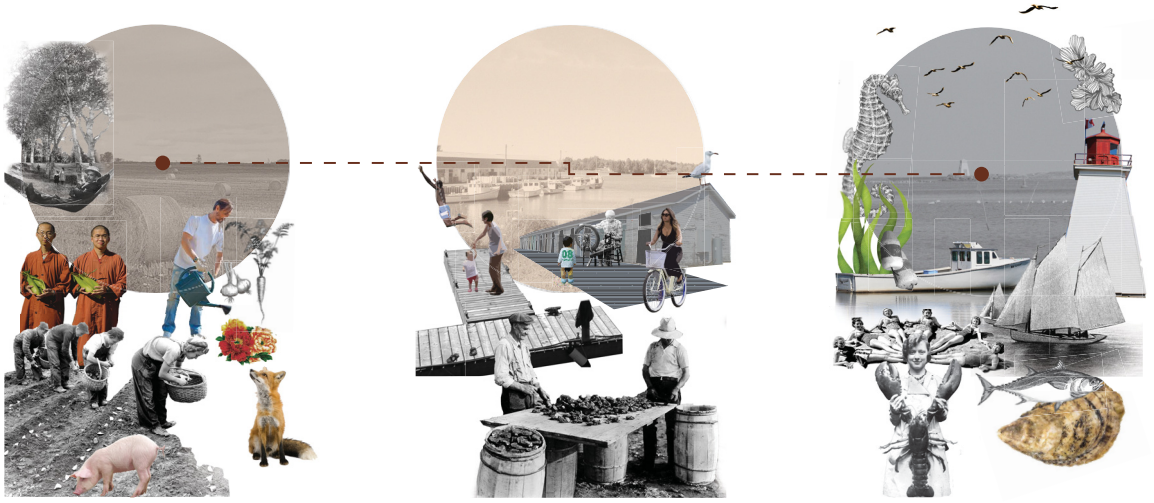
Interest in living life in connection with nature arose in the 1970s alongside the youth movement, marking a period of social unrest with conventional society. The Back-to-the-Land movement illustrates how a small sector of modern society has attempted to re-establish their roots in nature to a varying degree of success. Seeking a slower, more centred way of living, citizens of this movement from across North America migrated out of metropolitan areas to seek a live in the country that was closer suited to their moral values. Prince Edward Island offered cheap farmland and homesteads that were increasingly being abandoned as Islanders at the time were actively searching a more modern lifestyle. However, optimism often soon faded as they discovered the hardships of rural living and the harshness of the Island winters. At this time, Prince Edward Island caught global attention with Canada’s commission for Habitat ’76 as it became the home of the Ark at Spry Point, a bio-shelter design that integrated ecological systems with passive technologies within a single-family dwelling. It is studied in chapter three as a case study for informing the design.

The regenerative community as defined here is one capable of adapting itself in relation to its social, ecological, and economic needs. It is built on the paradigm shift that Lister describes as an organism model of open-endedness that is flexible and self-organizing, moving away from seeking control and stability (Lister 2016, 120). It is a type of community that is resilient and resourceful, living within its environmental capacity. It aims towards self-reliance through a re-localization of its resources and economy. The common goal of the community is to fulfill the fundamental human needs of its inhabitants through a co-operative or participatory approach. Each community is as unique as the people who inhabit it and the region and ecological processes within which it exists.

A central community facility balances social, environmental, and economic values while activating community empowerment through regional liberation. This type of community building provides flexible spaces for activities that contribute to and encourage community self-reliance. Participation in these activities allows individuals to begin contributing to the sustainability of their immediate socio-ecologic environment through learning new skills that contribute to a sustainable lifestyle definition. Linking community to production and leisure within a vision of ecological stewardship, the design facilitates a re-localized economy through value-added opportunities and trade of surplus goods. The building is designed such that it is made by and for the community, furthering a sense of empowerment and enabling the community to take ownership of their space. Utilizing existing local skills and materials builds on the local vernacular and sense of regional pride and is a sustainable alternative to looking for outside material and labour. The building adapts through time and in relation to shifting community needs, and seasonal flows and its related activities.

We are beginning to realize the benefits of simplifying our lives, and that true fulfillment comes from living life in connection and contribution to others (Wackernagel 1996, 136). Everything comes in practice and in order to become genuinely sustainable beings, we must simultaneously change our habits while changing our minds in a unified process. Forming new habits requires both mental and physical engagement. We must emphasize a society that operates through collaborative work and that engenders new ideas of the good life (Syse and Mueller 2015, 104). Research has shown that behaviour is determined by attitudinal factors and contextual forces, but it is also structured through a

community's material and technological characteristics (Robinson 2008, 11). Focusing on locally-relevant, practical and empowering education concerning climate change alone is insufficient for behavioural change. A community must simultaneously find opportunity for collective decision-making, and to allow its members to give shape to the social and material infrastructure that further enables their collective sustainable practices (14).



Conceptual image showing the village as connection point between agricultural and oceanic activities.

CHAPTER 2: LIVING OFF THE (IS)LAND

> In a sense, ecological design is really just the unfolding of place through the hearts and minds of its inhabitants. (Van der Ryn 2007, 85)

'Living off the land' is a notion that remains close to the hearts of many Island residents. As Canada's smallest and only island province, Prince Edward Island occupies a unique position as the home of the Confederation of the nation of Canada. Bounded by the Gulf of Saint Lawrence to the north and the Northumberland Straight to the south, it is a tract of fertile red soil that is 'cradled in the waves' that lap off its neighbouring provinces of New Brunswick and Nova Scotia. It occupies a space that straddles modernity - an in-between of age-old traditions and a fresh sense of modernity, from which it remains partially isolated. The Island condition, where boundaries to the sea clearly delineate the land and it's resources, necessitates a greater degree of self-sufficiency and sustainable management of its social and ecological resources.

This notion of 'living off the land' is now observed in terms of making one's living from the land or the sea through farming and fishing, which remain the province's primary industries. The close proximity to the ocean and the quaint and quiet way of life here attract thousands of people each year in what has become the Island's third most lucrative industry, tourism. Author Lucy Maud-Montgomery and her fictional character Anne Shirley have helped to put the small Island province on the worldwide map. Life on the Island falls within a process of seasonal changes, and with it, the toiling labour of working the land and sea. Modern technologies and industrialization have unbound many Island residents from the land and has significantly altered its social systems. Respect for nature and its resources has faded over the years in parallel to industrialization and economic drivers. However, within this notion of 'living off the land' there is a thread of timeless wisdom and social ties that can be traced through history, reinterpreted through a systems lens, and applied in modern terms for a society facing a global crisis with its environment.

Informing the design and future of any specified place requires a wide-ranging investigation of both its regional and local systems which form its social, economic and ecologic systems. Marine Biologist John Todd explains that the evolution of a community is a product of its location, history and its existing conflicting forces that are limiting factors in

its existing state. These factors provide the basis for community structure, movement, and future action. Todd recommends developing a “time perspective” by gathering old photos, drawings, stories and information, unveiling how the community came to be in its current state and a sense of its community structure. This type of analysis allows us to view the community in relation to its historical context to uncover past riches and lost or unexploited potentials (Todd 1993, 93).

American Architect Sim Van der Ryn (2007, 85) states that “Local knowledge is best earned through a steady process of cultural accretion.” He advises designers to pay careful attention to local actors such as farmers, fisherman and craftspeople. These are a valuable source of knowledge whose collective memories comprise a map of constraints and possibilities. Further, designers should develop concern for the smallest details of everyday life. It was through the careful orchestration of the everyday details that traditional cultures were able to structure themselves around the maintenance of the ecological integrity upon which they depended (81). Awareness of immediate surroundings such as water, food, shelter and materials celebrated interdependence and permitted survival. Thus, building sustainability on the patterns of long-term survival was once woven into the texture of everyday life (77). In present terms, design can transform our awareness, “so that people are richly informed about their place and the ecological processes endemic to it (186).” This type of design serves to both celebrate and ground us in place.

Living on the Land: Mi’kmaq Inhabitation

Prior to European occupation and the “settlement” of the land, the Mi’kmaq dwelled amidst the seasonal ebbs and flows of a pre-Anthropomorphic landscape in the Maritime regions of eastern North America. Daily life was closely integrated with the local ecology which allowed the Mi’kmaq to sustain themselves from the living abundance of the Island as far back as ca. 800 to 1000 AD (Canada Access Program, PEI). Legends attribute the Island’s origins to a Great Spirit who shaped a piece of dark red clay into the form of a crescent. The spirit imbued on this fertile clay all of its rich plant life of grasses and forests and flowers and placed it into what we now call the Gulf of Saint Lawrence as a home for the Mi’kmaw people (Baldwin 2009, 3). They called this land Abegweit, which roughly translates to ‘cradled on the waves.’

Their relationship to nature was not such that they were apart from it in the first place. Unlike Anthropocentric worldviews, Native American cosmologies do not elevate humans to take on a unique position in the universe. Biocentric worldviews are based on connection rather than boundaries, and an absence of hierarchy allows both humans and animals to be mutually dependent members of the same realm. Professor of History of Religions at Lund University, Anne-Christine Hornborg explains that to understand how the biocentric worldview is generated, we must take a specifically local lifeworld as the starting point. Everyday practical engagement in the world is the basis for cultural models because it is this daily practical experience, such as hunting for survival, that causes emotional engagement with the environment. By not assigning humanity a unique position, relationships with all other living entities will be of an equal quality (Hornborg 2007, 23).

The Mi'kmaq related to their environment in a partnership which extended to what others may label 'inanimate' objects such as the sun, wind and rain. All living beings in their world were understood to have a spirit, and as such, were respected. When an animal's life was taken, hunters made apologies to it and handled its carcass in a ritualistic manner, honouring its death (Baldwin 2009, 3). Hornborg (2007, 16) describes the Mi'kmaq worldview in terms of universal integration, where the everyday actions of living beings functioned as an integrating force in a vision of an environment in which humans dwell. Hunter-gatherer people have acquired a practical knowledge through their day to day actions of subsidence. However, these daily activities of food-gathering were not a base activity, but rather were experienced as, "tightly interwoven with cultural perspectives and ethical responsibilities towards the environment" (Baldwin 2009, 17).

Mi'kmaq family on Prince Edward Island (Photographer unknown. Edited by Earle's Picture Restoration).

This respect extended between the people of the Mi'kmaq society which was based on sharing and co-operation. Treating each other as equals, they relied on voluntary co-operation of individuals for tribal achievement. Leading each group was a chief who ensured his people's welfare (Baldwin 2009, 7). The Mi'kmaq engaged themselves in the changing landscape, dividing their year in relation to the natural transformations they observed in their environment. Spring was marked by the new leaves beginning to sprout and when the geese began to appear. They observed that the moose fawns reached a certain size in the mother's belly and that the seals began to bear their young. In the summer, the salmon began to run, and the wild geese shed their feathers, while autumn was marked by the waterfowl flying south once again. Winter came when the cold set in, the snow became abundant and the bears began to hibernate (Hornborg 2007, 16).

Survival in this area required moving camps seasonally to follow food sources. The winter months were spent in the sheltered inland areas while summer meant setting up camps along the coast allowing a diet of fish and shellfish with the added mobility of the water. In the summer they set up camps of wigwams, each housing up to two dozen people. There were abundant amounts of food including berries, mussels, clams, snails, oysters, and lobster as well as ducks and geese. This was also the season of gathering in large groups to renew friendships, find mates, play games and music, dance and tell stories (Baldwin 2009, 4). The fall brought severe storms and camps oved inland, at which time they broke into smaller familial groups to set up new homes on the banks of fast-flowing streams where they fished. Larger animals were hunted, and the meat smoked to preserve for winter, while the hides were used for clothing, snowshoes, toboggans and other useful items. The winter months were spent sheltered in the forest where they lived in small wigwams with insides lined with animals hides and fir boughs to keep warm. Ice fishing and hunting via snowshoes kept diets sustained, but visits to the coast for seal hunting could supplement when times were tough (Baldwin 2009, 5) The Spring came when the birds and waterfowl returned, and families began planning their trips back to their summer homes. They prepared new canoes from the birch bark sealed with spruce gum around a cedar frame. As the season came to an end, bands of Mi'kmaq moved back to the coast to the bountiful fishing locations to gather again with their wider communities (Baldwin 2009, 6).

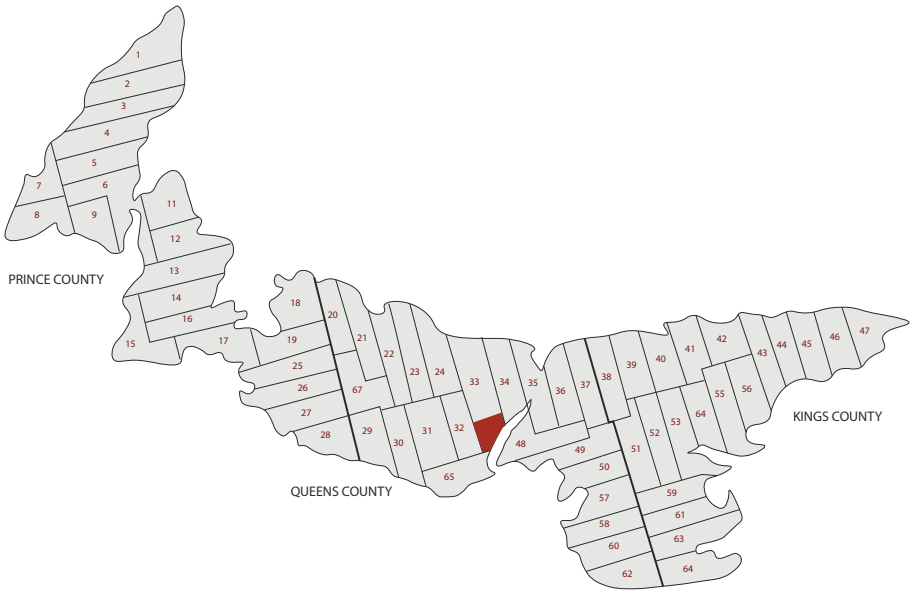
Eventually the Europeans discovered this "new land" and were attracted to the rich fish-

ing waters around it. In the 17th century, trade began with the Mi'kmaq, exchanging food, weapons, hardware and furs. Trade was also a way of making alliances, and European men would often marry Mi'kmaq women to strengthen relationships. Although the Europeans had a trade monopoly in mind, the Mi'kmaq people in the beginning thought their new white partners allies and felt a symbiosis with them. However, the equal exchange that began their trade was gradually transformed into a dependency on European goods which would gradually dissolve native society (Hornborg 2007, 6). As the population of Europeans in North America grew, large tracts of land that the Mi'kmaq recognized as home were sold off to wealthy Europeans. The British allotted small amounts of land to the Mi'kmaq in New Brunswick and Nova Scotia, but on Prince Edward Island, all land was given over to wealthy proprietors (Baldwin 2009, 52). The Mi'kmaq continued to roam in search of game for several decades after the British took control, but as the settlers cleared the forests and erected fences, the wild animals began to disappear and with it, the Mi'kmaq's ability to move about the land. In the absence of food and under strict British control, the hunter-gatherer way of life was lost.

Dividing the Land: European Settlement

The Europeans had a drastically different relationship with the land than their Mi'kmaq predecessors. In the beginning, the Europeans made fishing trips to North America, and when an abundant fishing location was found, a temporary camp was established on the shore and catches were dried on racks made of wood before salting and packing in barrels for the trip back to Europe. While in North America, they traded goods such as guns and metal tools for furs from the Mi'kmaq which were made into hats, muffs, gloves, and coats (Baldwin 2009, 12). The first years of settlement in North America were a continuous game of survival and endless hours of back-breaking labour.

The British government allocated in 1767 nearly all of Prince Edward Island to land proprietors who would form a long-disputed semi-feudal absentee landlord system. Landlords were required to pay to the Crown the costs of colonizing the land in a system known as the quitrent (Bumstead 2019). New owners were obligated to have one Protestant person for every 110 acres of land they had been allotted and to settle the land within ten years. If this condition was not met, the government reserved the right to reposes the land. Few landowners actually paid their quitrent or acquired the agreed upon number of settlers



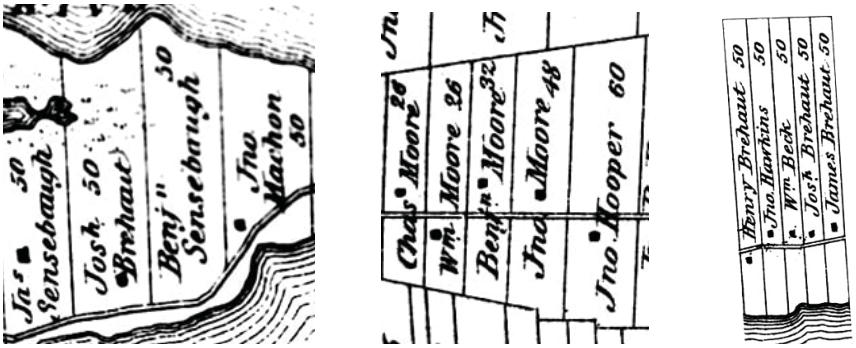
Land divisions of Prince Edward Island into counties and townships under the British Crown in 1767. In central Queen's County, land was set aside (in red) to form the capital city of Charlottetown (Illustrated Historical Atlas of the Province of Prince Edward Island, 1995).

as most were simply interested in the land for speculative purposes. As a result, after the initial ten years, only one-quarter of the lots had been sold (Baldwin 2009, 39).

In time, wealthy Islanders were able to buy large tracts of land which they began renting to local settlers, and absentee landowners hired local agents to manage their properties and to collect rent from tenants. However, since it took a long time and much backbreaking labour to build new farms, it was exceedingly difficult for tenants to pay their rent. Many fell behind on payments, leading to eviction without compensation, and relationships between landlords and tenants grew tense (Baldwin 2009, 86). Island residents tried to force the proprietors to either live up to their obligations or to surrender their land to those who were doing to the work of settling it. The absentee landlords were gradually eliminated through the purchasing of their land, and by 1880, most of Prince Edward Island was in the hands of its actual occupiers (Bumsted 2019).

An agrarian society, the early Europeans cleared the forests of trees by cutting and burning, or through a process of girding the trees of the bark and letting them slowly die. The process of clearing the land for crops and livestock took many years, and the first crops were planted amidst the tree stumps with ashes used as fertilizer. The trees were used as

Map of township 64 in 1808 showing land allotments oriented with their short edges along the Northumberland Straight to the south, and along the rivers of the five-pronged Murray River watershed (Illustrated Historical Atlas of the Province of Prince Edward Island, 1995).



Enlarged portions of land allotments from 1808 showing owner's name and location of homestead. The lots in this area were divided such that they are almost exclusively oriented with their long edge from north to south for water access (Illustrated Historical Atlas of the Province of Prince Edward Island, 1995).

firewood and to build and furnish their first rudimentary cabins (Baldwin 2009, 60). The first houses were one or two rooms made of logs with plaster, mud and moss to fill the gaps, and were built only to get through the first winter. Materials from the first cabin were later used for the more permanent residence (Canada Access Program, PEI).

Since early life was based on subsistence, people at the time supplemented their diets with fish, and early vessel registration records show that many average people owned small boats. Small watercraft allowed the early settlers to move about and trade with other communities as there were no roads until 1806, and the waterways served as the

primary mode of travel. As a result, the Murray Harbour community developed closer ties with those communities it could reach by water, and Murray Harbour North became a very important neighbour for sharing doctors and clergy, for intermarriage and the exchange of labour (Canada Access Program, PEI).

The early roads that the men laid were narrow and made of dirt, weaving across the Island around swamps, and streams and tangled roots. They were difficult to navigate in the winter when snowdrifts collected and made them nearly impassable. In the spring and fall with the rains and ground thaws, they became rutted and swampy (Baldwin 2009, 57). Small iceboats were used in the winter to cross the Northumberland Strait. Weather-depending, sails, oars, or paddles were used for the crossing, but when the ice was too thick, the men attached themselves to the iceboats with leather harnesses and pulled the boats over the ice on metal runners. In good conditions, the process of crossing took about three and a half hours (Baldwin 2009, 59).

Living Off the Land and Sea

The early years of settlement were known as the age of wood, wind and water, and almost every harbour became home for a shipbuilding venture (Baldwin 2009, 109). Timber became a hot commodity and was usually cut in the winter when it could be hauled out of the woods by teams of horses or oxen. In the spring, shipbuilding began, and Island shipyards came alive, bringing prosperity to the nearby villages. Completed vessels were often filled with local squared timber and set sail for Great Britain where both the timber and the ship were sold. Some Islanders kept theirs for use in transporting potatoes, oats, wheat, lumber, fish and livestock to the Maritime provinces and to the United States and West Indies (Baldwin 2009, 110).

The Island's south-eastern most land allotment, lot 64, was founded by an English Quaker by the name of John Cambridge. In 1784 he moved to what was then still known as St. John's Island to become a land agent for Robert Clark in lot 64 when it was still pure wilderness. He developed the first ship-building industry there, capitalizing on the area's optimal environment of mixed species of wood and a watershed of varying depths. Unlike most other land agents, Cambridge actively sought new settlers and would allow them the option of buying or leasing the land. He expected new settlers to clear the trees to supply

Murray Harbour provided a safe mooring ground for tall ships (Photographer unknown. Edited by Earle's Picture Restoration).

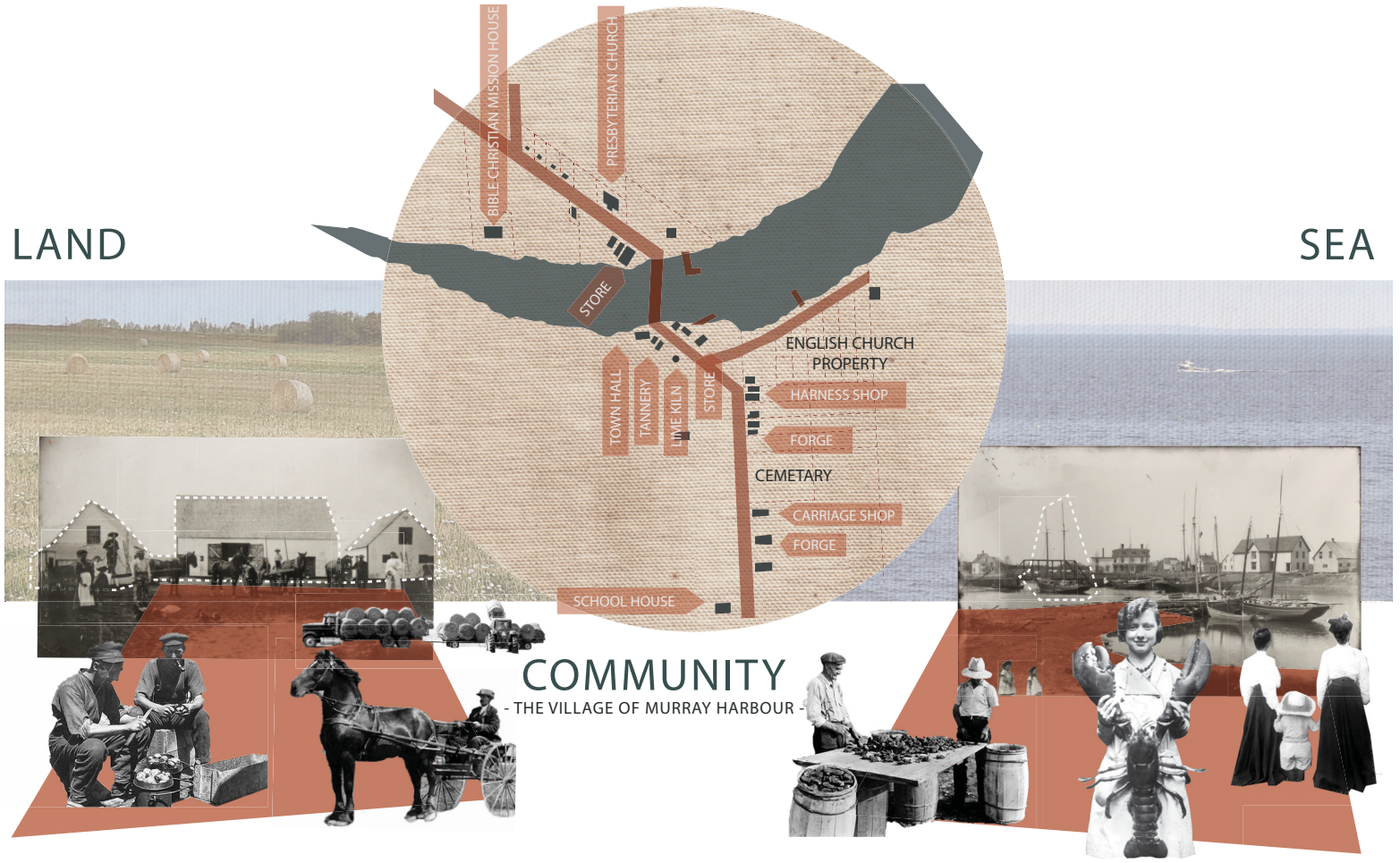
Moving wood on a sleigh in winter using horse power (Photographer unknown. Edited by Earle's Picture Restoration).

his industry, and in return he provided them with seed and enough to get by for the first year. Cambridge dominated the economy in lot 64, until his death in 1831, with a saw and grist mill, ship-building yard and the village's first store (Canada Access Program, PEI).

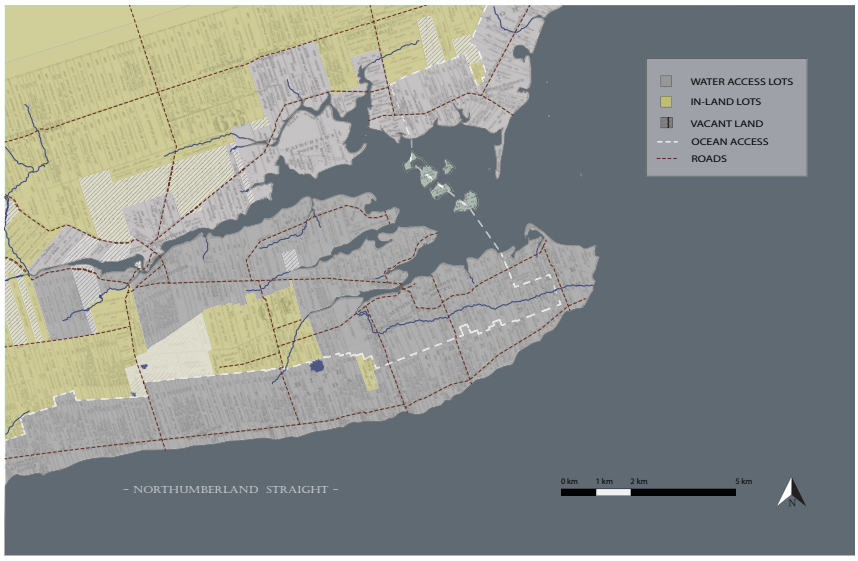
By the mid-nineteenth century, the Island economy was based on the small family farm and crops were exported as far as Great Britain and Bermuda, as well as locally to Nova Scotia and New Brunswick. Credit for the growth of the agricultural industry is due to the agricultural societies that were formed between 1825 and 1850 which educated farmers on modernizing methods. Agricultural fairs promoted better farming techniques and gave scientific talks while connecting farmers to imported grains and new farm machinery. Farmers began crop rotations to prevent nutrient depletion, and often used fish wastes, lobster shells, mussel mud as well as barnyard manure to help fertilize the soil (Baldwin 2009, 61). By the end of the nineteenth century, the agriculture economy had grown to include raising horses, sheep, cattle and hogs, while growing crops of wheat, oats, barley, rye, beans, peas and potatoes (116).

At this time, the fishing industry on PEI was still undeveloped as most Islanders could not afford the investment of the necessary wharves and vessels (Baldwin 2009, 112). The first fish processing plant was established in the 1840s by Daniel Davies in Beach Point and was the first successful attempt at developing the fishing industry on PEI. Herring, cod, and mackerel were dried or pickled before being sent off for sale. The first fish factories were constructed in the late 1850s to process hake, cod, and mackerel. However, it was

View of Murray Harbour ca. 1906-1910 looking west across the river from the south with several schooners in the foreground.
(Photo taken by Elliot J. Lumsden and accessed from the Public Archives and Records Office, [Acc2689/121]).



Conceptual drawing showing the village of Murray Harbour as it existed in 1808. Living off the land here, and in many other rural PEI communities, existed through subsidence from the land and sea (Map adapted from J.H. Meacham and Co. 1995); (Farm photograph on left from the Public Archives and Records Office, [Acc2689/220]); (Harbour with tall ships photograph on right from the Public Archives and Records Office, [Acc2689/121]); (Remaining photos edited by and accessed from Earle's Picture Restoration).



Map of township 64 in 1808 showing land allotments with access to water in grey, and land-locked allotments in green. Vacant lots tend to correspond to marshier, low-lying regions where the land was less accessible to farming. (Base map from J.H. Meacham and Co. 1995).

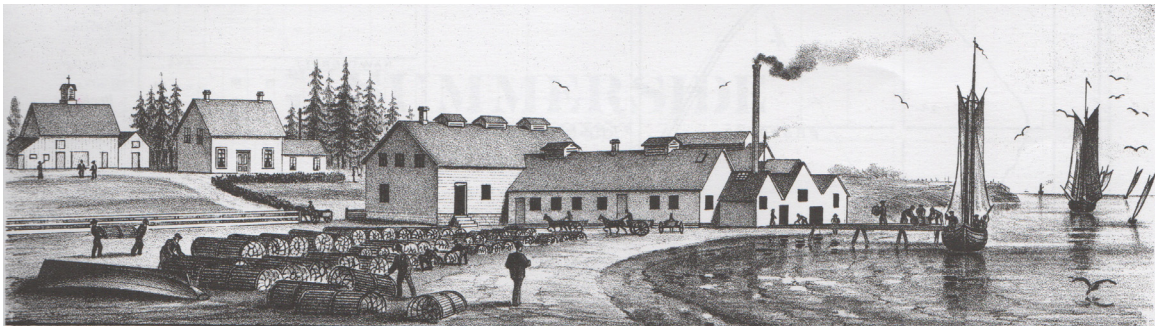
the advent of canning technology in the 1870s which created a market for lobster, causing the fishing industry to take off. Lobster fishing became the main industry in Murray Harbour, and it was the most prominent lobster area hosting the highest number of fisheries on the Island. Lobsters were landed at the cannery wharf and immediately weighed and cooked in large cast-iron kettles before they were washed, cooled and placed on the assembly line. There, 'crackers' broke the claws and tail, 'shakers' extracted the meat, 'pickers' squeezed the meat out of the legs, and 'packers' placed the meat in the cans with brine (Baldwin 2009, 114).

Most of this product was shipped in bulk to the United Kingdom and to France, while smaller quantities went to Germany, Belgium, Austria and Russia (115). With it came a waged economy dependent on industrial technology, marking the beginning of industrialized society in rural PEI. Following this discovery was a 30 year boom that climaxed in 1900 (Canada Access Program, PEI). By the mid-1880s it was evident that lobster stocks were declining, and to protect the industry, the federal government established two designated seasons for lobster fishing in 1889. It was also made illegal to keep female lobsters with eggs, and shortly after, it was required that fishers obtain licenses, keep only lobsters of a certain size, and to pay a fee per trap. Regulations were poorly enforced in the beginning, and lobster populations continued their decline (Baldwin 2009, 115).

Early farm life on Prince Edward Island as a collective activity
(Photographer unknown. Edited by Earle's Picture Restoration).

Social gathering took on a productive aim in activities such as barn raising parties, stumping frolics, spinning parties, and quilting bees. As there was no ready supply of labourers or the finances to procure one, neighbours tended to gather together to help new families raise their homes before winter. Food and drinks were brought by all and they often celebrated into the night with singing and dancing (Baldwin 2009, 62). Rural families travelled to the nearest village in a weekly occurrence to sell their produce at the market and to buy whatever was needed. Country stores became the natural gathering place outside of the home (68). Agricultural fairs were the highlight of the year in most villages, and farmers displayed their prize animals while women competed for prizes for best knitting, preserves and baking.

Although the range of entertainment on the Island was limited, each community provided its own form by the turn of the nineteenth century. These included strawberry socials socials, agricultural festivals, and tea and ice cream parties. These social events also doubled

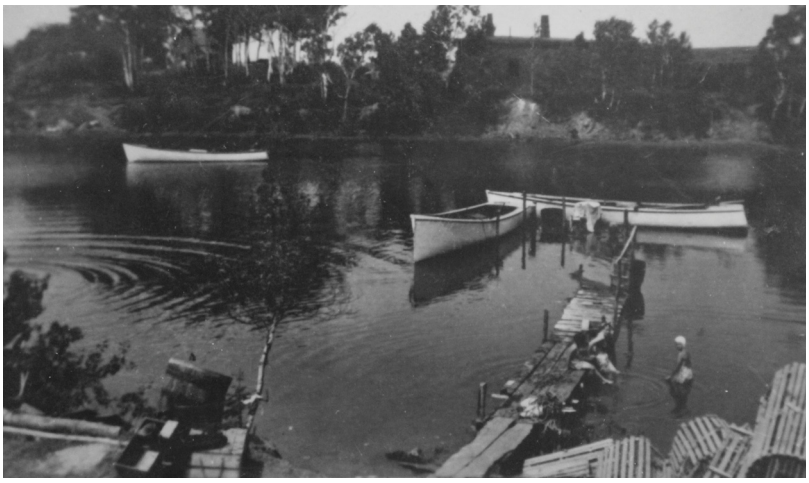


Lobster Factories such as this one in the nearby community of White Sands dotted the coastline as the fishing industry took off, with Murray Harbour becoming home to the highest number of factories and canneries on the Island (J.H. Meacham and Co. 1995).

Interior of a lobster factory in Murray Harbour ca. 1910. The lobster industry was one of the first jobs in this area to allow female workers (Photo taken by Elliot J. Lumsden and accessed from the Public Archives and Records Office, [Acc2689/120]).

as business where serious matters were hashed out, as well as political speeches and charity fundraising (Baldwin 2009, 127). Skating, picnics, horseback riding, hunting and fishing were also pass-times that Island residents enjoyed. At home, books and poetry were read aloud and cribbage, whist, backgammon and chess were popular games (67). In 1914 the Women's Institute formed in Murray River to allow women to meet and discuss issues, raise money, and contribute to the community (Canada Access Program, PEI).

The late nineteenth century saw an economic downturn despite the mid-century boom of small-scale manufacturing. No longer could small Island business compete with the cheaper goods that were manufactured in central Canadian factories. As such, the manufacturing sector declined steadily while over-harvesting weakened both the timber and the fishing industries. The once prosperous shipbuilding industries disappeared completely, and by the end of the nineteenth century the golden age on the Island came to an end (Baldwin 2009, 109). The most visible indicator of hard times was the steadily declining population. Without options for employment, nearly thirty thousand Islanders left for New England and the Prairies in the years between 1870 and 1900. This outmigration relieved the Island of its excess labour; however, it left an older and less entrepreneurial



Postcard image showing a small dock with lobster boats and traps and people swimming ca. 1920-1950 in Murray Harbour, PEI. (Author unknown. Accessed from the Public Archives and Records Office, [Acc4483/6]).

population in its wake (Baldwin 2009, 122).

By the turn of the twentieth century, lot 64 had grown tremendously and the 1901 census records show that there were 1,916 residents living in 366 households. About 67% were farmers and 15% fisherman, while the remaining were made up of merchants, shoemakers, school teachers, tinsmiths, mariners, harness maker, carpenters, masons, butchers, and doctors. As a whole, the Island contained more than five hundred mills for carding, wool, grist, saw, fulling, dressing, and shingles. Small factories produced products such as leather, butter, wheels, furniture, shoes, tobacco, beer, cheese, fish oil, bricks, sleighs, pianos, mowing machines and iron plows (Baldwin 2009, 120). Together there was enough expertise for a thriving self-reliant community.

With the railway extension to Murray Harbour the village became easily connected to the Island's capital of Charlottetown. This allowed local businessed and their goods and services a wider range of sales. The railway also meant that more people could leave to find better employment, and this period saw a population decrease as a result of limited financial opportunity. Many people and families left permanently for Boston and the New England States, while others chose to come and go for work.

The automobile brought the greatest changes to life on the Island, and by the 1920s, it had become a necessity for Islanders (Baldwin 2009, 125). Revolutionizing society, the automobile took over as the main mode of transportation, marking the end of the newly

View across the river in Murray Harbour, PEI ca. 1920 showing the bridge on the left, the home of Samuel Prowse next to it, the former Presbyterian church and Prowse's store to the right (Photo accessed from the Public Archives and Records Office, [Acc2689/122]).

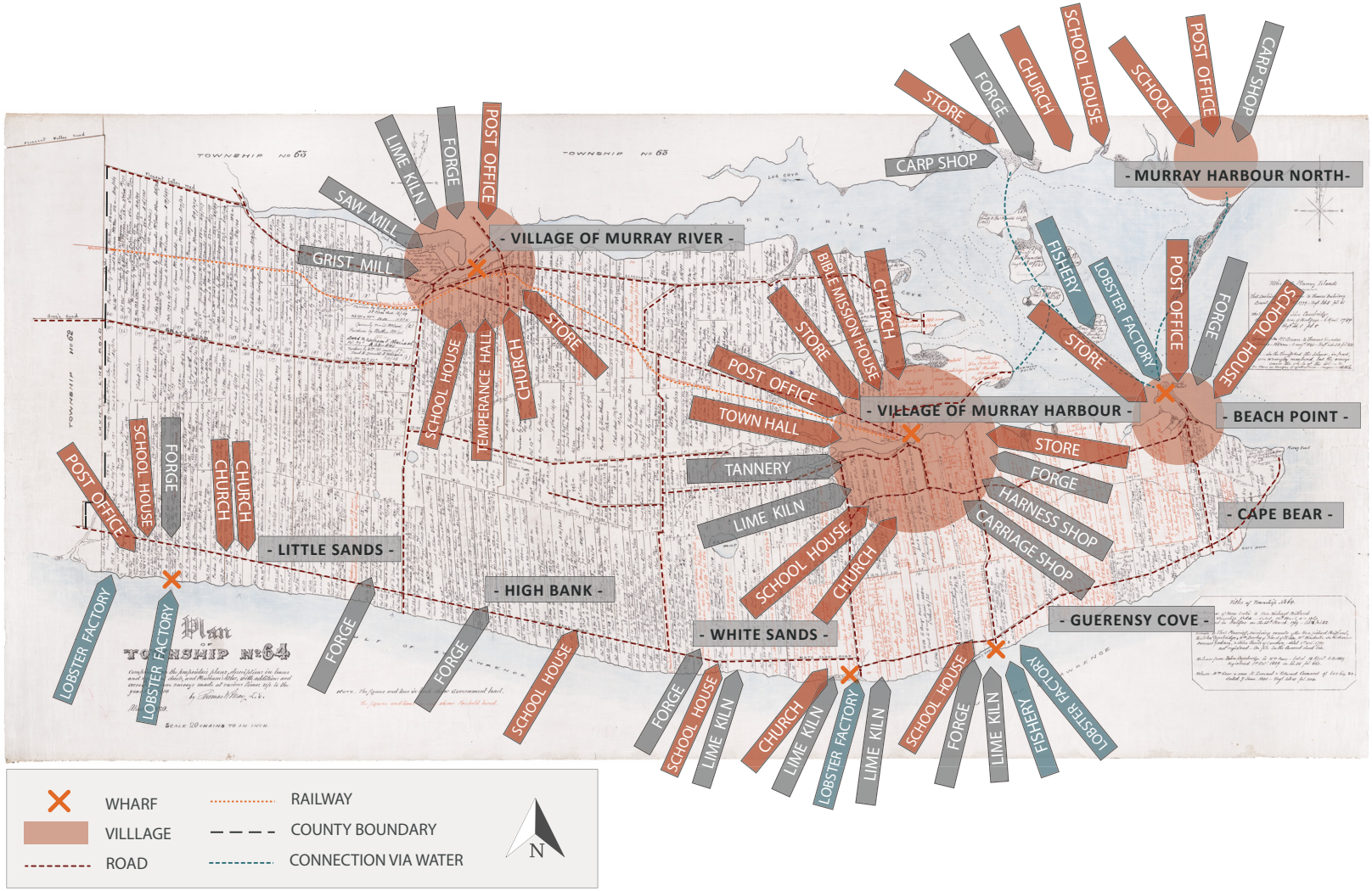
Starch factory near Murray Harbour, PEI ca. 1930 (Photo accessed from the Public Archives and Records Office, [Acc4223/2]).

Cheese factory near Murray Harbour, PEI (Photo accessed from the Public Archives and Records Office, [Acc4223/4]).

extended railroad by the 1960s. Farmers could now travel to town to shop and to sell their goods. Visiting family and friends became a frequent activity, heightening social life. The automobile also affected community layouts, and roadside motels and restaurants became a common sight (165). Transportation to and from the Island became more affordable and reliable between the world wars, as the number of paved roads increased (177). The ability to travel freely also impacted Island society in adding millions of dollars to the local economy and helping to develop what is now the second largest industry on the Island, tourism (193).

Boats too became powered by gasoline engines in the 1920s and allowed fishers a faster and more maneuverable mode of transportation to reach their fishing grounds, which until this time, remained close to the shore. They could now sail much greater distances from shore in less time, introducing new fishing grounds with more abundant catches. As a result of this increased ocean mobility, many small cannery industries underwent amalgamations. The number of canneries declined from 150 in 1900 to 103 by 1928, which reduced the costs of canning but greatly added to the rate of unemployment (Baldwin 2009, 167). Around the same time, the fishing industry was experiencing deep decline with poor markets, low prices, decreasing fish supplies and increasing fisher competition. In addition, a mysterious disease left the oyster industry in despair, and it was many decades before the oyster population recovered (167). Allowing time for fish stocks to replenish, the federal government cut the amount of fish that could be harvested in 1992 and began offering income supplements to fishers. As a result, the scientific culturing of

Lobster Fishing in Murray Harbour (Postcard image, accessed from the Public Archives and Records Office, [Acc4483/6]).



Historic map of Township 64 showing village and community settlements arising in relation to resource availabilities within the Murray River watershed and Northumberland Straight (Base map accessed from the Public Archives and Records Office, Lot 64, 1920 [Map 4, 174]).

Murray Harbour Railway Station ca. 1910 (Photo taken by Elliot J. Lumsden, accessed from the Public Archives and Records Office, [Acc2689/128]).

Early automobile on dirst roads of PEI (Author unknown, photo accessed from Earle's Picture Restoration).

mussels, oysters, salmon, trout and soft-shell clams has become a prominent industry on the Island (Baldwin 2009, 192).

In the years between 1900 and 1960, industrialization increased, and agriculture became more mechanized. Agricultural societies were gradually replaced by government departments with increased regulations, and farming became the way of life for fewer and fewer (Canada Access Program, PEI). Agriculture continued to amalgamate until it reached its current state wherein two main companies, McCain Foods and Cavendish Farms, dominate the industry and almost explicitly deal in potatoes. Approximately half of the Island's potato crop is processed into potato chips and frozen French fries for the North American market (Baldwin 2009, 191). The potato monoculture has had adverse affects on the Island landscape through poor crop rotation, the destruction of trees and elimination of hedgerows that prevent soil erosion (Baldwin 2009, 188). The spraying of pesticides is also destroying the natural environment and is widely believed to be a main actor in the Island's high cancer rate.

Prior to an economic boom of the 1960s, the village of Murray Harbour was self-reliant and mostly without need to look outside of the community for its needs. Following the 1960s was economic decline and with it, the vibrancy of the community as most of the businesses closed shop. One now had to seek outside to the nearest town of Montague for most of their needs. At this time, school consolidation was beginning to replace the schoolhouse system with centralized institutes, radically changing the nature of rural PEI. Lot 64 and surrounding area was the first of the Island to see a regional school built in Montague in 1964. The consolidated elementary school for Southern Kings combined communities of White Sands, Little Sands, Murray Harbour, Murray River, Murray Harbour North, as well as Sturgeon and some other smaller communities (Canada Access Program, PEI).

By the 1970s, Islanders began questioning the future of the province. High rates of unemployment and an average income level well below the national average was cause for concern. Many demanded the province continue to adopt the latest technological and economic advances to combat these issues, while others argued for a return to past values, worrying that the latest technology was endangering the environment and the Island way of life. Overall, there was a wish to return to the golden age when self-reliance, community and conservation were valued (Baldwin 2009, 187).

Murray Harbour wharf with boats loaded with traps for the first day of lobster fishing in May, 2019 (Photo taken by Delite Richards).

Potato warehouse in the rural community of Guerensy Cove a short distance outside of Murray Harbour, PEI.

CHAPTER 3: RETURNING TO THE LAND

> A fresh spirit moves globally, seeking new, low-impact ways for communities to live with each other and with nature. The youth feel it instinctively (Weyler 2013, 190).

Urban societies depend on the physical and organizational structures which infrastructures allow; however, these infrastructures create complex interactions with the ecosystems within which they exist (Li et al. 2017, 12). Current infrastructures are inadequate for global problems such as climate change due to their rigidity and single-serve function, thus requiring a large degree of upkeep (14). Moving forward, we must consider socio-ecologic integration in all of our physical structures and strive towards adaptability and resilience (13). Architecture can facilitate an integration between society and ecology by acting as an interface, allowing opportunities to re-develop relationships by uniting humans and ecology both physically and symbolically.

The human-nature relationship is an ever-evolving social question that we continue to grapple with into the 21st century while encountering unprecedented social, environmental and technological change. The Industrial era and its radical exploitation of natural resources was perhaps first felt in the 1960s with the rise of the ecological movement. Deeply motivated out of concerns over environmental destruction and a dominant consumer society, groups such as the Back-to-the-land movement, the New Alchemy Institute in Massachusetts, and the Ark project for Habitat ’76 in Prince Edward Island responded with social action. The moral philosophies and subsequent projects that resulted from these groups can be read as an infrastructural response to a growing ecological consciousness that seeks unity between humanity and nature.

The Back-to-the-Land Movement

Followers of the Back-to-the-land movement in the 1970s felt there was more to life than what they found within urban and suburban environments. Migrating to rural areas, they sought a life closer to nature, to their work and to their families, and where they could produce their own food. What set them apart from other rural dwellers was their belief that the simple life was morally superior to that of consumption (Cavers 2016, 190). However, “They were not so much escaping as experimenting, seeing whether living small, simply,

and self-sufficiently would be as fulfilling in practice as it sounded in theory (MacEachern and O'Connor 2009, 18)."

Opinions differed on how to pursue such a lifestyle, but the distinguishing goal was to become self-sufficient while creating a new form of community (Cavers 2016, 191). Interests converged around ideas by writers such as E.F. Schumacher with *Small is Beautiful*, Steward Brand and the *Whole Earth Catalog*, and Helen and Scott Nearing's *The Good Life* (MacEachern 2009, 3). In contrast to the upper to middle class lifestyle from which they tended to come, the Back-to-the-landers were opposed to the throwaway conveniences that this life promoted, and instead chose to redefine the simple life, and how it could be achieved for themselves (15).

Prince Edward Island, Canada offered the Back-to-the-landers cheap farmland and arable soil. The isolated island society at the time was still closer to that of 19th century and trying hard to catch up. While many Islanders were abandoning a long tradition of farming for alternative economic activities, the Back-to-the-landers were moving in to take over left-behind farms and homesteads. The 1970s, due in part to this movement, saw a reverse in the trending rural exodus and shrinking population (4). Two communities arose in the areas of Breadalbane in Queen's County and the Iris, Hopefield and Cardigan area in King's County, both within proximity to either of the Island's two cities of Summerside or Charlottetown (5).

Although misunderstood by locals, Islanders tended to welcome these young people who were fixing up neighboring farms and reviving rural communities. As they adapted to the Island way of life, they were introducing new ideas to Island culture and creating an interesting new fusion of communities (MacEachern and O'Connor 2009, 10). "The back-to-the-landers, in establishing themselves on PEI, simultaneously validated the celebrated Island way of life and brought new ideas as to what that way of life could be" (2). It was a moment of two cultures colliding, each thinking itself travelling in opposite directions but, in meeting, realizing they were not all that different from one another (22).

Prince Edward Island, however, did not offer an escape from reality but rather a more difficult one. They quickly realized that the simple life came with huge effort and hard work. Lacking the necessary skills for rural living, they soon realized that there was a ne-

cessary knowledge involved in living off the land, and they came to rely on the skills and experience of locals to guide their homesteading experiment (8). They began adopting technologies that would help make their lives simpler and that were within their limited budgets (15). Some began developing their own while others were attracted to the idea of learning traditional technologies.

Valuing co-operative work, the Back-to-the-landers realized its necessity for their non-conventional lifestyles, and they developed a close sense of community (14). Living close to one another helped lighten costs and provided much needed support (MacEachern and O'Connor 2016, 272). They united over building projects, child care, sharing items like cars and tools (MacEachern and O'Connor 2009, 14). Social gatherings became integral to their way of life and often took a work-related role in activities such as building bees, tapping maple trees or sculpting. The role of community was also significant in that it provided the children with a wide range of role models from which to gain perspective (MacEachern and O'Connor 2016, 273).

For various reasons, the Back-to-the-landers often returned to conventional society. In many cases this was motivated by the children. Parents faced the demands of the school system which drew them into the mainstream, often forcing them to interface with the business economy to make a living (261). Children often led to the adoption of electricity and other modern conveniences, and eventual abandonment of the lifestyle. Parents came to realize the difficulty of explaining their conscious choice of lifestyle to their children who spent their days immersed in conventional society. "This may speak ultimately to how fragile that existence really was – how difficult it is in our society to seek the simple life, and how simple it is to be pulled back into that larger society (MacEachern and O'Connor 2009, 17)."

The New Alchemy Institute

In 1969 John Todd and William McLarney formed the New Alchemy Institute. Having gone back-to-the-land for a period in California, they wanted to provide scientific assistance for others like themselves. Fearing that modern agriculture could collapse due to chemical use and biological damage, they sought, "to develop an alternative, and radically different, mode of food production" – one that tackled the problem at its roots (Wade 1978, 727).

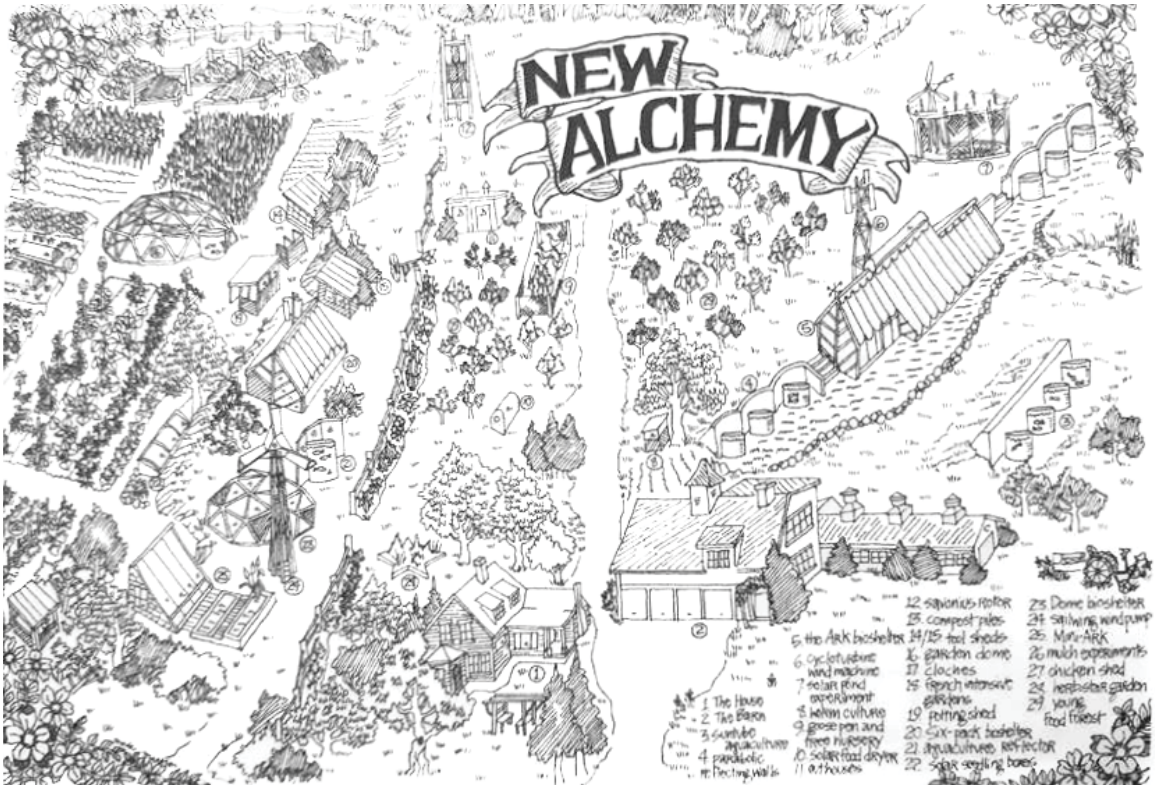
Believing science had bred a false sense of confidence in our ability to problem-solve, they emphasized self-reliance over a dependence on conventional solutions (729). The New Alchemists were interested in whole systems and designing sustainable structures that integrate man, machine, and nature into one (Trim 2016, 156). However, their first task was to analyze existing and relevant knowledge by experimental application, and to make their results public for those interested to put into practice (39).

They began by re-integrating existing knowledge by re-discovering the forgotten wisdom of farming prior to industrial practices (Wade 1978, 728). They defined a form of agriculture dependent only on renewable power sources of sun and wind, involving biological cycles with no chemical use that relied on a diverse variety of crops. To inspire people to grow their own food, their method needed very little investment. Contradictory to principles of consumption, the New Alchemists believed that "people must participate in the processes that sustain them (Mannell 2018, 39)." They sought to reduce the scale of food production systems to become truly participatory by utilizing living and organic processes (39).

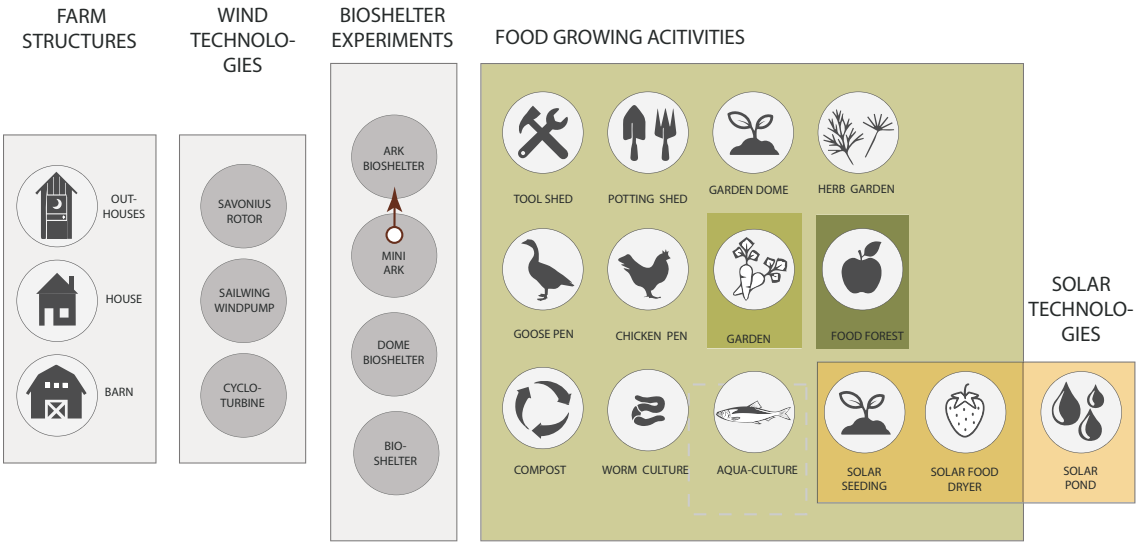
Inspired by the technological views of Buckminster Fuller and E.F. Schumacher, the New Alchemy Institute saw technology as a mediator between human and natural interactions, giving form to all social structures. To them, "technological change played a central role in any social or environmental transformation, since the adoption of new technologies could alter social structures and human relationships with the environment (Trim 2016, 157)." They became leaders in the Appropriate Technology Movement through their scientific analysis and practical application of alternative technologies (Greene 1978, 25). Hoping to influence conventional technology towards a more democratic form, they saw value in small-scale and easily intelligible systems that could be manipulated by anyone (157).

The New Alchemists took over an existing 12-acre farm in Cape Cod, Massachusetts that included windmills, agriculture and aquaculture systems (25). This became their testing grounds for alternative technologies that mediated interactions between humanity and nature. Some of these experiments included bioshelters, solar and wind technologies, aqua-culture systems and a variety of structures and forms for growing and preserving food. In their building designs and technological integration, they addressed the modern

problem of seeing a building as a single function entity. Instead, the New Alchemists saw their buildings as living ecologies (28).



The New Alchemy Farm in Cape Cod, Massachusetts served as an experimental farm and research centre. Drawing made by Maia Massion (Mannell 2018).



Analytical diagram of New Alchemy Farm.

IMR and Conserver Society Canada

October of 1973 was the beginning of the OPEC oil embargo, and Western society becomes acutely aware of its dependence on oil and experiences feelings of insecurity (Mannell 2018, 32-33). Prince Edward Island was dependent on outside sources of oil, gas and electricity, and faced the highest energy costs of all provinces (MacEachern 2003, 9). Within a year, Islanders were paying 50% more for electricity and 100% more on heating oil (MacEachern and O'Connor 2009, 5). The Canadian government responds to this crisis with a national strategy of Canada as a 'Conserver Society' that promoted an optimistic view of the future as one that could be collectively achieved through renewable energy use and localized production (34). The provincial government of PEI recognizes its opportunity to turn the Conserver Society theory into practice by developing itself as a place of environmental possibility (MacEachern 2003, 15).

An emerging vision of the Island as a demonstration site for alternative development was its opportunity to, "address a longstanding existential challenge, a striking contrast to other provinces that perceived these as threats to their growth-based, consumer-driven prosperity and comfort (Mannell 2018, 44)." Premier Alex Campbell, concerned about the effect of centralization on the future of PEI, saw industrialization and globalization as damaging to the increasingly marginalized Island economy. "Instead, the government of Alex B. Campbell proposed to make the Island a veritable laboratory for renewably energy. A complete paradigm shift was promised, a societal turn to self-sufficiency and sustainability (MacEachern 2003, 9).

The Campbell government announced in January of 1975 the creation of a privately run resource organization called the Institute of Man and Resources (MacEachern 2003, 20). IMR was concerned with advancing systems for alternative energies and increasing resource self-sufficiency and methods of production (9). Their main objective became the testing and application of alternative systems, with an emphasis on practical adaptations of existing methods, to determine their suitability for Prince Edward Island. Although initially interested in food and crop productions as well as living shelters, the focus of IMR became almost entirely focused on energy systems as it seemed to be the most pressing problem (26).

As a result, PEI becomes nationally and internationally recognized for its forward-thinking progressivism (MacEachern 2003, 30). Prince Edward Island served as an appropriate testing grounds due to its physical constraints as an island and because it had an abundance of diverse resources available to it (31). It received the attention of international energy circles and was even suggested to be a world leader in conservation and renewable energy policy by the alternative energy advocate Amory Lovins (9). Not only creating change within the province, these efforts held the potential to inspire a wider change in the consumer culture of the west (Mannell 2018, 15).

The Ark at Spry Point, PEI

The Ark at Spry Point, Prince Edward Island was the Canadian commission for Habitat '76 and was a joint effort between Solsearch Architects and the New Alchemy Institute (Mannell 2018, 5). It was an early leader in bio-shelter design that aimed to shelter, sustain and support its inhabitants (11). With idyllic ambitions, the New Alchemists believed that the Ark's inhabitants "would gain enlightenment and meaning through learning to build a symbiotic relationship with nature (27)." The Ark opened on September 20th, 1976 and attracted thousands of visitors and media attention but would go on to see a controversial and short-lived future before being demolished in 1999 by an American developer (87). The Ark stands in memory as a national attempt to use, "technology to remake Canadian society and protect the environment (Trim 2016, 169)."

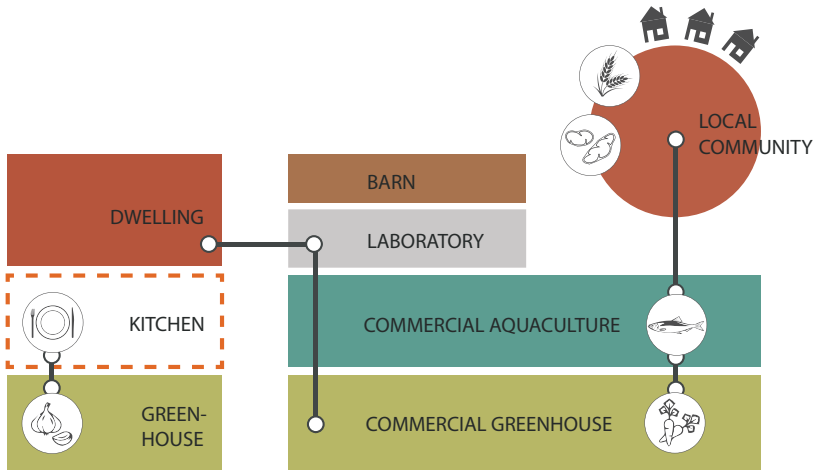
The Ark offered its inhabitants what its creators saw as a more ethical lifestyle that was in close relationship with nature (Mannell 2018, 11). Meant to alter our concept of the human place within a larger existence, the Ark was part of a growing eco-social ethic that attempted to change relationships between people and their environments by creating a new way of being in the world (77). While much of what is called 'green architecture' attempts to lessen its environmental strain through harm reduction, it ignores entirely the problem of the consumer lifestyle. The Ark addressed this issue head on by questioning the very role of buildings in their ability to transform the way that we inhabit the Earth (88).

As a single family dwelling, the Ark contained a private greenhouse with a commercial greenhouse and aquaculture system as an economic add-on that created a connection

Photograph of the Ark in Spry Point, Prince Edward Island with Solsearch Architects David Bergmark and Ole Hammarlund upon its opening in 1976 (Mannell 2018).

to the wider community. As an experimental structure, the Ark housed a laboratory and monitoring stations for advanced research. A living experiment was conducted for 18 months as one of the architects, David Bergmark, along with Nancy Willis and her children lived in the house to conduct the research (27). A direct connection between the kitchen and table to the private greenhouse meant that daily life was lived in connection to producing one's food, symbolizing our dependence on nature for comfort (29).

Architecture successfully integrated physical and biological systems into a single living system within the Ark. Large windows on the south side provided passive solar heating while 36 solar panels actively took advantage of sunlight, while operable windows allowed for natural ventilation (Mannell 2018, 17). Three insulated water tanks situated below the living unit held hot water for daily use and for seasonal storage. A water-to-air heat exchanger provided the living unit with heat, while a small woodstove provided emergency backup (25). Below the barn was a rock vault for further passive heating. Solar ponds as well as the deep planting beds absorbed solar radiation for further heating. These systems combined allowed enough thermal mass to keep the house warm during harsh Island winters (19).

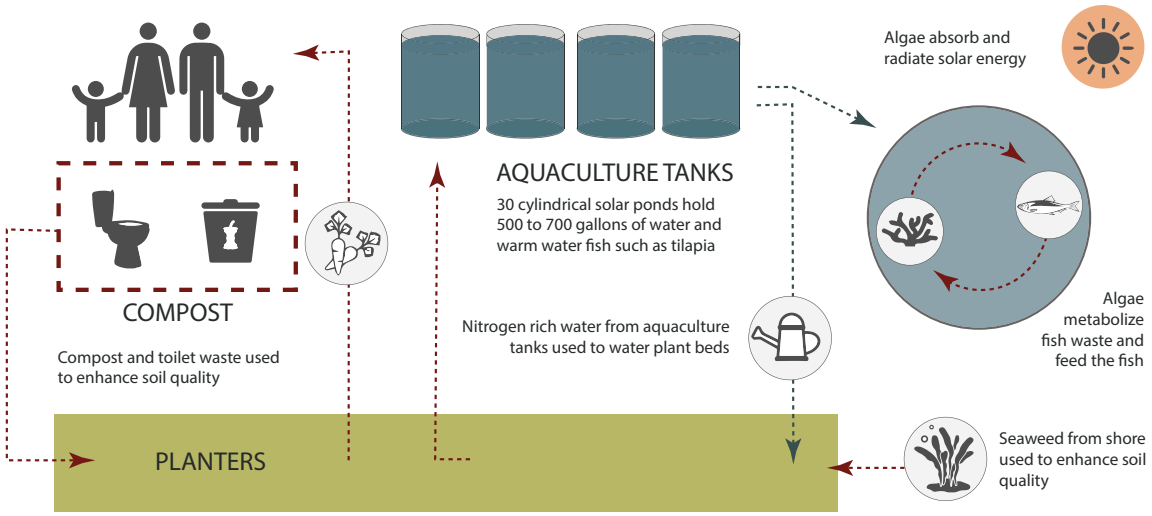


Building layout and programmatic connections within the Ark.

The Ark's aquaculture system consisted of 30 cylindrical solar ponds which doubled as fish tanks. Plant thinnings and weeds were either fed to the fish or composted. Natural pest predators and disease-resistant plants acted in place of fertilizers or pesticides while kitchen compost, toilet waste, and water from the ponds rich in nitrogen, as well as seaweed from the shore were used to enhance soil quality. Algae in the tanks metabolized fish waste and fed fish, while also absorbing and radiating solar energy. The aquaculture tanks took on different roles of support for the eco-system, and "Once established, the system was largely self-tending, beyond feeding and harvesting the fish (Mannell 2018, 25)."

Despite its successful systems integration, the Ark experienced some technical difficulties - disappointing Islanders who, despite the intended experimental nature of the Ark, were promised success. The wind turbines malfunctioned and the Ark's connection to PEI's power grid marked it as a failure in many eyes (Trim 2016, 167). As a federally funded project, the Ark was burdened by high expectations from multiple parties which, in some ways, pre-determined its disappointment (155). Furthermore, a winter construction hiked the building costs due to delays in federal funding (Mannell 2018, 65). The cost was further inflated in the public as many refused to believe the Ark's true cost of approximately 50% more than a conventional home (75).

A shifting political climate aided in the Ark's downturn and the new Conservative government showed its hostility towards the project (Mannell 2018, 83). The media publicized a growing body of political resentment and perceptions of the project begin to shift (79).



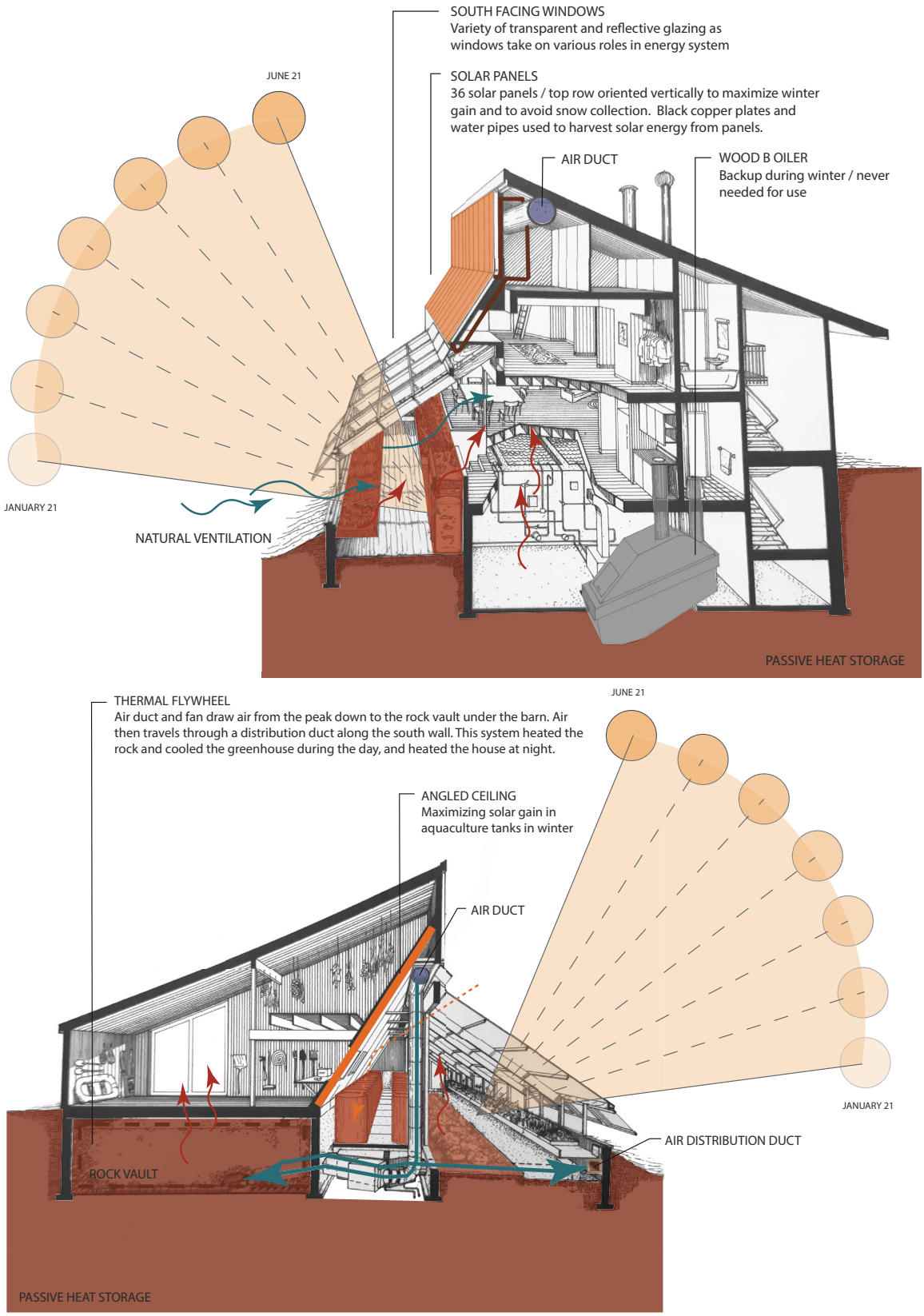
Living organic systems within the Ark.

To the general public, the innovators of the Ark were 'come-from-aways,' and classified as hippies that were spending taxpayer dollars on a project many deemed unnecessary. An inability to balance the hundreds of daily visitors while also managing the research operation resulted in a limitation on tours, leading to further frustrations (73). The local community would no longer feel a part of a project that was meant to serve its community.

Despite its difficulties, the Ark at Spry Point and its innovators brought with them new ideals about place, society and food production that were transplanted within local culture (Mannell 2018. 86). In the final weeks before its opening date, hundreds of people from near and far assembled on site and were helping to complete the project (68). It would become a sort of pilgrimage site in the months and years after its opening (Trim 2016, 163). The Ark left a lasting impression on its local community as well as a much larger international community of environmental stewardship, because it offered a vision of life where advanced technologies integrate with a placed-based tradition to offer self-sufficiency and meaningful work for its inhabitants and the greater community (Mannell 2018, 72).

The Village as Solar Ecology Design Conference

Following the Ark projects, The New Alchemy Institute was encouraged by Anthropologist Margaret Mead, who, "felt very strongly that for these ideas to really catch hold and help inspire a generation of people that the ark concept should begin to envelop the idea



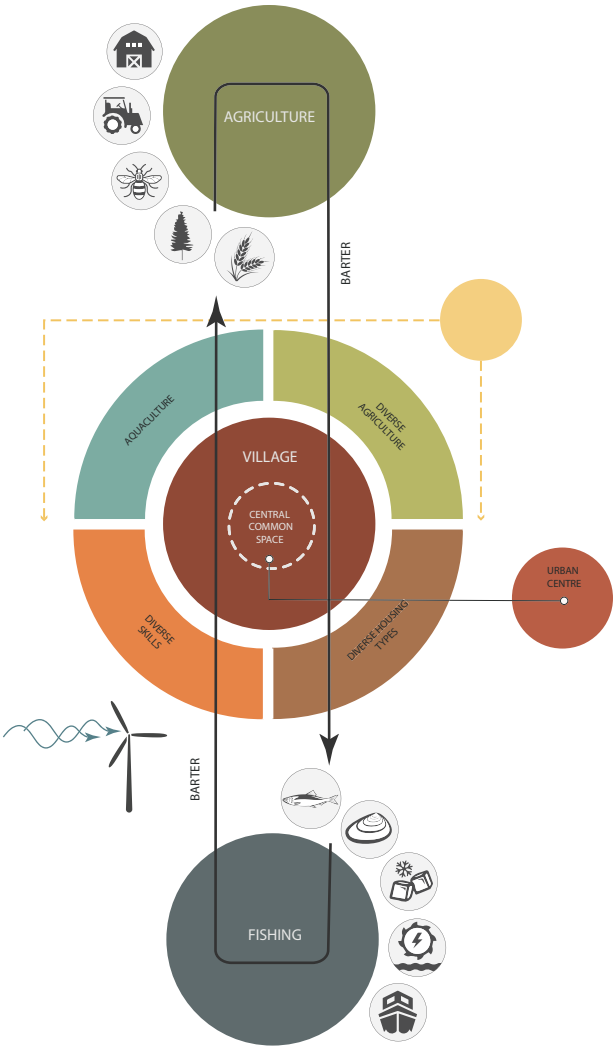
Analytical Diagram showing passive solar techniques and heat storage within the Ark (Mannell 2018).

of a village (Greene 1978, 28).” This village was seen as more complete than the modern village because it would synthesize its ecological, social, economic as well as technologic components. It would use renewable energy sources and treat its own waste by connecting it to aquatic and agricultural food cycles (28).

The Village as Solar Ecology: A Generic Design Conference was held in 1980 to explore these possibilities (Todd 1980, 7). They sought to, “approach the pre-industrial village from the higher cultural level of post-industrial cybernetics and ecology (Thompson 1980, 14).” Their vision of a meta-industrial village shifted away from an industrial mentality that dominated nature towards an ecological mentality seeking symbiosis with nature. Such villages would each adopt a regional approach that would have connections to larger global processes. Needing to restructure itself towards a planetary culture, countries could de-structure themselves in adapting instead to regional identities which would be in-tune with ecological processes within their locale (Thompson 1980, 14).

Solar villages intended to create a new order that would rely on mutual dependence and collective participation. “The sacrifice of the part to the whole will be in the original sense of the offering of the part to the whole – from within. There will need to be an unfolding of significance between the domains and parts that is perpetually regenerative (26).” The unifying relationship among the parts would be self-evident in the village design so that inhabitants sense the “wholeness or wholesomeness of one’s activity (Critchlow 1980, 27).” Expressive in form, the village should not need explanation but rather be identifiable in its dependence on rain, wind, sun, earth and air. The village would be flexible and responsive to change with an ability to grow, shrink or otherwise adapt as necessary. It would not be a closed entity, but instead, a part of a globally-functioning society (Wells 1980, 44).

The solar village would include small-scale food production within the home as well as a cooperative activity. Solar greenhouses and exterior garden plots would be added to individual homes (Ervin 1980, 67). Fish or solar-algae ponds would be placed uphill from the garden plots to act as natural fertilizers. Food requiring special preparation could become a co-operative activity, while food preservation could take on various scales at home or within the co-op that could include freezer lockers. Canning could take a similar approach



Interpretive diagram combining ideas from the Village as Solar Ecology design conference for village and regional application.

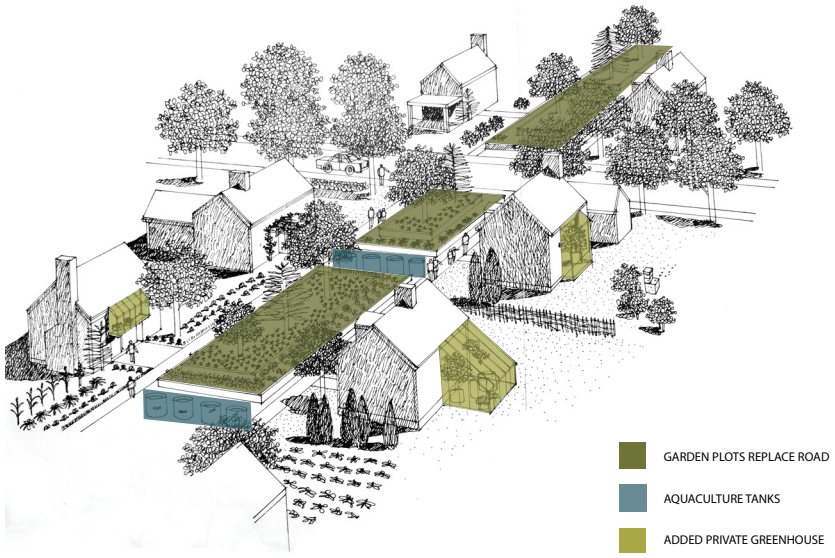
with canning equipment provided within the co-operative as well as root cellars and solar food drying techniques. This presents opportunity for small businesses to grow, preserve or purchase food from local growers for a variety of value-added local products (68).

To physically and symbolically mark the value of collective functioning of the village, it should demark a place within the centre as a sacred common ground (Critchlow 1980, 26). In the sense of an offering, this central location would be a space to give thanks to the abundance of nature and the community that comes together to live in harmony with it. Like the English tradition of the “village green” it would set aside land for the community to be used as a resource in times of economic difficulty, as a refuge and a sanctuary. This

central space, “would represent a way in which we could raise ourselves from the mechanistic model of eating, sleeping, pro-creating and working to a place set aside with time to contemplate the mystery of existence and to be thankful for one’s fortunes – whatever” (27).

The work of the New Alchemy Institute and Solsearch Architects in the 1970s was one of many precursors to our current ambitions of integrating ecology within our built works. Today, ecological infrastructures are holistically integrating water-based, land-based and non-living landscapes through ecological planning, design and technology in urban settings to reduce the negative effects of human systems on the environment (Li et al. 2017, 13-14). In an ecological infrastructure, no component may be independent, but rather must perform its integrated function in combination with the larger infrastructure (17). Such an infrastructure framework would take account for both biotic and abiotic ecosystem interactions that considers all living things (17).

The people of the back-to-the-land movement re-defined their relationship with nature by physically locating themselves in out-of-the-way environments and utilizing tangible technologies that eased their new lifestyle. They didn’t require much in terms of material wealth; instead, shunning it as an interruption from the more vital components of life lived in harmony with the natural flow of the universe. The New Alchemy Institute devoted years to advancing integrated systems for food, production, physical comfort, and



Neighbourhoods retrofitted with greenhouses, garden plots and aquaculture tanks. Base image from the Village as Solar Ecology design conference (Todd 1980).

social innovation. Their efforts did not take hold within conventional culture, but many like-minded individuals continue to re-discover the simple life in their own terms today. Facing many of the same problems as the 1970s only now to more extreme lengths, many more people are waking up to the reality of the destructive nature of our western life-styles. The foundational principles of the projects described here are ever-relevant today as we continue to strive towards a better definition of human engagement with the earth as a global society.

Many outlying communities across Prince Edward Island lost their sense of self-reliance, of community and of care for its land when it merged with the modern world. However, greater physical connectivity has made accessing the Mainland easier for Islanders and accessing the Island easier for tourists. It has allowed the social web of Island life to grow beyond its close-knit communities, and technological achievements such as internet, tele-vision and social media now connect Islanders globally. Enhanced inter-community con-nectivity carries potential for new social form that is built on localized networks of pro-ductivity that create new economic opportunities for Islanders. Like the 1960s and 70s, there is again a growing concern for ecological sustainability, only now it is with greater urgency. Prince Edward Island can again serve as a national example of sustainable living, creating empowerment from its close-knit community identity and its dependence on its bounded resources.

In many ways, PEI continues to feel much of the same stress it did during the 1970s. Youth continue to feel pushed towards making a better life elsewhere in Canada yet feel their ties to the Island calling them home. Rooted in place, the older generation resists the community separation into centralized care facilities, but with much of the younger gen-eration gone, there is no care to be found within their community. A continuing rural exo-dus leaves cheap inland properties empty while the cost of waterfront living is affordable only for the wealthy tourists who summer there. Although tourism is now essential to the Island's economy, it is like the other main industries of agriculture and fishing in that it provides only seasonal work and leaves many without employment during the long winter months. The Prince Edward Island government has turned its attention towards regaining its working age population through initiatives for creating new economic opportunities to draw a younger population. A growing sense of diversity on the Island has illustrated that

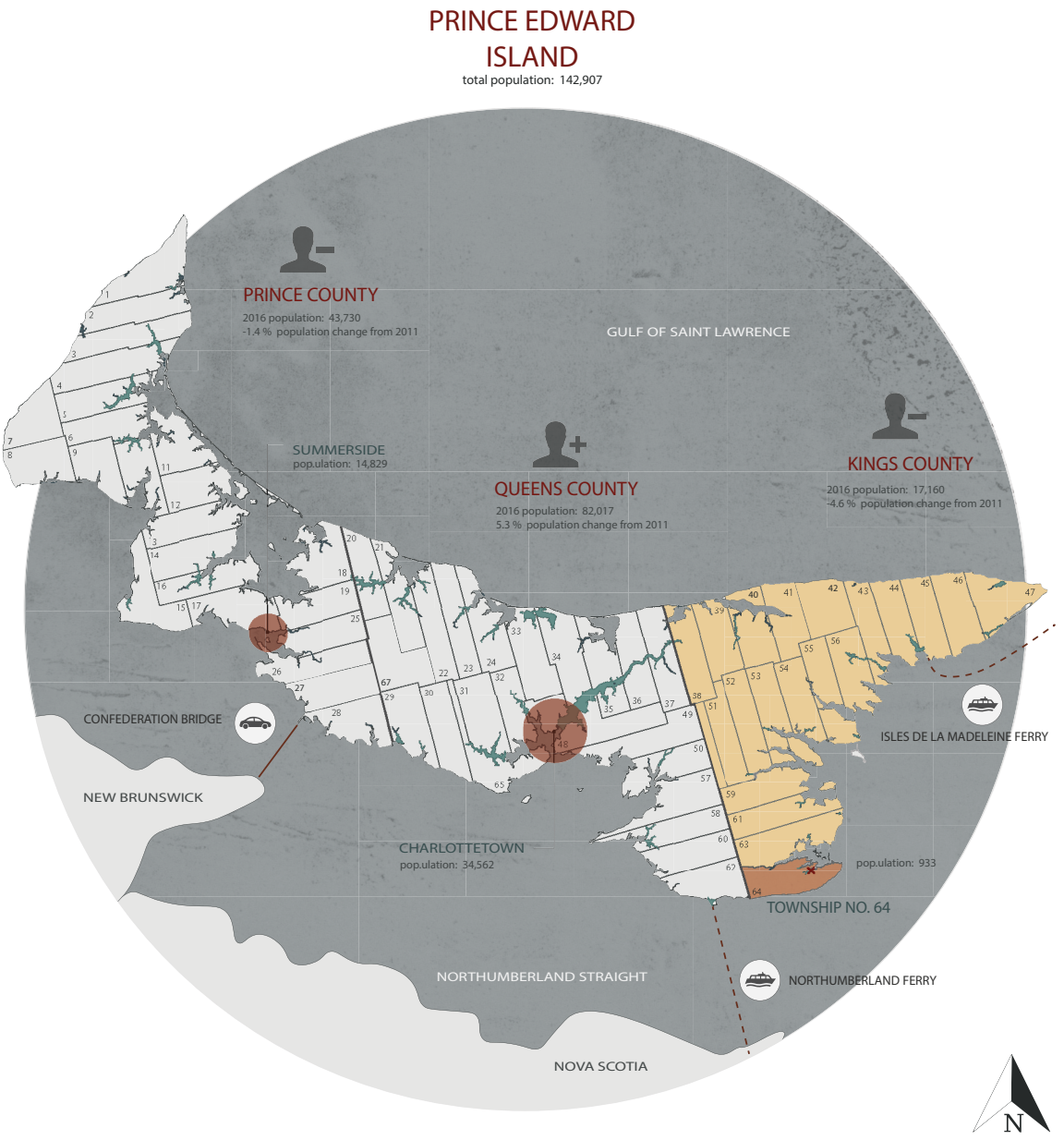
the well engrained ‘come from away’ attitude of life-long Islanders may be washing away with the tide, as Islanders begin to realize that there is no future for Prince Edward Island without people.

A Population Dilemma

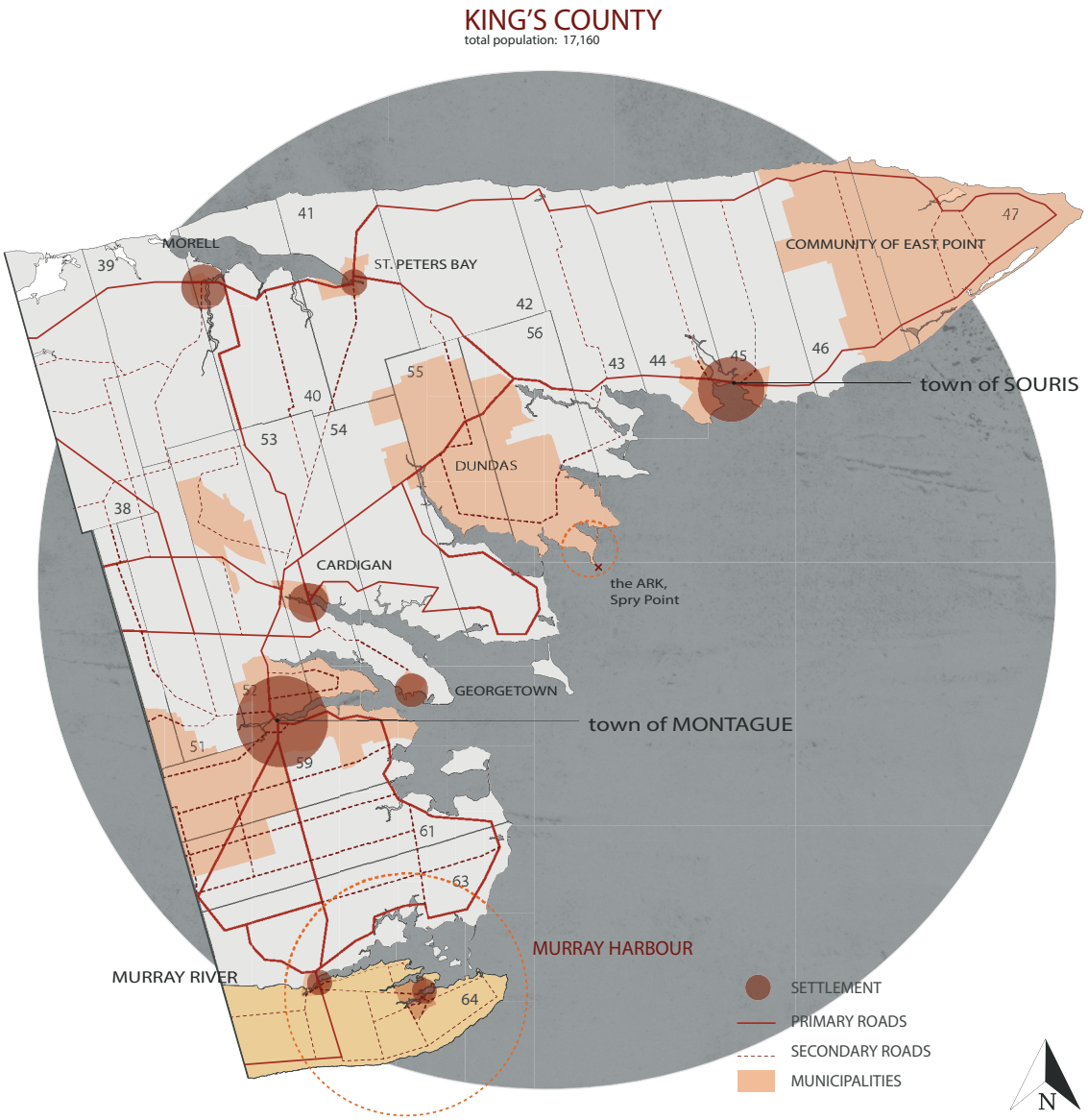
Prince Edward Island is divided from north to south into the three counties of Kings, Queens, and Prince County. Home to the capital city of Charlottetown, Queens County’s population continues to grow while the western and eastern most counties of Prince and Kings continue to decline. According to the 2016 Census, the population of Queens County grew by 5.3 percent reaching a total population of 82,017. In relation, the population of Prince County declined by -1.4 percent to 43,730, and Kings County by -4.6 percent to 17,160 people. Within Kings County, the rural inland farm-based community of Dundas experienced the largest population decline in 2016 with a total loss of -23.1 percent of its population, followed by the community of St. Georges experiencing a -20.6 percent decline. Murray Harbour had the largest decline of established villages in King’s County with -19.4 percent change from 320 people in 2011 to 258 in 2016. Cardigan was close behind with a -19.0 percent drop from 332 to 269, followed by Georgetown at -17.8 percent decline, lot 63 at -10.9, and the town of Souris at -10.2 percent decline. The total population of seniors aged 65 and over on the Island in 2016 numbered 27,715 and is a 21.6 percent increase from 2011. As the number of seniors rise, the number of children fourteen and younger has been decreasing in Prince and Kings County, with Kings receiving a -13.4 percent decrease between 2011 and 2016 (PEI Statistics Bureau 2016).

A Population Action Plan was launched by the province in 2017 to address concerns of its future population and is targeting to increase its current population of 150,000 by 10,000 by the year 2022. PEI has been leading population growth in the Atlantic Provinces since 2007, however, trends of out-migration and population aging contribute to a further depleting labour force. The 1971 the median age of Islanders was 25, compared to the 2017 median age of 44. The 2017 to 2022 goals are concerned with attracting working age people through interprovincial and international migration and retention of new immigrants and international students. A social media campaign in 2018 entitled ‘Maybe You Should Come Home’ was launched to try and convince Islanders who had moved away to come back home. Contestants were asked to post reasons for moving back, with the win-

ner receiving a one-way flight home from anywhere in the world. The research component of this initiative found that 80% of those who responded were interested in moving back. Reasons for wanting to return included better work-life balance, lifestyle, and wanting to be nearer to family. The majority of those who responded to the survey had left primarily for employment opportunities, and it is a lack thereof that has prevented their return (Russell 2018).

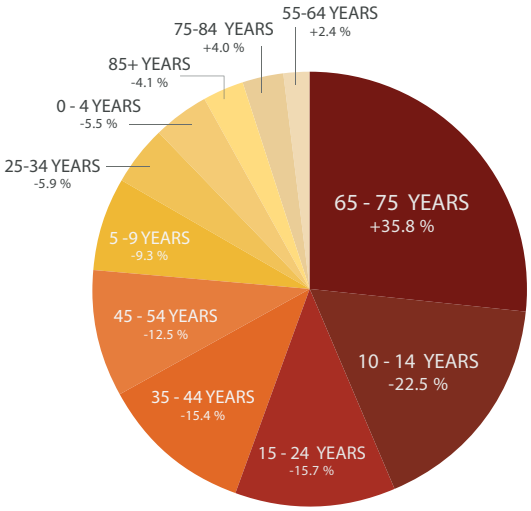


Map of Prince Edward Island showing its two cities, three counties and related population decline (Prince Edward Island Statistics Bureau 2016); (Map adapted from Government of Prince Edward Island GIS Data Catalog).

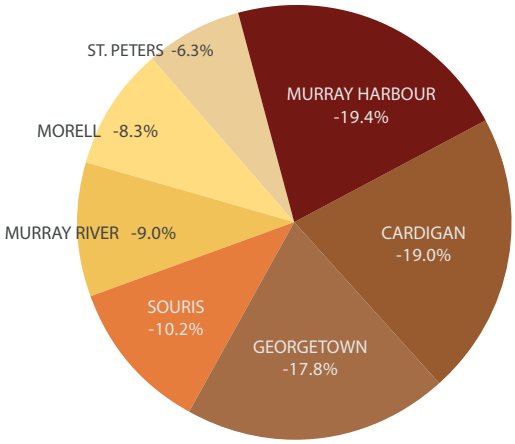


Map of King's County showing established community settlements (Map adapted from Government of Prince Edward Island GIS Data Catalog).

While many Islanders move away to pursue a different lifestyle, the Island is an attraction for those looking for a quieter way of life. A large group of Buddhist monks and two groups of Amish have recently moved here, offering an interesting cultural fusion and learning opportunities in rural Prince Edward Island. Part of the Population Action Plan is seeking to attract and retain new immigrants as they are believed to become the core of future population growth on the Island, and at present most immigrants leave after an average of two years which is a retention rate of 38 percent. The government believes that supporting a 'welcome to the community' initiative will foster an inclusive culture for new-



Population change between 2011 and 2016 within established towns and villages in King's County (Prince Edward Island Statistics Bureau 2016).



Percentage of population change betwen 2011 and 2016 of age groups in King's County. Statistics (Prince Edward Island Statistics Bureau 2016).

comers to find belonging and where their skills are valued (Gov't of PEI 2017).

In 2008, a large population of Buddhist monks established male and female monastic institutes in the Kings County communities of Little Sands and Heatherdale. The Great Wisdom Buddhist Institute and the Great Enlightenment Buddhist Institute attract tourists and relatives from all over the world, drawing approximately 2500 visitors annually (Stewart 2018). Initially keeping to themselves, they thought it best not to disturb the locals. However, they soon realized that Islanders were curious about who they were and why they had settled there. Locals initially perceived the new community of monks as a threat, and the Buddhists soon realized that they must let their guards down and establish relationships with the community by participating in local events. Soon after, they adopted an open door policy, inviting Islanders into their facilities (Kyte 2019b).

The Little Sands complex houses approximately 300 monks who now host an annual open house. The 2018 event hosted more than 2,000 people who travelled to the event from all around the Maritimes (The Guardian 2018). The monks continue to find ways of integrating and providing for the local community through organizing events like beach and roadside clean-ups, community dinners, and door-to-door deliveries of rolls and small gifts at Christmas time. These acts of generosity towards the local community have cre-

ated a growing acceptance among Islanders, and the monks have reported that they are gradually feeling more a part of the Island, and that Islanders have responded through small acts of generosity of their own (Kyte 2019).

More recently, fifteen Amish families have moved to the Dundas and New Perth communities of Kings County, seeking a place with enough affordable land within a fifteen kilometer radius so that their children could continue their way of life (Walker 2017). Their horse and buggies are a common sight in rural Kings County, as they travel to the nearest town of Montague for their lumber and supplies. The Island legislation has been amended to allow for the Amish's own education system. They pay taxes but use very little of the government-funded services as they are nearly self-sufficient, paying for their own healthcare, education system, and care of their elderly. They live a simple life and use no electricity, instead opting for kerosene lanterns, wood stoves for heating and cooking, draft horses to power farm equipment, and diesel engines for pumping water or for cooling their dairy tanks. An intermediate in their establishment on PEI has described their presence here as "gentle people for a gentle island" capturing the accepting attitude of Islanders to their new neighbours (Walker 2917).

The typical Amish farm is about 100-150 acres and only 30-50 acres of it is cultivated at any one time. A community effort is made for planting and harvesting, and many have purchased a dairy quota from their neighbours, milking about 30-40 cows (Walker 2017). Their organic farming methods are much more ecologically sensitive than the typical North American farm, utilizing traditional ways of farm life while scorning the use of pesticides and herbicides. Islanders are optimistic that the Amish presence here will revitalize the land while encouraging the government to support young farmers (MacDonald 2016). Many locals hope that the Amish commitment to small scale family farming will develop economic strength to a diminishing rural way of life. Many are excited about the Amish presence here as it represents the values that once prevailed in Prince Edward Island's humble beginnings of resourcefulness and self-reliance (Rankin 2014).

Understanding the social difficulties of being the new community in town, the Buddhists reached out to their new Amish neighbours, extending an invitation to their monastery. Although the two groups outwardly appear very different, they share the commonalities

of valuing simplicity and that happiness is not achieved through material wealth. They both support organic farming and act to take care of the land so that the next generations can flourish. It appears as though their relationship may likely strengthen as the Great Enlightenment Buddhist Institute has asked the Amish if they would try growing some Asian vegetables for the monks, and the Amish were reportedly happy to help out. Many appreciate that both the Amish and Buddhist communities are simply spreading love and kindness and wish to live peacefully on this small Island (Kyte 2019a).

CHAPTER 4: REGENERATIVE COMMUNITIES

> Now we are beginning the slow work of turning this destructive cycle into a regenerative one. By making nature visible again, favouring technologies that are not hidden and that do not posses hidden consequences, our imaginations are again enfolded in nature. (Van der Ryn 2007, 186)

In the literal sense of the word, regeneration is the repair and renewal of living tissue. In ecological application, the term is extended to describe the repair and renewal of the planet as a living system. Described by Cowan and Van der Ryn (1996, 194), "Regeneration is an expansion of natural capital through the active restoration of degraded ecosystems and communities." Natural and social processes are enmeshed from the regenerative viewpoint into a more meaningful and complex system of which community involvement is vital to the design and implementation of managing (Lyle 1994, 37). According to Ndubisi (2014, 579), the regenerative concept emphasizes the use of input-output models as a tool for evaluating the behaviour of a system. For effective regeneration, system outputs must exceed the input in a closed loop where outputs of one system are inputs of another (579). Honouring ecological processes poses design constraints that must be met locally, regionally, and globally (Van der Ryn 2007, 94).

Regenerative Design

Professor of Landscape Architecture, John Lyle describes regenerative design as something that reaggregates. Like a living entity, our urban systems can act as an ecosystem structure, which gradually or due to a sudden disturbance, processes change over time. Structures have been observed in nature to continually reorganize themselves, forming an ecosystemic order which functions through flows of energy and materials. This is a distribution system that continually recycles vital materials such as water and nutrients (Lyle 1994, 23). Lyle (40) applies the systemic notion of regeneration to the urban setting, describing a regenerative city as something that "brings its varied activities together to share space, reinforce each other, and eliminate long trips from one area to the other." The community can function itself as an ecosystem by managing energy and water flow, and recycling wastes; and by doing so, it cements its connections between its citizens, technologies and the landscape. Lyle stresses interdependence as a means of borrowing

and trading, providing for emergency backup for one another by balancing resource disparities. The relationship he describes is one of symbiosis, citing such networks to offer an alternative to centralized structure. Such regenerative qualities in a community are flexible, diverse and effectively maintain security (266).

Regenerative technologies are more small scale and easily integrated with their surroundings than industrial technologies, and their processing becomes a part of daily life (44). “Operating locally and at a smaller scale, regenerative technologies lend themselves to greater community control. This can help to refocus local identity through shared responsibilities of management (266).” In his experience with participatory planning, Lyle has found that we can expect to engender activity and more effective participation through use of regenerative technologies in the community. As these systems function at a smaller scale and more locally driven, they are likely to stimulate interest locally (268).

According to Van der Ryn (207, 81), the skills for regenerating communities are already based in our everyday practices, and it is a matter of applying these actions in a different way by attending to water, energy, waste and the land with love and careful attention. If these skills become part of the fabric of everyday life than building sustainable communities is possible. Engaging in these everyday actions develops a ‘culture of sustainability’ which is a shared awareness that serves to regenerate the health of its people and ecosystems (82). Sustainability cannot be imposed by outside forces, nor can it be mechanically replicated. Rather, sustainability will take endless forms and diversity helps ensure that the entirety of the fabric of technologies, cultures and values are sustainable. It is about growing a culture of sustainability that is suited to its particular place (83). Professor of Landscape Architecture and Environmental Planning, Randolph Hester describes this as taking bold action towards ecological democracy through homegrown precedents. “Finding local examples of enabling, resilient, and impelling form grounds the future in the experience of the community. This makes the future not only recognizable (I can see my place in it) but also a matter of identity and pride. This provides the basis for visionary futures that are socially acceptable, even desired” (Hester 2006, 290).

To help communities build in sustainable systems to their everyday functioning in pursuit of what he terms ecological democracy, Hester recommends developing a priority frame-

work. Such a framework functions as a skeletal system, structuring form and supporting the vital essence of urban settings. Establishing this framework organizes citizens within a world of possibilities and, “is a direct statement about what actions are most important for the general well-being of the city (Hester 2006, 264).” The priority framework is only effective if the environments that are created match their local patterns and activities (24). Urban designs must become more grounded in everyday life as actions towards ecological sustainability become more urgent, but it is the sense of familiarity that will provide the metamorphosis into a different future (281). Hester develops four design strategies for inspiring ecological democracy within everyday actions: by designing for what people do all day, integrating the present experience with incremental change, marking time and inspiring visionary futures among the backdrop of everyday (283).

Resiliency

Resilience is the ability of our communities to have the flexibility to bounce back following terms of stress (Lister 2016, 121). It allows the absorption of shock in the face of changing conditions to the environment, and in following this, return to a state that is routinely cyclical and which retains the majority of its structures, functions and feedbacks (125). Our design strategies should build resilience into the community system itself by considering its attributes (130). When a community becomes aware of its resilience, they are enabled to see how they may preserve or enhance their restorative powers within the community (Meadows 2009, 78). Ecosystems are characterized by resilience where a multiplicity of species act in unison to keep the greater system in check, and multiply or decline in relation to climate and nutrient availability, and increasingly so, human activity. Populations also have the ability to evolve through genetic variability and, in time, can create entirely new systems that respond to changed opportunities for life support (76-77).

Hester (2006, 141) has defined rules for resilient design, beginning with increasing diversity in the urban setting. He advises an integration of the many parts of the urban ecosystems that may be operating in isolation, and to consider the indirect interconnections of these systems by following the flows and cycles of biological processes. We should rely on renewable energy and resources while designing within the natural limits of the bioregion. Natural processes should be revealed through design and solve multiple problems through the fewest amount of actions. Design should take place through a democratic de-

cision-making process, and design acts should coevolve with human development, habitation and nature. By evolving the design out of the intrinsic character of the local network, human fulfillment can be found alongside the restoration of ecosystems.

Self-Reliance

Rural communities often face issues in their capacity to offer the essential components to sustain itself. Development of single industry economics in rural communities leaves them vulnerable in the face of economic challenges. Capacity-building has been recognized as a key strategy within sustainable development policies for increasing community-driven potential (Warburton 1998, 24). Robinson (2008, 12) recommends the design of a central 'organizational home' for handling climate adaptations and issues of sustainability within communities. Such institutions would give space to and strengthen the community's ability to collaborate and to circulate and embed education of sustainability and climate information into the community's daily functioning. Communities must turn to re-developing local economic networks by providing the necessities to promote and facilitate local innovation. Local agricultural land as well as areas of opportunity for farming within the community should be utilized for local production. To distribute goods and services to community residents, farmers markets and small businesses should be employed, and when possible, utilize "value-added" activities (8-9).

Re-localized economies increase options for small-scale and sustainable economic opportunities to arise and allow communities to re-establish themselves within a decentralized system. This helps reverse the trend of rural erosion by offering an intentional and more ecologically sustainable way of life and will become key to sustainability moving forward. This does not mean that a global society should not exist, but rather that we continue to trade, share cultures and remain globally interconnected by first becoming self-reliant within our communities (Weyler 2013, 194). By sustainably using their own resources first, individual bioregions can engage in ecologically balanced trade of their surplus goods (Wackernagel 1996, 142).

Stewardship

The notion of stewardship could be defined as the, "actions taken to maintain, restore,

and improve one's community, the landscape, and larger ecosystems (Hester 2006, 369)." The actions of stewardship are motivated through a sense of caring and civic responsibility and are informed by local wisdom and urban ecological principles. Responding to a global public interest, stewardship provides the individual with security, new experience, a sense of responsiveness, recognition, and fulfillment. Acting through stewardship develops one's care for community which is extended to include all people, plants, animals and environments. The concept of this type of meaningful involvement, a connection to a larger system, provides both a set of moral principles and a course of action. It requires an active responsibility that guides our daily lives and our public engagement (383).

Hester suggests a need for a wide range of settings in which people can engage in stewardship activities. This can take place in the backyard, at the neighbourhood level, on farmlands, on public lands and throughout the region. A diversity of options facilitates people of all kinds and abilities to join in (371). In the urban setting, he suggests that landscapes should be carefully designed to invite stewards to partner in cooperative actions, and to provide settings to celebrate milestones, recognizing this action. "Projects that cross class, gender, generation, and ethnic divisions are especially valuable because they improve not only the urban ecology but also the capacity of the community to work together (Hester 2006, 375)." Becoming in-tune with local processes, citizens develop the skills to create positive action and are more likely to volunteer for the care of their community and its larger ecosystems. It is through shared experience that people are able to reunite with other people in the community and the ecosystem within which they dwell (369).

Participation

To bring community together for civic engagement requires face-to-face contact wherein members work together and develop shared interests. Architecture can help develop places that foster an aggregate of shared experiences, activities and interests; in short, it can help develop centredness in the community. Centeredness is essential for economic complexity, local identity and rootedness, and this quality builds socio-spatial capital and incubates ideas of locality (Hester 2006, 21). The loss of centredness in modernity has resulted in a diminishment of local identity and attachment, knowledge of place and the ability to work together within the community. Restoring a sense of centredness within the village of Murray Harbour will require places that encourage interaction and commun-

ity ritual. Hester advises that designers recreate multiuse centers at the micro-neighbourhood, neighborhood, and regional levels (22).

Sin Van der Ryn (2007, 176) explains that, “Since ecological designs typically unfold over many years or decades, it is imperative that they coevolve with the wishes of their future stewards.” Hester (2006, 39) advises designers to inventory the existing rituals that take place in the community, drawing social and spatial dimensions from each of these. He has developed a design approach involving the development of place knowing, place understanding, place caring, and subsequently, action. This process begins with listening to the people and the place and setting goals that increase the participants’ knowledge of their community. By making a comprehensive inventory and mapping, the designer can introduce the community to itself and expand local knowledge and understanding of its urban ecology (369). Since participants are more likely to take responsibility of a place if they are involved in its analysis and decision making, this process nurtures stewardship by creating a forum for participants and designers to learn from each other and the landscape (370).

Existing already within communities are the local knowledge and materials necessary for the design, build and maintenance of their spaces. As such, Van der Ryn views the designer as a cultivator who consciously grows a shared ground for ecological design intelligence. In this notion, integrating design with common life lends the activity an inclusiveness that respects all voices (174). Since design requires the definition of a problem, and problem defining is a subjective activity, all stakeholders have a point of view which is equally knowledgeable. Communication is necessary in order to design together in framing the problem, discussing goals and actions. If sustainability is the most challenging problem of our time, “then participation in design, as a means to effect deep, transformative, socio-political change, seems essential (Faud-Luke 2009, 142).” Furthermore, participation has the ability to emancipate people by making them active contributors in their environment as opposed to passive recipients. Participation in design is akin to design humanism that aims at reducing domination by promoting mutual support and celebrating a collective human instinct. (147).

Participatory movements such as this are currently emerging in the design world. Co-design is one such movement based on the premise that the people who ultimately use or

inhabit a design are entitled to have a voice in deter-mining how it is designed. Co-design offers the opportunity for multiple actors to define the context and problem collectively which improves the potential of a design outcome becoming effective (Faud-Luke 2009, 147). The concept of metadesign emerged out of the 1980s application of information technologies to art, design and cultural theory, and is well suited for dealing with complex problems while enabling knowledge sharing and social creativity. According to Faud-Luke, the appropriate environment for metadesign to take place is in under-designing so that others can add their own creativity and design, which allows the system to evolve. “Meta-design is seen as co-creative and co-evolutionary, encouraging an ‘unselfconscious (or spontaneous) culture of design’” (151). This has some relation to the notion to the emer-ging design approach known as slow design. This concept verges away from economics-driven capitalism, instead considering metabolisms that carry new possibilities for societal values (157).

Since design is the enactment of human instinct, it is a social activity which provides the materialization of our world (Faud-Luke 2009, 152). Design strategies that extend be-yond the designer alone are aimed at slowing people down for more meaningful and less energy intensive modes of living (Faud-Luke 2009, 194). Applying the co-design approach in re-examining our local resources and socio-ecological capacities will boost the localiza-tion movement and hopefully transform our societies and environments into a more sus-tainable mode of living, producing and consuming (193). Hester concludes that, “we need to structure attempts at sustainable design as experiments in which all of us are active participants: all of us are designers, citizen scientists, and ecologists. This is fundamental for an ecological democracy to develop” (Hester 2006, 273).

Adaptability

For a community to regenerate, it must be capable of continually re-evaluating itself from the inside out in order to determine its next iteration, adjusting its systems and physical components as necessary (Wackernagel 1996, 135). This requires the community to set parameters around conflicts between maintaining quality of life today and finding future ecological stability. Such a process is iterative rather than linear in its planning, involves repeated cycles of learning through trial and error, and gradually transforms beliefs into action (137). Meadows (2009, 82) recommends, “If subsystems can largely take care of

themselves, regulate themselves, maintain themselves, and yet serve the needs of the larger system, while the larger system coordinates and enhances the functioning of the subsystems, a stable, resilient, and efficient structure results."

Systems fit for the future require a general flexibility at all levels of human and ecological functioning. Nature exhibits flexibility where change is built into living systems and their environments which are characterized by dynamic change and uncertainty (Lister 2016, 120). Bateson describes flexibility as the "un-committed potentiality for change," and advises that social flexibility, a precious resource, should be budged appropriately upon only necessary change (1973, 505). To transition towards flexibility, it is useful to start not with a prescriptive approach, but with an abstract idea of ecological health to guide our approach (502). Instead of linear, or single-path solutions, we should design diverse systems to employ multiple pathways using redundancies, avoiding vulnerability while creating stability (Meadows 2009, 4).

Nancy Jack Todd suggests that through the synthesis of biology and architecture, we can view the function of a neighbourhood itself as analogous to an organism. As such, the parts of the neighbourhood become symbiotic to the whole, with all social and physical functioning working together. These functions are felt within the community and understood by its residents who live in operation of these components (Todd 1993, 116). Adaptability is achieved through varying uses of the environment and altering the forms of both human and nature-made systems. If the overall structure can accommodate change while still maintaining its fundamental form, and if its spatial configurations are malleable enough to permit a multitude of functions over time, the system is flexible (Hester 2006, 255).

For spaces of socio-ecologic integration to become successful, they must encourage frequent use throughout the day and evening, providing efficient spatial usages and easy sequencing of activities. It should provide a presence which is open and inviting through a variety of forms of community interaction. Such spaces should focus on shared activity with multiple and flexible indoor and outdoor use and must provide reminders of a common purpose even when not in use (Hester 2006, 25). Steward Brand's notion of 'shearing layers' within buildings that change at dif-ferent rates tells us that greater layer

connectivity within a building means there will be greater difficulty and cost required in its adaptation. This notion is built upon by Schmidt in 2016 with the addition of human occupation and surroundings, the physical context of the site and surrounding environment. These ideas suggest that a building cannot be conceived apart from its immediate context and its users (Schmidt 2016, 55). In order to alter spaces, services and skins of a building, the different lifespans of its components are important to consider, as well as how they will be replaced in consideration to construction and deconstruction processes. Therefore, the way that the building is detailed is highly important to consider (Schmidt 2017, 70).

Adaptability in built form can roughly be characterized into six adaptability types. Adjustability allows its space to be changed by its users depending on the necessary task. Versatility allows spaces to be easily changed while refitable spaces allow a change in performance. Convertible adaptability refers to a change in user, and movable refers to the ability to change locations. Scalable buildings can change in size (Schmidt 2016, 69). To allow a change in occu-pants, environmental conditions or in technologies, the objects and components within an adaptable building must be reconfigurable and movable to accommodate for new tasks. When components are easily configurable by the user, spaces have the versatility to change spatial layouts that can be rearranged for a variety of purposes to take on new users and new work patterns. The structural scheme of column placement, the dimensions and overall shape and area of the plan, its location or lighting and services, and the movability of walls, furniture and fixtures create a framework for a buildings ability to become versatile (70).

Regenerating Communities in PEI

A need for regeneration of rural Island communities across Prince Edward Island is evidenced through ongoing phenomena such as lack of employment, population erosion, a declining sense of community and a decreased sense of reliance on local ecologies. Regeneration is an appropriate word for describing the type of community necessary for developing socio-ecologic sustainability as a co-operative initiative. This term illustrates the ability of a community to function like an organism capable of reforming itself over time in response to internal and external forces. Community regeneration is important because it

allows us to understand that society exist neither in static nor immobile forms, but rather function like any other ecosystem in their ability to show resilience through adaptations to their changing environments.

Through a vision of regeneration, designers can help develop socio-ecologic integration and subsequently, self-reliance and resiliency within the community through a range of settings in which ideas can arise, take hold and mobilize into action. These spaces act as incubators for social actions to become increasingly in tune with ecological capacities and social factors. Like the metaphorical nodes of a plant which Randolph Hester describes, designers can inspire socio-ecologic exploration by creating spaces that allow new ideas to grow and spread into their surroundings.

Through the design of an 'organizational home' within communities sets an invitation for civic engagement in address of common issues. Here, the community can develop socio-ecologically sustainable solutions through drawing citizens into a participatory exchange of ideas and actions and rewarding its members with a sense of purpose and belonging. It is essential for adaptability that communities constantly engage in re-evaluating themselves as systems from the inside out. Informed by the existing strengths and assets within the community of Murray Harbour, this project develops a space for sharing knowledge and skills with other community members by emphasizing a hands-on learning experience. Inter-generation and inter-social exchange offer a mode of learning from one-another that promotes diversity and inclusiveness within the community.

There is a two way celebration of the individual with skills and assets to share, and of the community collective as a care-giver that shows generosity and promotes the flourishing of each individual. Opportunity to connect on a more global scale can be taken by inviting new talents into the community in the form of work-exchanges and by promoting the village as an eco-tourism destination, thereby learning and sharing through a fluid integration between a dynamic group of residents and visitors. Providing room for individuals to work together strengthens the collective mentality and sense of group adhesion. There is less need for individual ownership, and the co-operative social framework ensures that each individual is accounted and cared for.

In his writings on ecological democracy, Randolph Hester developed four points for addressing ecological consciousness through design. The first point is concerned with designing for what people do all day. This thesis proposal can be described as a 'home-grown' approach to global ecological problems. It does not consider the building or its site in isolation but enfolds through a regional analysis of natural and social resources from the land, sea, and existing communities. Connecting regional assets to the building project develops through a study of existing land allotments or varying forms which each offer a range of potentials. Considering what activities take place within the home and surrounding property relates to Hester's advice of designing for what people do all day. The home is the starting point for creating sustainable approaches to individual lifestyle changes which can be shared with and reinforced by the community. Addressing activities within private and public land allotments is to address the fundamental structure of the rural lifestyle and can help utilize these environments in a more ecologically sensitive and more productive manner.

Next, Hester describes the need to integrate experience through incremental changes. We each play a role as individuals in the development of a global ecological future through adapting the way that we engage in our world on a daily basis through our habits and lifestyles. We will never be successful if our expectations do not allow for failure or the time which is necessary for profound social change. Building ecological sustainability through adapting our daily habits will not be a rapid nor a straight-forward action but will involve many attempts. By viewing the community as an organism within an eco-systemic structure allows us to understand the importance of feedback loops that allow continual re-evaluations of community functions. Adaptability within the proposed building is important to allow the community to interpret these feedbacks to inform its next iteration. Any initial change may evolve into many following forms or it may decay if it is not beneficial, but the building is flexible to allow the incremental differences that the community may pursue at a given point.

Hester's third point is related to the marking of time. Due to climate, resource availability and social flux in Prince Edward Island, the community production centre must be seasonally adaptable to frequently shifting program activities, weather, and social groups. The building is designed such that it can grow through phasing and community-led additions

in relation to available finances, resources, population and socio-ecologic needs. A familiar building form and flexible building components allow the community to adapt the building on a seasonal and yearly basis through shifting programmatic and spatial relationships. In this way, the building marks the natural cycle of seasonal flows that are readily apparent on PEI. Phasing and community additions act as a physical documentation and indicator of the changing forms, growth and regenerative process of the community.

Hester's final point is to inspire visionary futures among the everyday life of the community. By not defining a conclusive building with set program, this thesis project proposes an abstracted framework for the sustainable redefinition of the village through its own devices. Observing that community already has resilience built into its social structure, the project attempts not to define the future of the community, but to uncover opportunities and ways in which it may begin working for itself through collective participation. Individuals are invited to imagine how they may play a role within this redefinition. In this way, the project is meant to inspire people to create their own visionary futures within their everyday life. Rather than prescribing a solution, the responsibility of the architect here is to begin a dialogue with the community to discuss and uncover possibilities which will develop the priority framework.

Designers can help develop local knowledge by providing the setting for ideas to incubate, transform and spread, educating through a hands-on approach to learning. By building an inventory and analysing the existing social and environmental resources in a locality allows the designer to facilitate a conversation with the community as a starting point for design. Building this dialogue introduces local wisdom to inspire environmental and social exploration through nurturing experiments. Centres such as this, "are like nodes of a plant from which new growth springs, where inklings form into plans and from which seeds disperse. All of these actions are essential for the acceptance of innovations that are necessary to create an ecological democracy (23)." Community commitment is invited through the voluntary investment of time and energy to use, improve and care for the center. The designer should encourage symbolic ownership by considering personal and civic meanings that stimulate the imagination, participation, and stewardship (28). By doing so, we can build the capacity for thoughtful action by providing places for inclusive daily and episodic rituals that bring the community together in common pursuit (37).

CHAPTER 5: DESIGN

> The answer is that we must turn on the historical spiral and approach the pre-industrial village from the higher cultural level of post-industrial cybernetics and ecology. (Thompson 1980, 14)

Imagining the village and community as a living organism, the architect can sew a metaphorical seed for empowering communities to grow their sense of resiliency. In this thesis, a reinterpreted notion of 'living off the land' explores how architecture can begin to integrate society and ecology for heightened self-reliance. Beginning with an historical analysis of place formed an understanding of how society once lived self-sufficiently from natural resources. A renewed interest in socio-ecological re-connection arose in the 1960s and 70s resulting from a felt separation of humanity from nature. A stream of ecological design thinking developed the concept of the community as a living organism that is part of the larger living ecosystem. Acting as a framework for sustainable regeneration of rural Island communities, the co-operative production centre proposed here is an adaptable form of architecture to foster re-localized resources and economy.

The regional conditions surrounding the village of Murray Harbour are examined through mappings, resource inventories and land allotment strategies. The building design is understood as a physical framework for community development in action of an evolving priority framework. An abstract building plan and gameboard model demonstrate a flexible architectural framework for seasonal and programmatic adaptability, inviting the community to engage in dialogue and imagine how they might begin to inhabit the space. Due to project constraints, community involvement is described only in theory and it is left up to the reader to imagine the various possibilities of how the architecture might unfold in reality. However, a narrative is provided to describe one possibility through site analysis and building placement, a phasing timeline and seasonal inhabitations.

Regional Analysis

Prince Edward Island has historically and continues to live in strong relationship with both the land and sea. The cultural consciousness includes a sense of life spent in-between these opposing environments and the seasonal changes that orchestrate life there. The

Mi'kmaq inhabited this place expertly because they did not think themselves separate from the natural flow of life, moving seasonally within their ecological means. The British divided the land for themselves, enforcing ownership and resource consumption, leaving no space for the traditional Mi'kmaq or their value system. The strategic land allotments put in place sought to maximize farmland while providing access to the ocean.

Life in rural Prince Edward Island is in direct experience seasonal change. Annually the landscape of beaches and dunes, fields and forests, and rivers and streams, are shifting their forms in a constant state of regeneration. Farmland is transformed through new growth in the spring and summer, until it is harvested and laid barren for the winter. The wharves that perch along coastal communities come to life in mid April in preparation for the fishing season but sit empty again when winter comes and the ocean freezes. The beginning of the tourist season creates activity and employment opportunities as the Island comes to life once again following the long winter. Almost overnight, the population doubles as tourists return and restaurants and amenities re-open their doors to serve the many who vacation here each year.

The village of Murray Harbour is located amidst the Murray River watershed that is formed by five rivers meeting the ocean at the south-eastern tip of PEI. At its base is the Island's largest freshwater body known as MacLure's Pond, and the village's sister community of Murray River. Low-lying land surrounds the watershed, providing a range of ecological

Lobster boats docked temporarily at the wharf in Murray Harbour on setting day in May, 2019. Local wharves come to life in the spring when fishing boats are launched into the water and lobster traps occupy the wharf (Photo taken by Delite Richards 2019).

Natural and human-made coastline conditions along the Murray River watershed estuary. Natural coastlines of varying depths and bottom conditions provide habitat for a range of ocean ecology. Man-made coastal reinforcements and wharves were originally made of wood but now use concrete, metal and imported stone in addition. Regular dredging must occur to keep the waterways deep enough for passage and wharves free of sand build-up for fishing boats.

conditions from the sandy shore-lines near Beach Point, to marsh-type environments of the interior. The human hand is evident among the picturesque estuarine landscape. Wharves and smaller floating docks mark communities and properties along the rivers, and rocky reinforcements protect shorefront properties from erosion. This estuarine environment has both ecological and social significance as locals and tourists spend their summers on or near the water here.

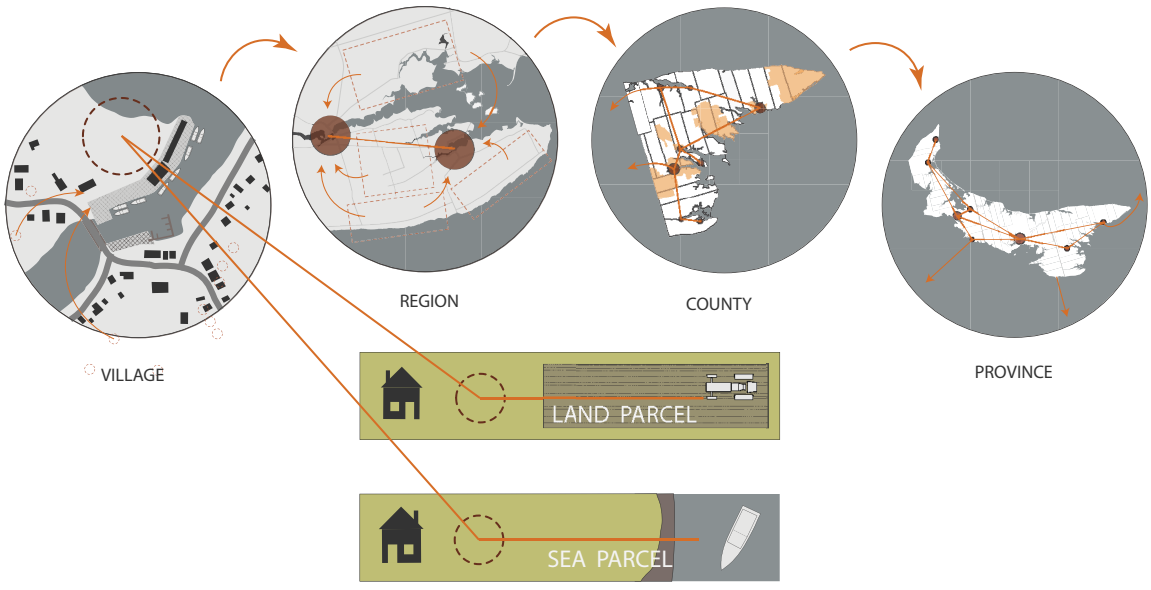
Prince Edward Island is known for its fertile red soil; however, a potato monoculture dominates the once small-scale family farm. The Amish were a welcome addition to Island culture, setting an example of both community and land caring that many Islanders admire. Like the back-to-the-landers of the 1970s, people are becoming concerned about the detrimental effects of commercial farming. A growing trend of organic farming and permaculture is determined to re-integrate with ecological flows and making a meaningful life that is again centered around the home. This trend is evident on PEI where small-scale farming is still practiced, and affordable land is still abundant and attracts a wave of new-age farming.

Historically, land allotments were divided in Township 64 such that their short sides faced the sea, offering its settlers trees for building and burning, land to clear for farming, and access to the ocean. The traditional homestead predated the village and contributed to its formation by providing an excess of food which permitted other economic activities to arise. The rural land allotment connects to the village network by supplying the resources to feed its citizens, while the village allows small local businesses to support local farm-

Photographic collage of landscape conditions in Murray Harbour and its surrounding area. The region is bounded by the Northumberland Straight to the south upon which agricultural land overlooks, while the north is bound by the Murray River watershed of estuariane habitat. Going from land to sea involves a boat trip from one of the wharves in this area, along the river leading to the mouth of the watershed at Beach Point which is marked by the lighthouse and the one mile bell bouy. To experience this voyage from land to sea and back again is to experience the in-between of land and ocean that life is defined by on the Island.

ers and fisherman. This scenario of barter between rural and village allotments could be re-applied in a similar way today to stimulate self-reliance through re-localization and strengthened regional networks.

The land allotment is a primary component in the structure for the regenerative community, similarly in that the individual is a primary component of the co-operative. These lots, both private and public, can be optimized to their environmental position and its resources or opportunities. The relationship each lot has to its environment determines what its potential is. The thesis looks at rural lots that have water access, those which are land-locked, and those located within the village. Citizens can imagine potential economic add-ons to partake in that create benefit for the individual and community alike. Integrating design within daily life, citizens can re-think the possibilities within the home or property that can contribute to sustainable adaptations within their existing structures. The project hopes to empower landowners to create economic opportunities at home once again through a sort of re-invented home-steading practice.



Interpretive drawing of a regenerative community framework in which village and rural land parcels become home to value-added activities which feed the central community production facility. These products and services create connections with neighbouring villages, creating a larger regenerative network.

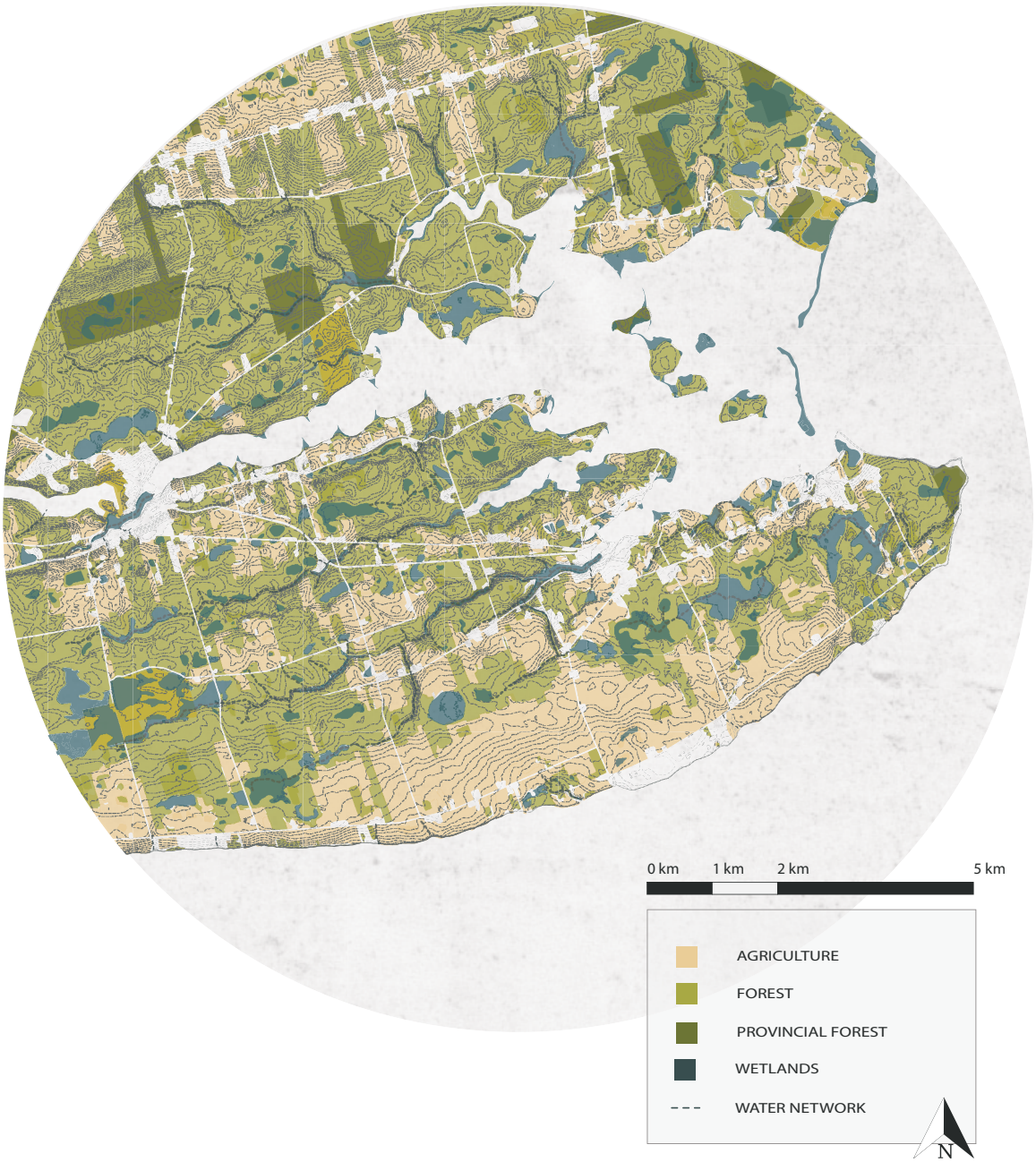
Land

The Colonial farmland divisions are still evident in the long patches of field and hedgerows that line the shore overlooking the Northumberland Straight. Traditional homesteads developed on small patches of these skinny plots set slightly back from the road and accessed via a long laneway. Barns and out-buildings created micro-climates and work-yards for a range of activities like milking cows and gathering water which dictated life on the farm. The yard was once a more activated environment in comparison to the aesthetic nature of the contemporary mown lawn. Some of these homesteads remain as a visible reminder of a pre-consumer lifestyle, but the hardships of such life are not forgotten by the locals. These sights, reminiscent of traditional farm life, are now an attraction for sight-seekers, photographers and tourists.

Agricultural land in here is primarily south south-east facing along the coastline where the land is elevated such that the watershed does not touch it. There are few local farmers who still tend these fields, as most are now commercially farmed primarily for potatoes, grain and oilseeds. Island fruit crops consist of strawberry, cranberry and wild blueberry but are not grown locally to Murray Harbour. However, two wineries operate nearby and grow their own grapes annually. Hog, beef and poultry are the primary livestock, but some small farms are involved in raising sheep, goats, alpacas, and lamas for their wool and milk. The forested areas that lie inland surrounding the river system are lush environments that provide high quality wood that is used for lumber, boat-building, and firewood. Provincial forests are designated to manage ecological research and for public recreation.

Gradually, owners of commercially-farmed fields could designate small portions of the land to other organic crops and livestock to increase diversity, creating a more dynamic patchwork of field and pasture. Ecological management should occur similarly where landowners consider designating parts of their land to habitat restoration through re-planting forests, densifying hedgerows along fields. Accessible technologies that can be managed and repaired locally could be utilized to increase renewable energy production through adoption of solar and wind technologies. Government grants and programs aimed at landowners could increase incentives, such as the Rural Action Plan, and develop alongside these endeavours to promote small-scale economic opportunities.

Land-bound allotments can be re-invented by those who inhabit them to increase self-sufficiency. For example, many cottage industries exist in this area using small-scale production within the home. Other rural lots have used their land to create small businesses such as a garlic farm, greenhouse and plant nurseries and Christmas tree farms for example. Some locals regularly sell the surplus goods from their home gardens at nearby



Regional map showing land cover surrounding the Murray River watershed. Most of the land that faces the Northumberland Straight is cleared for agricultural use, while the low-lying areas along the watershed are swampier wetlands. Base map data (Government of Prince Edward Island GIS Data Catalog).

farmers markets. Those interested in working from home and creating jobs for others to work locally can re-imagine the use of their spare rooms, old barns and out-buildings, and yards for economic add-on opportunities. The products and services created here would be further enabled through relationship to the community production facility. Small home gardens and greenhouses can produce enough food for the household, and surplus goods traded or sold at the production centre.

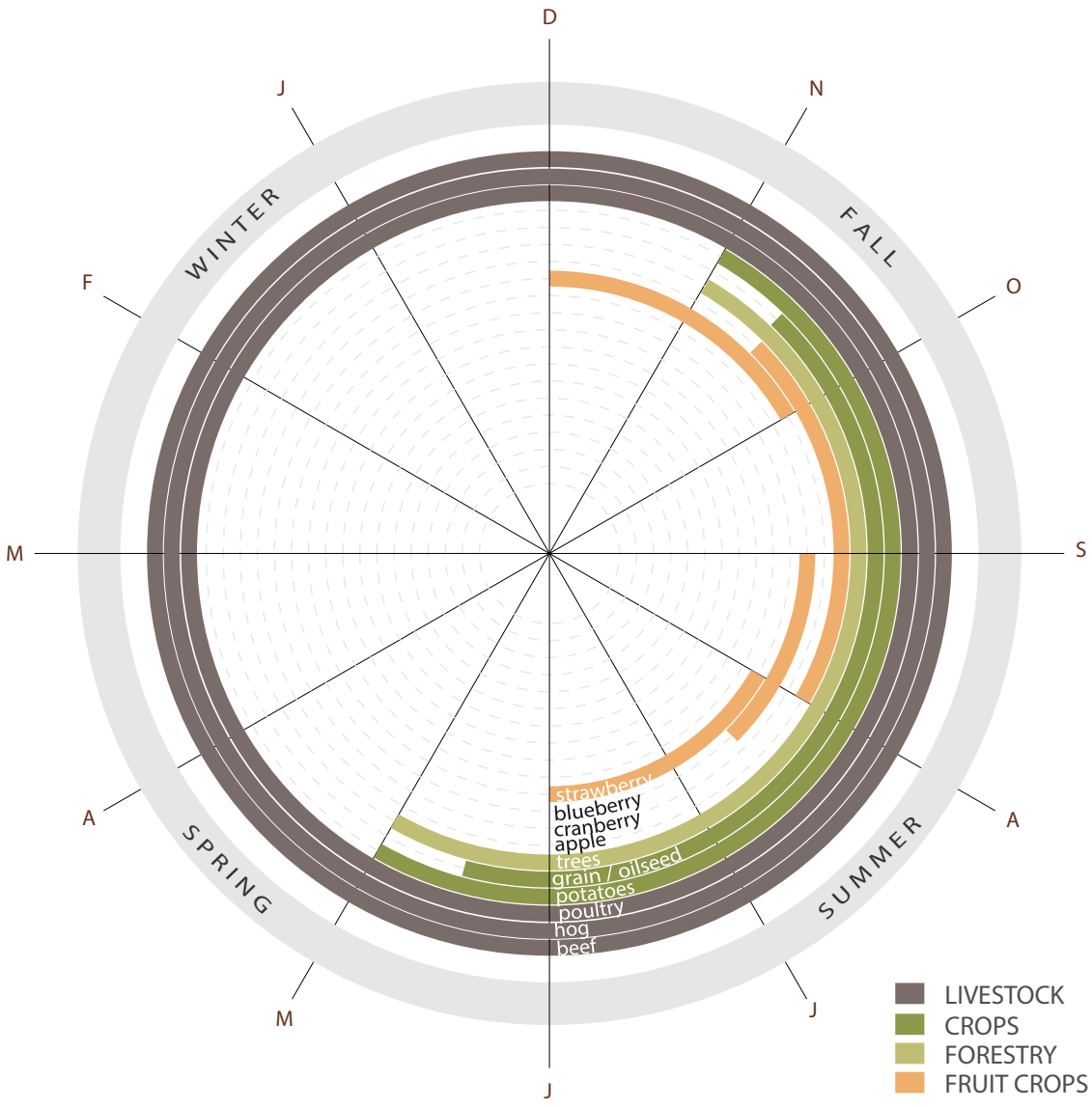


Diagram illustrating the seasonal nature of commercial agriculture on Prince Edward Island. Potatoes, grain and oilseed are the dominant species, but fruit crops such as strawberry, cranberry, apple and wild blueberry are also grown. Beef, hog and poultry are the primary livestock species. Local forests are a source of firewood and lumber.

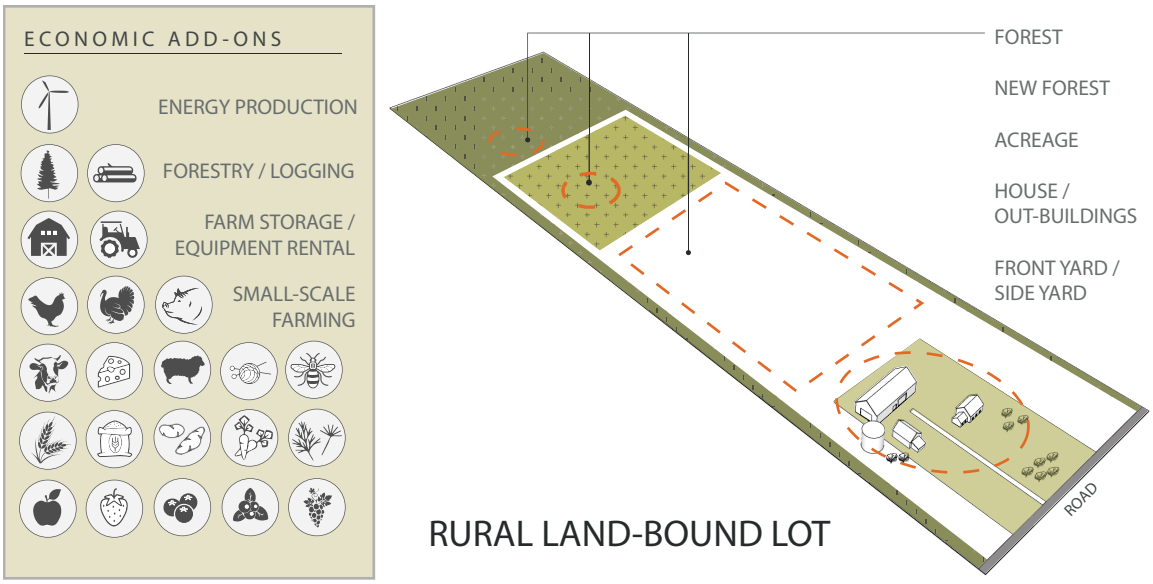


Diagram analyzing the rural land-bound lot for economic add-on opportunities.

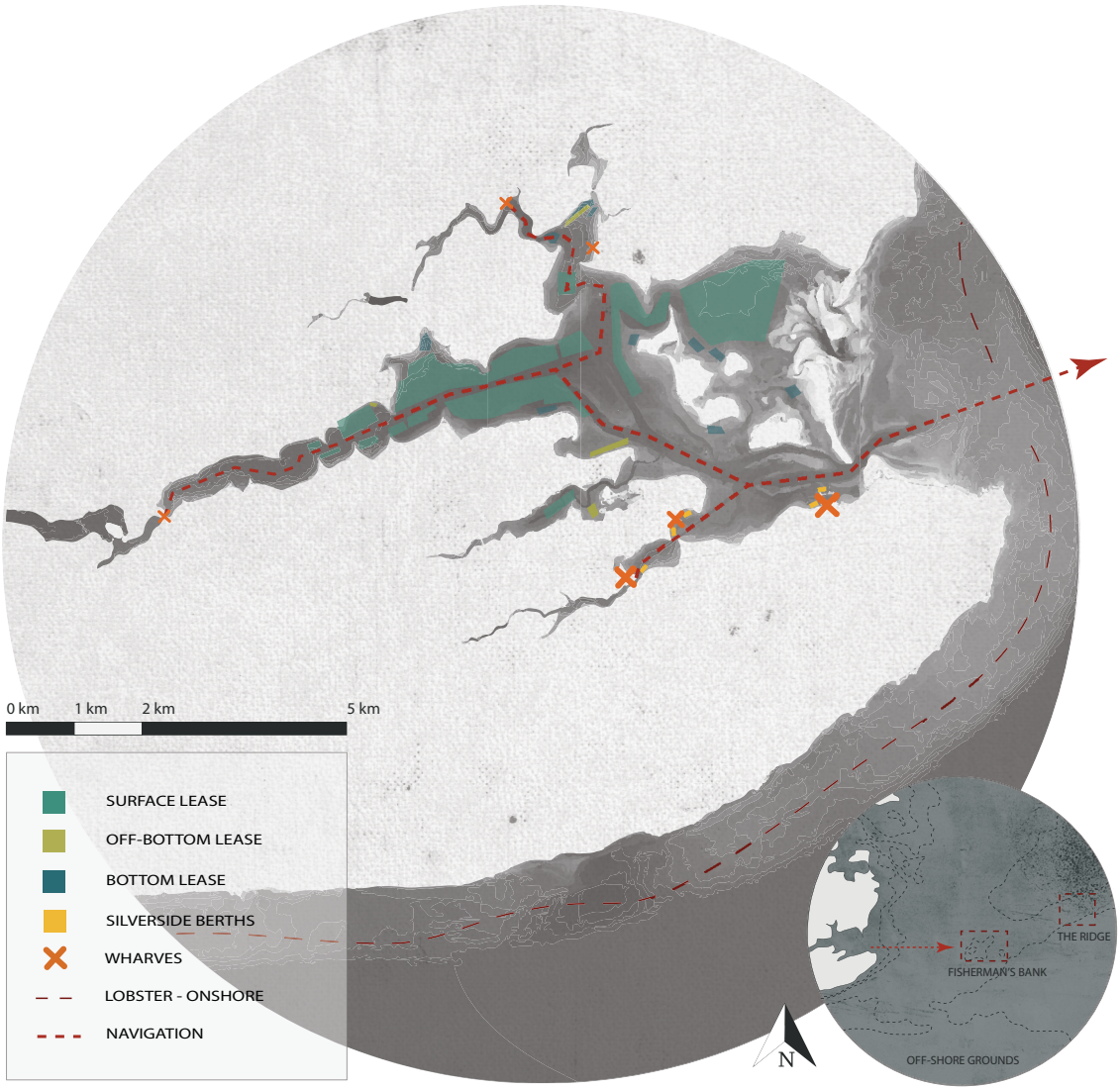
Sea

In the summertime, the Mi'kmaq traditionally travelled to the watershed region surrounding Murray Harbour to live on the rich bounty of diverse fish species that live in this area. The fishing grounds along the coast of PEI initially attracted the Europeans whose ships overflowing with fish returned to Europe to sell their bounties. The ocean was the original means of trading and environments where ports could be constructed are the places where the first settlements arose. The ship-building industry sought a specific coastal environment that provided both a diversity of tree species as well as a variety of water depths and sheltered harbours. The sister villages of Murray Harbour and Murray River arose in this fashion, where the many inlets could be dammed to use water to power local mills.

Lobster is the primary product of the fishing industry on PEI, and its habitat is both along the coastline and further out to sea at places known as the Ridge and Fisherman's Bank. Through the Department of Fisheries and Oceans, the federal government controls fishing licenses, quotas, and regulations to manage ocean resources such as halibut, crab, and tuna. Within the Murray River system, there are bottom, off-bottom and surface leases where mussels and oysters are farmed, and clams can be found. Berths are located near many of the wharves to trap silverside fish for use as bait. Other such species used for bait

include herring and mackerel that is caught off-shore. Sport fishing allows license holders to catch trout and bass in the rivers. Deep-sea fishing for mackerel is a common pass-time as well as digging for soft shelled or bar clams along the sandy inner shorelines. In winter, smelt fishing shanties are a common sight along the frozen rivers.

Waterfront land in this region is either ocean-facing or river-front property, and is often sub-divided into smaller residential lots, often for cottages and summer residences. Along the shore where the land is still used for agriculture, small pieces of land are sub-divided



Regional map showing active fishing grounds of the Murray River watershed and coastal area. Aquaculture leases dominantly along the northern portion of the watershed are habitat for mussels, oysters and clams. Berths along the South River trap silversides, a fish that is frozen and used as bait. Wild lobster are caught further out to sea on ocean grounds known as the Fisherman's Bank and the Ridge. Base map data (Government of Prince Edward Island GIS Data Catalog).

from the fields with road-side frontages as residential lots. Other waterfront lots have long laneways that bring residents to homes along the water's edge. In both cases, private lawns are large tracts of land that are often an acre or more surrounded by trees or fields and bounded on one or more sides by the ocean or river.

In the ecologically rich northern zone of wetland habitat, riverfront lots have become popular campground destinations and cottage developments. Lots in these environments could take advantage of their position through eco-tourism that complements the existing

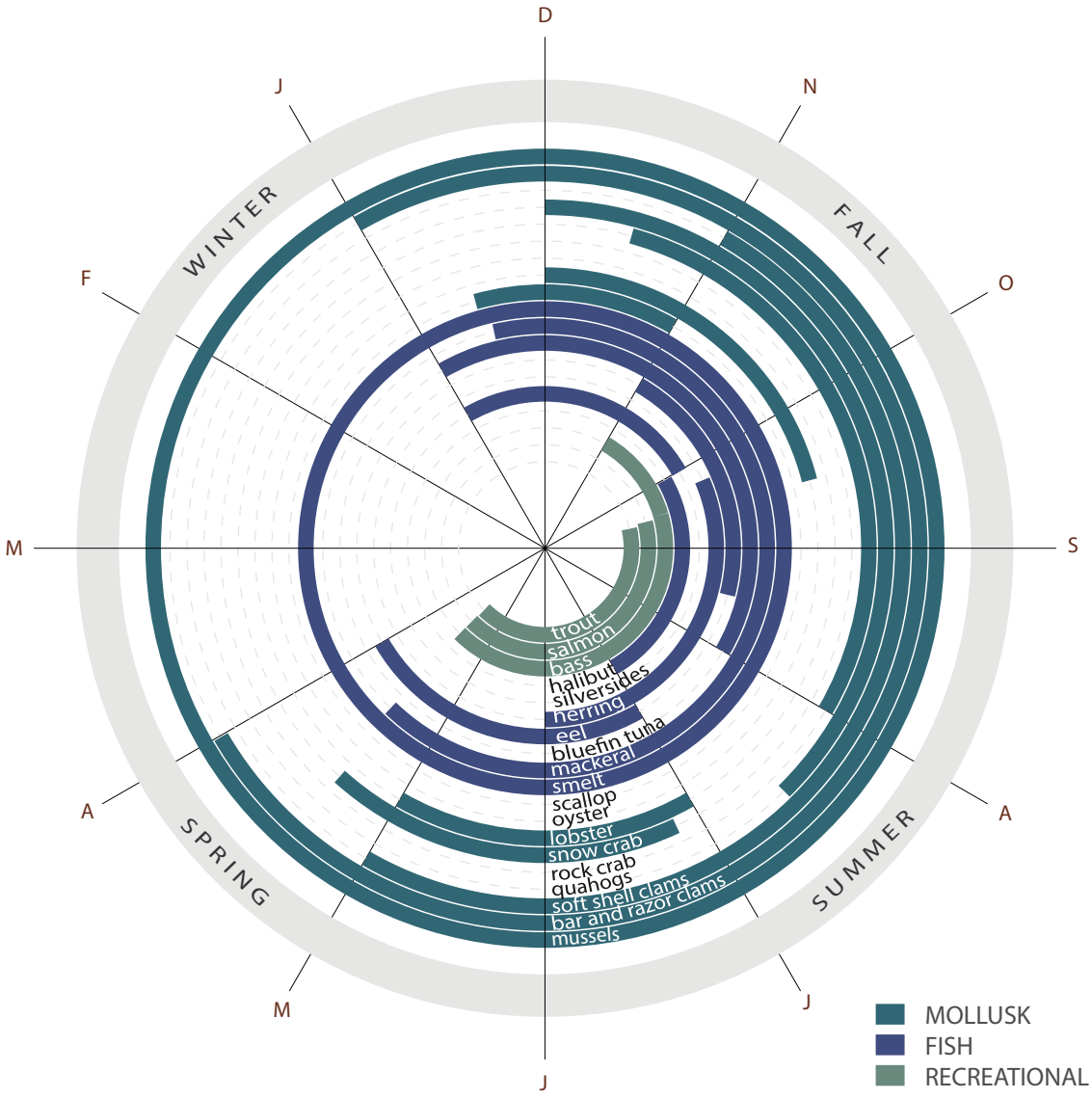


Diagram illustrating the seasonal nature of commercial and recreational fishing on Prince Edward Island. Lobster and crab are the primary exports, but other mollusks include quahogs, clams, oysters, scallops and mussels. Tuna is a popular export, and smelt, mackerel, eel, herring, silversides, and halibut are also fished, while trout, salmon and bass are fished recreationally.

tourism rentals, by promoting ecological knowledge of estuarine habitat through guided tours, hiking trails or boat and paddle rentals. Owners of existing summer homes that are vacant for the majority of the summer could team up with cleaning services to increase rental opportunities and decrease the need to additional land-clearing for new cottage builds.

Mussel cultivation already takes place along the waterways, but landowners in this area could become involved in developing sustainable alternative methods of shellfish farming or fish hatcheries. Government licensing for clam digging, for example, already exist but through sustainable management, landowners could work with government to create more opportunities for ecological development as a resource for value-added products. Shellfish can be preserved through bottling or freezing or made into other products while fish can be smoked or dried, and similarly preserved or sold for immediate consumption. Varieties of seaweed can be harvested to make nutrient-rich compost or to be made into products or sold. Those located near optimal tide locations could engage in experimental forms of tidal energy near river narrows or in deeper areas along the coast. Small-scale wind farms or individual wind turbines could be added to private and public lots, along with solar energies such as photovoltaic panels or small solar ponds could create renewable energy for the owner and the community.

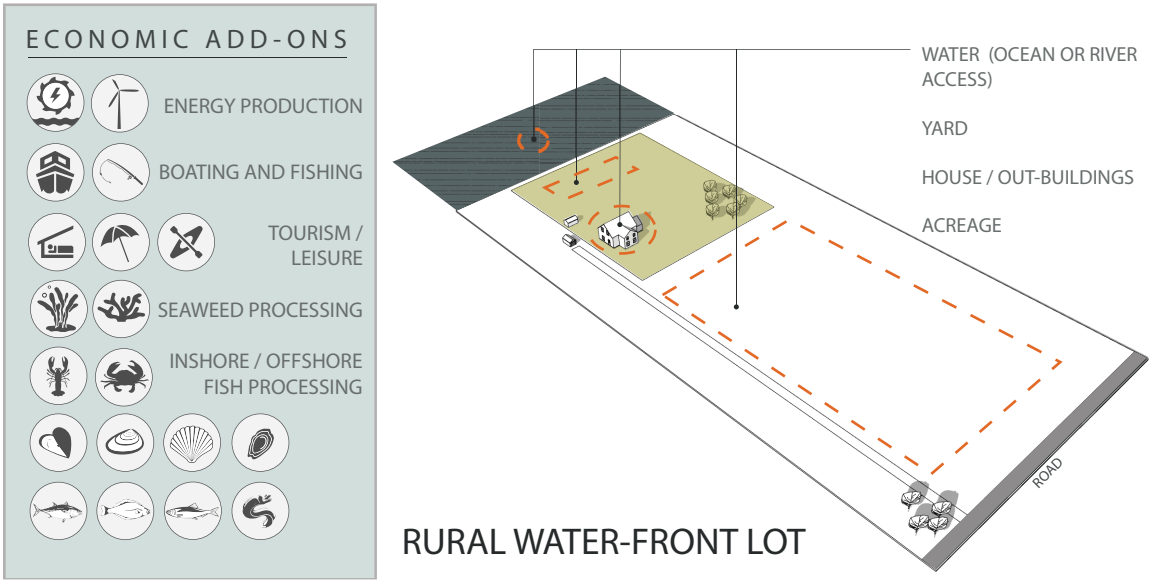


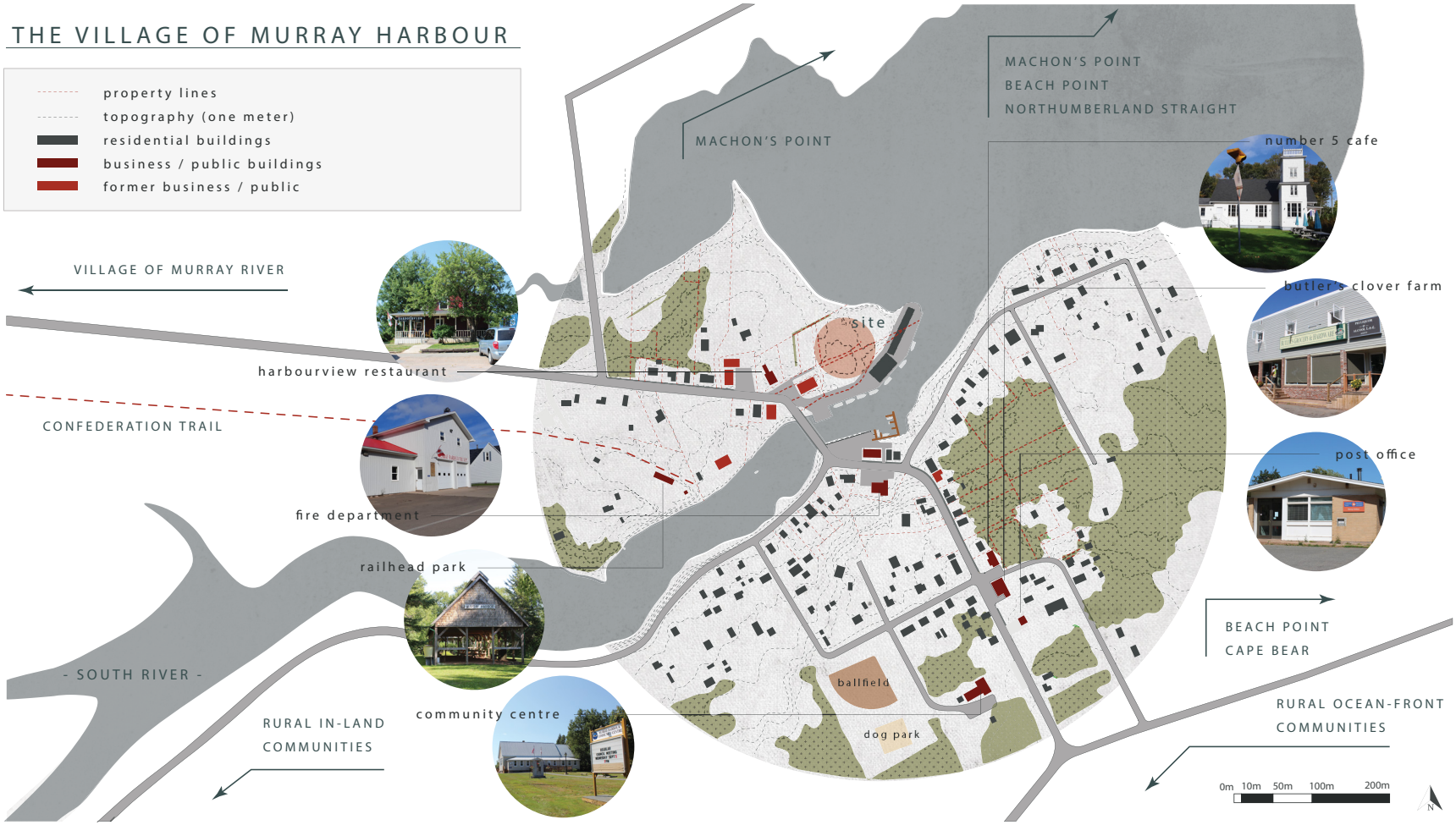
Diagram analyzing the rural land-bound lot for economic add-on opportunities.

Village

The village of Murray Harbour was chosen as a test case based on its declining population and economy despite historical prosperity living from its resource availability, and its position within an ecologically productive watershed environment. The municipality encompasses an area of approximately four square kilometres; however, the surrounding rural communities of Abney, Beach Point, Cape Bear, Guernsey Cove, White Sands and Gladstone have formed in close relationship to the village (Rural Municipality of Murray Harbour 2019). It is a quiet place with a population that floats around just 250 people who enjoy the slow pace of life here. Experiencing severe out-migration over the last decade, the community is now generally made up of two types – those who spend their entire lives there, and those who have purposely sought out this quiet existence. Although these two types cross paths daily, there is no call for their cross-pollination in a co-operative setting.

Described by Tourism PEI (2019) as a rural fishing village that "exudes the charm and timelessness so often associated with life on PEI," the village website further describes it's pace of life as allowing tourists and residents alike to enjoy everything that the community has to offer (Rural Municipality of Murray Harbour 2019). The village is located within a fifteen minute drive from the Northumberland Ferry which connects Wood Islands, PEI to Pictou, Nova Scotia. This proximity often catches the stray traveller who takes a right turn off of the ferry. Nearby attractions include King's Castle Provincial Park or the Cape

Aerial photograph showing the village of Murray Harbour centred around its active wharf and bridge along the South River of the Murray River watershed. Many rural Island communities were formed around a wharf (South River Murray Harbour Port Marina 2019).



Village map of Murray Harbour, outlining existing businesses and public spaces, and connections to the neighbouring village of Murray River, and surrounding rural communities of Abney, Machon's Point, Beach Point, and Guerensy Cove. Base map data (Government of Prince Edward Island GIS Data Catalog).

Bear Marconi Station that received the first call from the Titanic in distress. Railhead Park marks the ground where the railway station and turntable once were once located. It is the trailhead of the Confederation Trail, an island-wide trail system on the footprint of the departed railway system. Tourists can find a variety of accommodations including a motel, cottages, bed and breakfast and campgrounds nearby.

Typical private residential lots in the village have the house closely set to the street with a minimal or small front and side yards or driveways separating the house from its neighbours. The backyard tends to be larger and often holds mini barns and other small out-buildings for workshops, and storage sheds. Houses with a south-facing exposure can benefit from government grants that now make it more accessible to purchase solar panels. Grant applications such as this and other information from Efficiency PEI and other organizations would be accessible at the production facility where homeowners can also learn hands-on skills for building structures such as greenhouses, composting units, and rooftop-scale wind turbines. Within the village priority framework, the community might engage in urban densification, sub-dividing larger backyard lots to house small residential units. These units could become homes for the elderly who have out-grown the need for their large house, or to supplement incomes as a tourism rental. Backyards might also become productive in a number of ways, utilizing existing structures as much as possible, for new small business start-ups such as furniture making for example. Likewise, the home

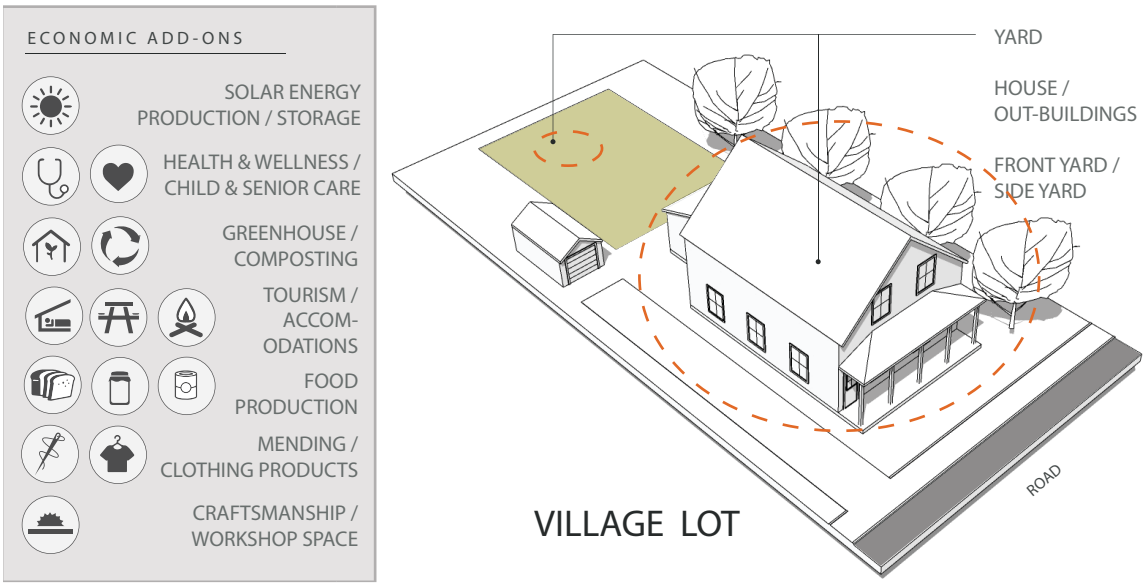


Diagram analyzing the typical village lot for economic add-on opportunities.

itself can become and economic space by utilizing spare rooms or the kitchen for activities like craft-making, baking and other food production. Houses and other buildings within the village can be renovated or modified to some degree to become places of child and senior care, allowing the elderly to age in place and children to develop relationships that are rooted in the community.

At the heart of the village is the Murray Harbour Community Centre which is situated directly south-east of the proposed building site. The Community Council meet here monthly and live stream their meetings for village transparency (Rural Municipality of Murray Harbour 2019). The facility also regularly hosts events such as traditional ceilidhs that are a popular attraction on the east coast, weekly farmers' markets during the summer, community school and various other events. A stage and basement greenroom with costume storage hosts regular plays that are put on by the local drama club, the Village Players. Attached to the front hall space is a complete industrial-style kitchen that allows for sizable community meals and catered events. Behind this is a classroom space and a public library that are housed in the old two-room schoolhouse that pre-dates the contemporary regional school system. Adjacent to the community centre is a ballfield, dog park and playground.

Murray Harbour Community Centre. The heart of social life in the village, it houses a library, industrial kitchen for community meals and events, classroom space, and a stage and hall for regular performances.

Butler's Clover Farm and Liqour Agency.

The Lucky Dollar (Community Access Program, 2018.)

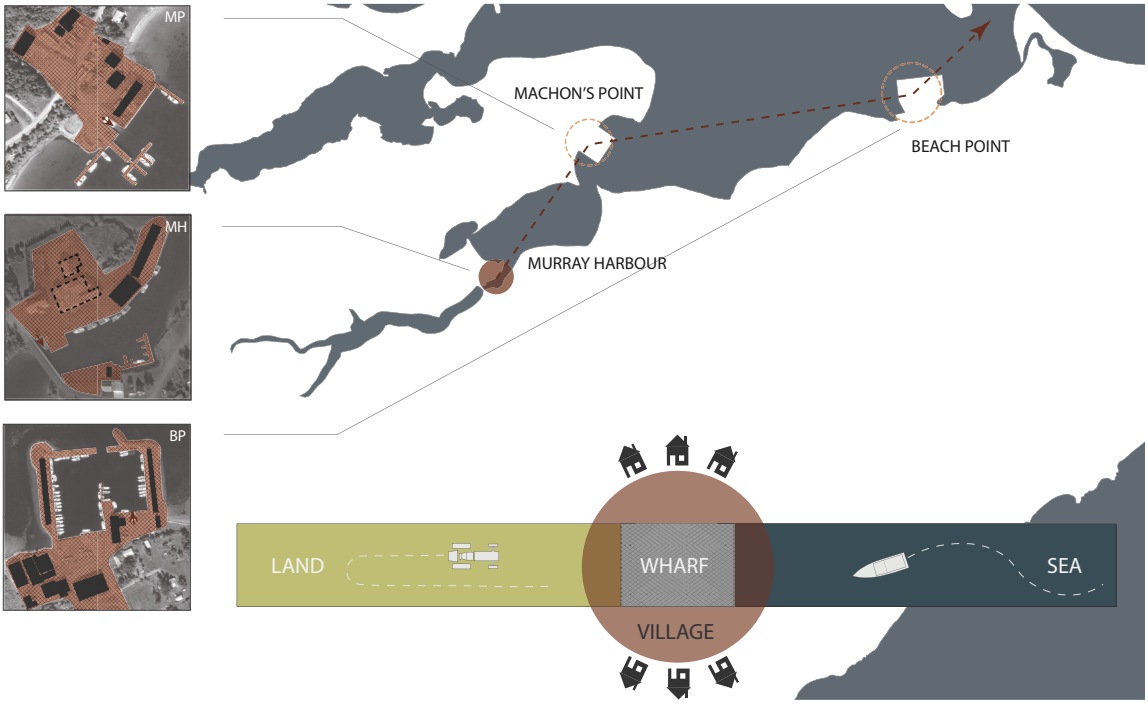
Now the village's only store, Butler's Clover Farm is a general store situated within view of the community centre and is another popular social zone within the village. It is a local hangout for drinking coffee, and has recently begun to offer in-house baked goods, hot lunches and pre-made and frozen dinner options. During the summer the store is a popular stop for recreation seekers looking for ice, liquor, and barbeque items. In addition to selling basic groceries, this store also sells selected hardware and building supply items. The upstairs level has been renovated into apartments that offer housing to seasonal workers who come from as far away as China or Mexico. Without the store, a twenty minute drive by car is necessary to reach the nearest town of Montague, and as such, it is an integral part of village life. The Harbourview Restaurant is a popular eatery that attracts people from all across the Island each year. The #5 Café opened more recently in an old church located next to the store and has become very popular for its food and desserts as well as their homemade preserves. Other village amenities include the post office, a volunteer fire department, and an automotive repair shop.

Site

Wharves are sites of significant economic activity that mark the coastline of Prince Edward Island, and often are the nucleus of rural villages, as is the case in Murray Harbour. The village formed around a narrowing of the South River where the waterways allowed inland shelter for tall ships to moor. As it began, the wharf remains physically central in the village and is a marker to all who visit of its sea-faring economy. Both a working and a social environment, the wharf interfaces land and sea, but is also a place of ecological insecurity. Surrounded by some of the village's most historic buildings, a now-vacant lot directly adjacent to the wharf was chosen as the site for the community production centre. A fish factory occupied the site, although long-vacant and in full disrepair, until it was recently torn down. The site is prominently located within view upon approach from all directions including by boat, and now grows wild through patches of pavement and concrete. Despite a rich history, the site is now a hole in the town fabric but is reminiscent of the long-standing relationship of the village society to both land and sea as a means for self-reliance.

View of the site looking north near the existing entry with fish shanty building appearing to the right. The site, now privately owned, was the location of a lobster processing facility in Murray Harbour, PEI that was demolished within the past ten years. This piece of land adjacent to the wharf is again for sale.

A small network of three wharves along the South River combine to form the infrastructure for fishing industry operations in this area. Furthest inland, the Murray Harbour wharf is where fisherman can store their equipment, and dock and fuel their boats. Within sight from here is the next wharf where Machon's Point Fisherman's Co-op is located where fisherman can sell their catches and get ice while buying bait. From here, the largest of the wharves and located near the entrance to the ocean at Beach Point is visible. The Beach Point Processing Company located here processes lobster into frozen products. Not far inland from any of these wharves are services that support the fishing industry, such as commercial cold storage facilities, boat-hauling services, and one of the Island's few remaining boat-builders.



Map of the South River and its system of wharves at Murray Harbour, Machon's Point, and Beach Point that together, make up the infrastructure that allows the fishing industry to operate in this area. The village formed around the wharf and is an appropriate position to build on the site's productive history.

Beach Point houses the most industrial of the wharves with a large fish processing facility.

Photos from the nearby wharves of Machon's Point and Beach Point illustrating the industrial landscape of wharf environments that currently allow the fishing industry to operate commercially.

The river divides the working wharf on the north from the tourist-oriented marina on the south. Viewed from the parking lot south of the river, the site can be seen in the centre.

Fishing boat in progress at the local boat-building business. The operator is one of few remaining in this trade despite the area's long-standing past steeped in the craft. Many new boats are now built out of fibre-glass, but the MacKay boat shown here is built of wood which has largely been felled from local forests.

Individual and communal fish shanty typologies. The individual units shown above from North Lake, PEI are detached, but generally located side by side. The communal type appearing below from Beach Point are attached and usually painted different colours to differentiate the units. This type can have either a gambrel or a gabled roof, but both utilize this space for added storage.

Small buildings known as fish shanties on Island wharves serve to house fishing equipment. These built forms at Murray Harbour and in Beach Point take a communal form which differs from the individualized forms that exist as other Island wharves. Both typologies have doors on both sides of each unit to allow for loading and ventilating wet traps for storage at the end of the season. The gambrel roofed structure in Murray Harbour has additional storage for lobster traps in the attic. Hatches above the door allow traps to be hoisted into the roof for storage during the winter and can be accessed by a rudimentary ladder built into the wall inside of the door. Over time, these buildings are repaired as necessary, and although the total form is communal, each unit is sometimes individualized by its owners. These working structures are representative of individual ownership within an overall common structure, informing the concept design in their linear and modular form.

The fish shanty building is built with trap-storage in mind with a hoist system to utilize attic space.

On the wharf side of the gambrel-roofed fish shanty, people from the community have used colourful paint to fix up a patch of the building's facade.

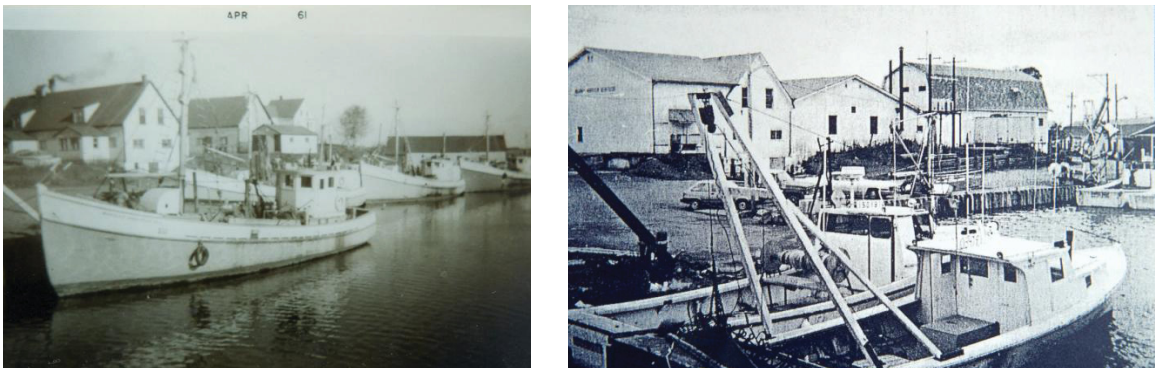
The site is bounded by water on three sides with a view down the river offered from the north and views to the village from the south. Running along the east side is a paved wharf that sits just above the highest tide which the site rises slightly in elevation over. Near the entrance to the wharf is a large yellow two and a half storey wood building that has been built onto and changed forms throughout its history as a store but is now privately owned. The factory building also morphed in form throughout its years and stood directly beside the store which operated until recently as Miss Elly's Genteel Gifts and Things.

To the north, a roughly circular expanse of land offers the highest elevation on the site at approximate three metres above sea level and offers views down the South River. It marks the place where a prominent house of Fred Prowse once stood into the 1970s and the old well is still embedded in the ground, although it is now very close to dropping off the side

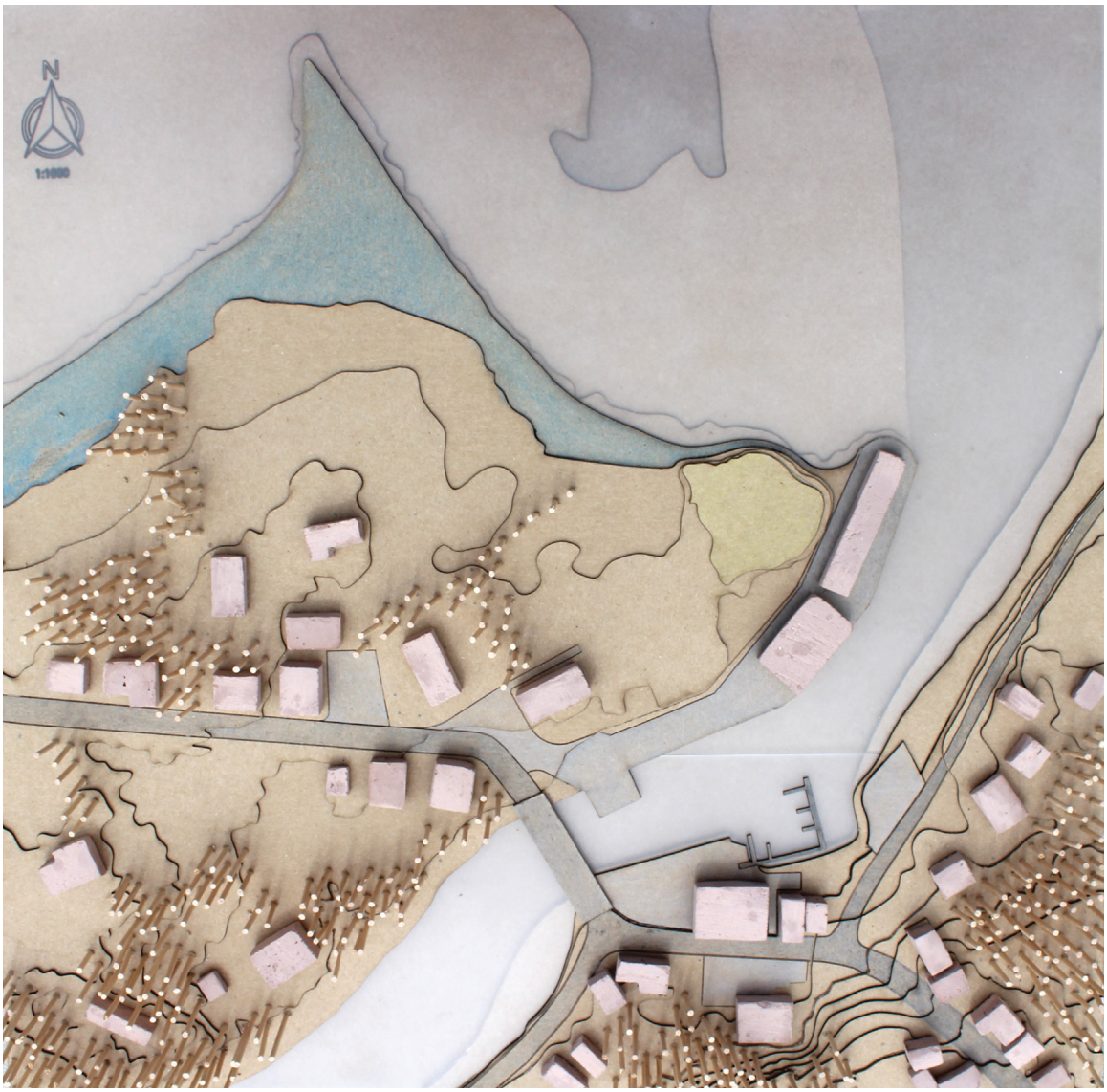
Aerial views of the former lobster processing factory in Murray Harbour located on the prioject's site adjacent to the wharf (South River Murray Harbour Port Marina 2019).

of the cliff. This area will be reserved as a community greenspace zone to make this once private view public for all to enjoy as a multi-use outdoor space. A central firepit is located amidst paving that marks the cardinal directions and surrounded by semi-circular bench seating. The circular nature, derived from Mi'kmaq storytelling circles, serves as a meeting and place of social exchange where everyone can be heard within the community. This space can double for other gatherings including outdoor concerts or flooded as a skating arena in the winter.

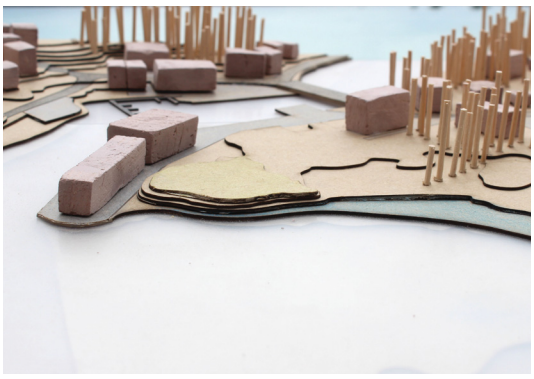
Existing access points to the site are located on the west and east sides. A narrow laneway runs parallel to the old store building on the west, connecting the parking space in from the Harbourview Restaurant to the site. This is a place of socializing during the warmer months and mixes locals, tourists, and summer residents. To the east, access to the old factory is still visibly paved leading from the wharf nearest the red shanty building and dissolving into the overgrowth. Trees bound the property to the north and west along the property line, providing shelter from the dominant north-west winds and dividing the property from its residential neighbours. This wind-block is amplified through the design of a berm that doubles as cold storage for produce and equipment. It also serves to protect the site from future rising sea levels which will eventually flood the water basin to the north.



Images of the late factory building that occupied the site until recently (Community Access Program, 2018).



Model of wharf portion of the village of Murray Harbour, PEI. Two fish shanty buildings run linearly along the wharf where fishing boats dock. On the opposite side of the South River is additional wharf space and a marina for small recreational boats.



Former house of Fred Prowse was once located on the project's site adjacent to wharf until the 1970s. The house is situated with a view looking down the South River and its location can still be identified on site as a raised portion of land and the old well near the edge of the cliff. (Author unknown. Accessed from the Public Archives and Records Office, [Acc2689/125]).

The factory footprint on the south side of the site is reserved for a community solar garden. Designating this space to remain open for its solar access displays the garden as a symbol of ecological regeneration at the forefront for the community. The building is set back to keep the site open as an invitation to enter, creating an intermediate zone between the wharf and the production centre as a place of social gathering while working or meandering the garden. Since this patch of land is heavily polluted, the community would use composting strategies to begin re-building its fertility using seaweed from the adjacent shoreline, manure from local farms, while developing their own composting centre for the future.

The building is oriented southerly to make use of passive solar potentials but is angled slightly counter-clockwise to better fit the shape of the site in relation to the community greenspace. The building is activated from north to south and grows linearly in an east-

Prowse and Sons store was among the first stores in Murray Harbour ca. 1900-1910. (Photo taken by Elliot J. Lumsden. Accessed from the Public Archives and Records Office, [Acc2689/214]).

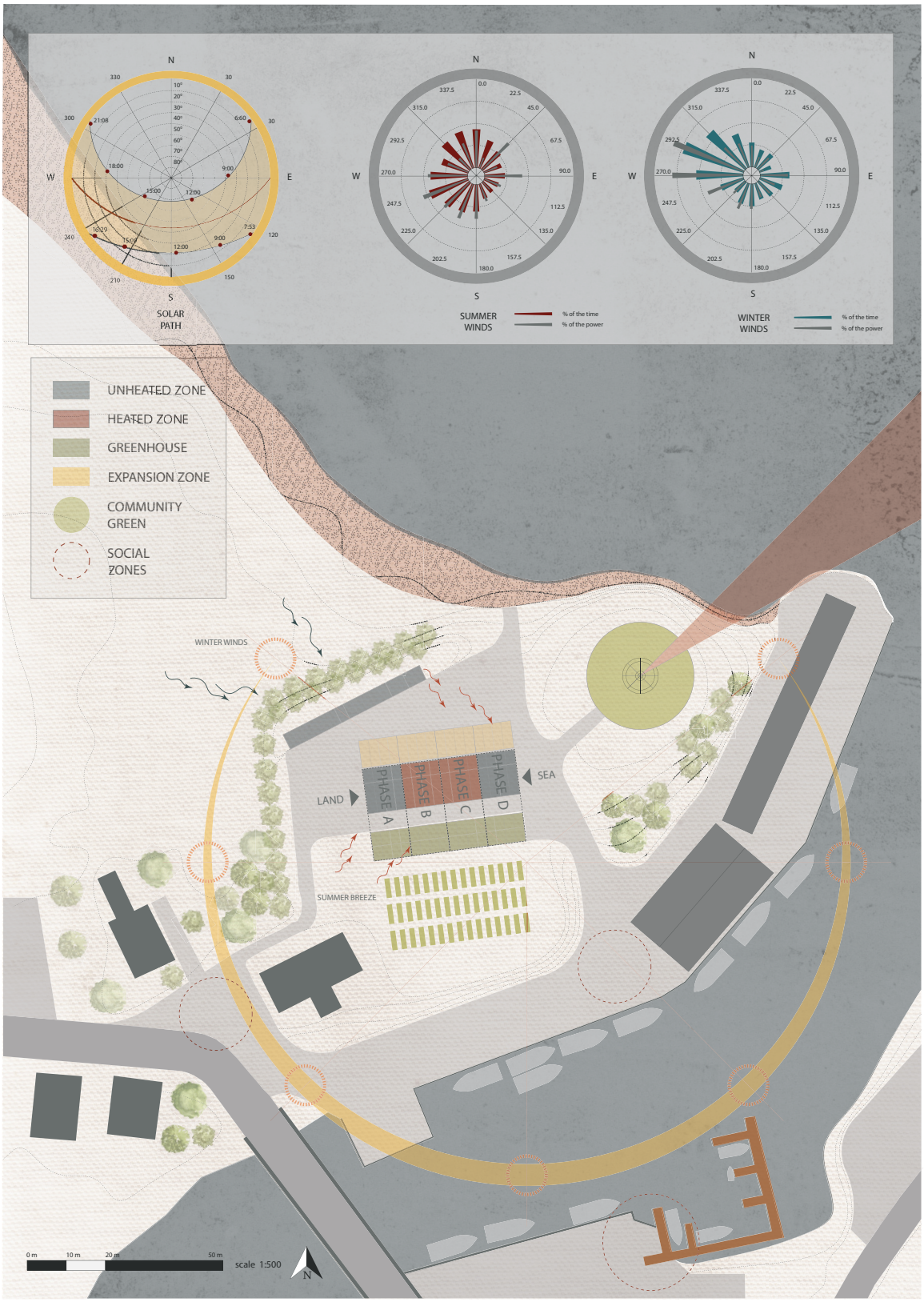
The building remained a store into the 2000s as Miss Elly's Genteel Gifts & Stuff. (Photo taken by Elliot J. Lumsden. Accessed from the Public Archives and Records Office, [Acc2689/122]).

west direction. A phasing grid is projected on the ground as a starting point for community discussion to guide the building strategy over time. In its completed form, the west end of the building will deal with resources from the land while the east end deals with ocean resources. The greenhouse begins as visible separate from the main production centre, but in time can be connected through the construction of a lobby space. However, the greenhouse acts as a solar collector for the facility and is connected to it through underground heating ducts that store hot air in the mud vault below the main building.

Panoramic views of the site from (a) the northern edge looking down the South River, (b) the northern river edge looking south towards the site, (c) at the existing entrance to the site looking east towards the wharf buildings, and (d) looking west from the centre of the site with the old store in the background.

Method of Community Engagement

Empowering communities to take ownership of their space requires their direct involvement in the design, build, maintenance and future expansions of the production facility. Since ecological design unfolds over many years, it is imperative that the building coevolve with the wishes of its stewards (Van der Ryn 2007, 176). Prior to industrial methods of production, design was a naturally intuitive practice for most people. For the community to re-create its sense of self-sufficiency, they must be able to take charge of their own future, and this requires being able to take charge of their community facility. Thus, the architect must relinquish much of their creative powers, viewing their role as designer in a radically different way.

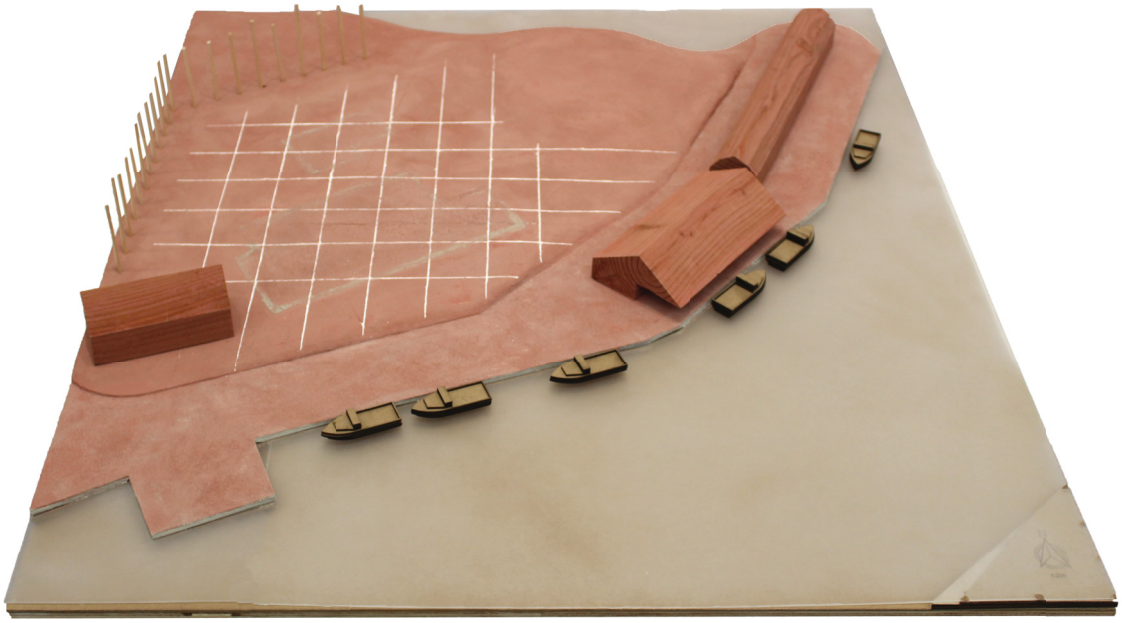


Site analysis with winter and and summer wind rose diagrams and solar path.

The role of the architect may be described as a cultivator – someone who sows seeds through the integration of design within the everyday life of the community. Forming an ongoing relationship, the architect helps develop what Hester termed a 'priority framework' to guide future initiatives. Cultivating a community's ability to insert incremental change within their daily life encourages collective social action towards ecological sustainability. This enhances rural self-reliance by strengthened social, economic and ecological connectivity. The architect plants a metaphorical seed of regeneration within the minds of the community, growing its sense of resiliency as a regionally connected organism.

Developing a method of engagement is key to creating community dialogue, allowing citizens to imagine radical possibilities and a variety of potential roles that they may play or ways to contribute. Hester (2006, 39) developed a design approach that includes place knowing, place understanding, place caring, and subsequently, action. The process begins with listening to the people and the place and setting goals that increase the participants' knowledge of their community. By making a comprehensive inventory and mapping, the designer can introduce the community to itself and expand local knowledge and understanding of its urban ecology (369). Participants are more likely to take responsibility of a place if they are involved in its analysis and decision making. This process nurtures stewardship by creating a forum for participants and designers to learn from each other and their ecologies (370).

Although unable to work directly with community, this project develops a method for working with rural Prince Edward Island Communities. Study of historical context, regional and village scale analysis educated the designer of the intrinsic qualities of a place, allowing them to compile opportunities and goals for sustainable development to the community. Promoting knowledge of the ecological, social and economic fabric to the community, they are better able to insert and activate incremental changes at home and within the everyday life of the village. The project that is developed below is not considered a final design, nor does it achieve to be as it is absent of community involvement. Rather, it is a starting point, an initial tool, for beginning a design with the community.



Gameboard model base for a starting point for community engagement in discussion and planning a priority framework for the village and production facility. The base model acts as a gameboard on which pieces can be placed as a tool for imagining possible development schemes, starts with the existing lot with treeline, and neighbouring buildings. The old factory building footprint is marked on site with a grey outline, and a 32' phasing grid is scratched into the earth to orient the activity to the sun.

To involve communities in the design of their facility, this thesis develops a gameboard-style model that acts as a tool for community engagement. The physical components of the board allow the citizens to envision the possibilities within the village, connections from the village to the site, and the future possibilities that such a building framework may allow to arise. The board itself models an essentially flat site with an elevated mound and marks the footprint of the former factory building. The existing treeline delineates the site from the adjacent properties to the west, and the fish shanties and former store are modeled in wood collected as scraps from the local boat-builder. A 32'x32' grid is scratched into the earth to establish spatial definition through an initial phasing grid that orients itself to the solar axis.

To promote user appropriation and empowerment within the co-operative production facility, Schmidt recommends what he terms an 'unfinished design' that allow users to alter the space to suit their needs. Permitting an interaction between the occupants and the architecture, unfinished design allows users to take an active role in their physical environment (Schmidt 2016, 28). As a two way interaction of the building 'learning' and the

user ‘teaching’ establishes balance between the scale and relationships of spaces in the building. The form and structure can remain the same, but the frame takes on different uses by forming new relationships with the users. However, Schmidt warns that too much freedom is also bad. There must be a certain level of rigidity which acts to increase the building’s opportunity for change (29).

Schmidt further recommends (2016, 68) investing more in the structure and necessary components of a building rather than its finish, while leaving the option for addition or subtraction of components that are less defined. The level of flexibility should be effective and efficient by considering the type of changes that might occur, and how best to accommodate for these. Hester (2006, 260) recommends starting square or of a conventional typology, and letting the building become unique in time. Designs should combine small and large rooms, rooms that are partially designed, and structures that allow for growth over time. Thick ecotones should be used to transition from interior to exterior and outdoor spaces should be in scale with the functions that are likely to happen there, allowing for spillover space from the interior (262).

Spatial flexibility and phasing potentials allow the building to grow as needed, so that the community can adopt an iterative approach to re-forming itself seasonally, annually, or as required. The building can develop over time in relation to the community’s financial capabilities as well as changing needs, along the east-west axis in a modular fashion. The flexibility of the building’s component parts allows programs and spatial configurations to move linearly along the phasing modules to be re-configured as the building grows outward. The building’s adaptability allows the community to alter its built space to suit its evolving needs where programs and activities can rise and fall within the dynamics of the socio-ecologic current.

Informed by local barns, boat-building structures, and communal fish shanty buildings, the formal design of the production centre is familiar to the community and within their skill set and access to local materials and labour. The vernacular gable form is regionally well-known and the starting point for most structures in the area. Its simplicity and familiarity of form allows the community users to replicate it linearly throughout its phasing, and to add their own additions in time. The modularity of the building which allows its

phasing to occur is inspired by the nearby communal fish shanty building. Building along a linear east-west axis guarantees new phases access to passive solar heating and additional program space while leaving the north side flexible to support community add-ons in time. The structural scheme is inspired by local Amish barns, and are reflective of the collective engagement involved in Amish barn construction. The Amish are well-known for their quality construction, and many Islanders now hire them to build for them. It suggests that they may be involved in the construction of the project as a means of transferring knowledge and reinforcing community connection through diversity.

Formal inspiration is taken from this 30'x40' Amish-built horse barn (Photos taken by Jill Thomas, 2019).

Systems

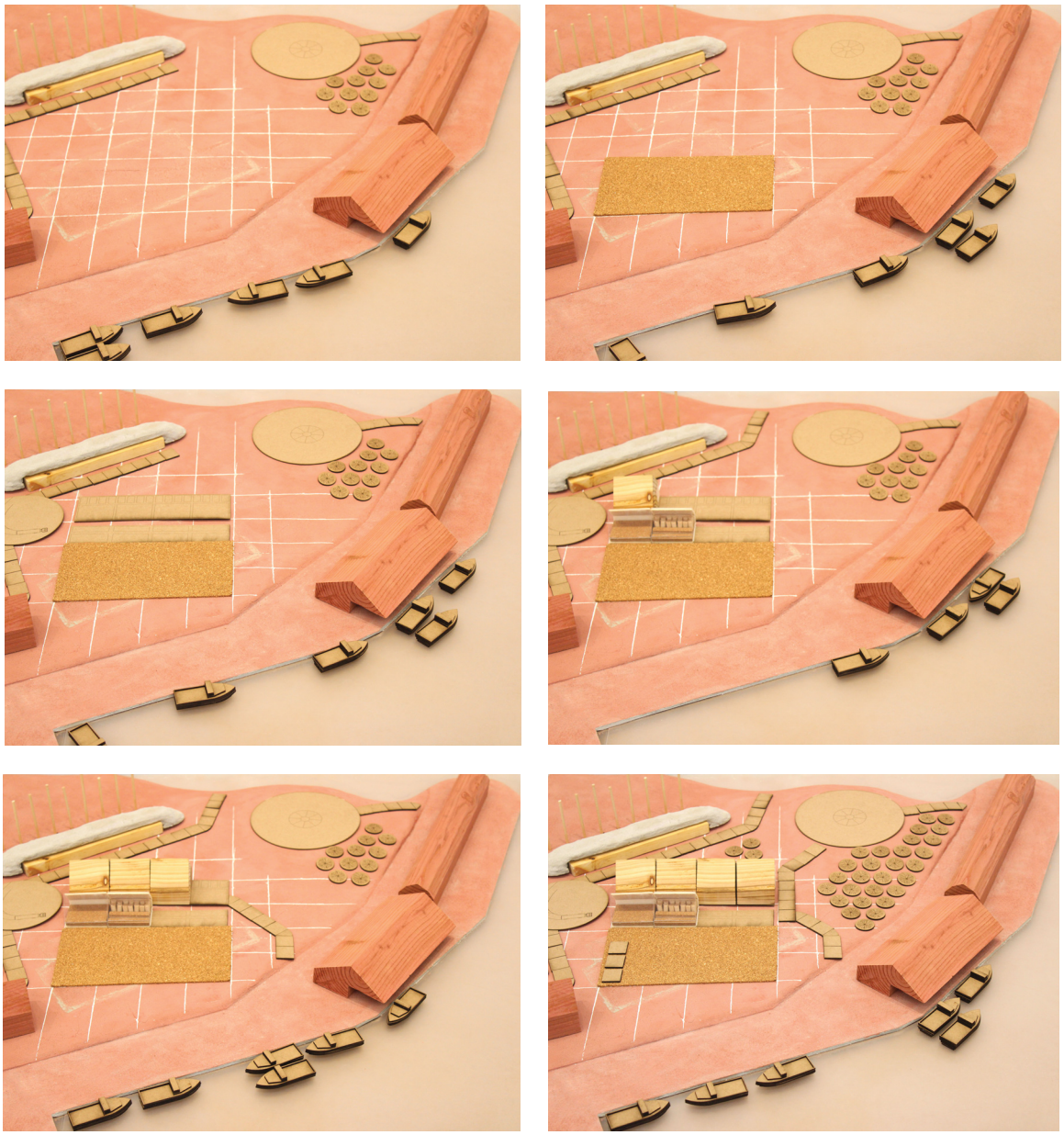
A system is a set of interconnected components which over time produce their own patterns of behaviour over time (Meadows 2009, 2). Understanding relationships between the structure and behaviour of these components allows incremental shifts towards more desirable patterns, multiple pathways and redundancies, and increased stability (1). Meadows explains that, "A system generally goes on being itself, changing only slowly if at all, even with complete substitutions of its elements—as long as its interconnections and purposes remain intact. If the interconnections change, the system may be greatly altered (16)." The basic operating unit of systems, feedback loops allow systems to undergo profound change through a change in purpose even if components and relationships remain unaltered (17).

This thesis introduces a set of built components, referred to as production modules, greenhouse modules, cold storage modules, and solar garden modules. The living components, considered as actors within the wider ecological system, are human, animal, aquatic and plant life; but they are also the earth itself, the flowing waterways, the wind and rain. The human components are members of the community within which nested sub-systems exist, including tourists and summer residents, migratory workers, and any other visitors who happen upon the site. Inspired by the work of the New Alchemy Institute, this building operates according to an internal eco-system that, requiring human participation, passively heats the facility while producing food for the citizens of Murray Harbour.

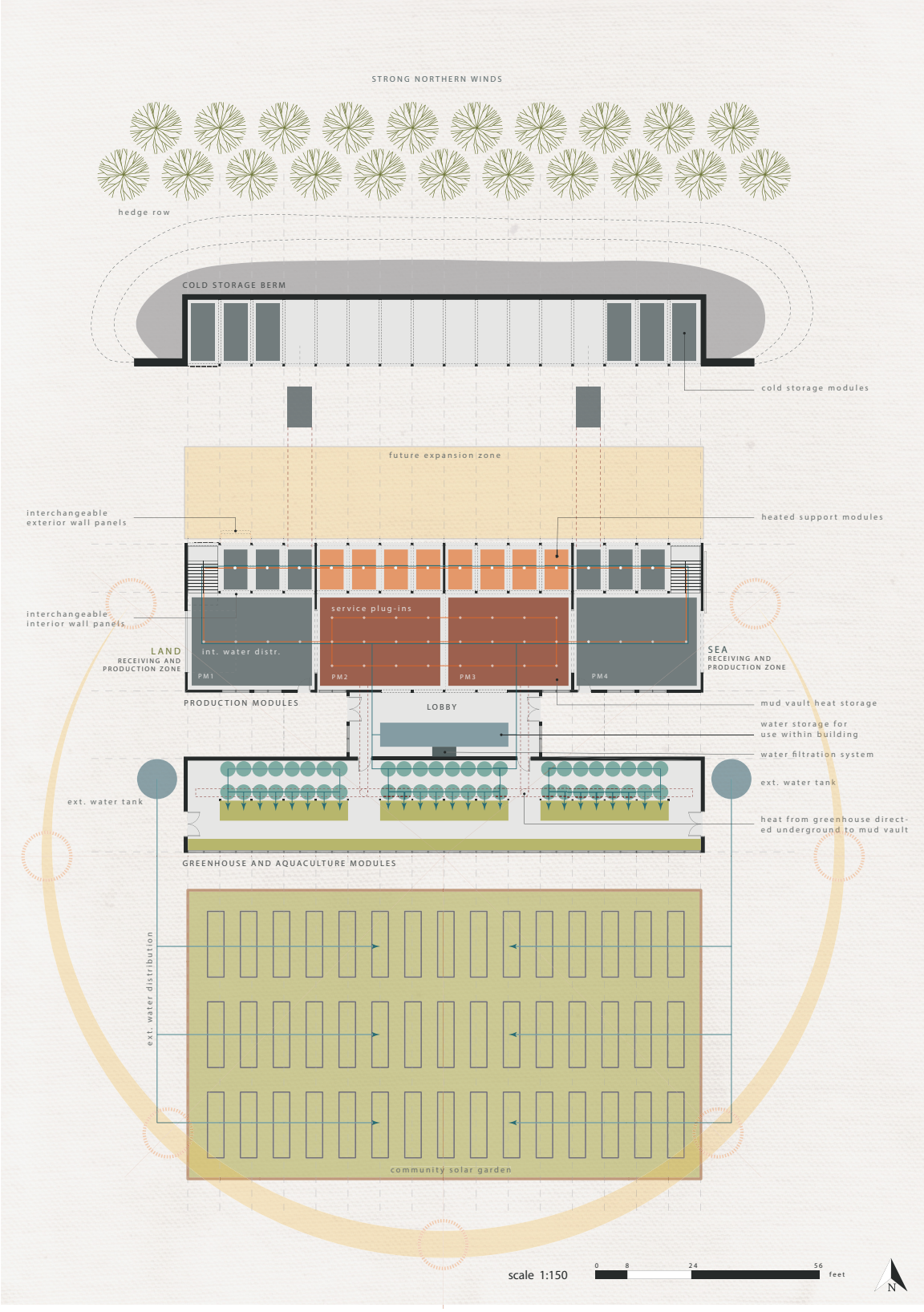
Gameboard model pieces representing the production module with support modules, greenhouse modules and solar garden components, cold storage berm and game piece tokens. These pieces can be placed by the community on the gamboard to play out multiple scenarios and building growth patterns.

Combining these components within a phasing scheme grows the building's ecosystem structure over time. Planning for the future, the community develops a growth plan for the building that is part of their priority framework for the village. Each of the four modules can grow incrementally, creating space for a densified range of programming. The production module is for the primary collective activities and is separate from but heated by the greenhouse module. The exterior solar garden contributes to the food-processing system by providing additional planting space, a yard for small livestock, composting units and other solar-activated buildings. The cold storage berm creates a micro-climate for the work yard, while modules within act as cold cellars, seasonal storage, and flexible space for the work yard. Over time, these building components combine to develop under the growth plan for a more elaborate system of self-sufficient community production.

Photographs showing boardgame pieces creating play scenarios.



Photographs of the gameboard in play describing one possible phasing of a development plan. The play begins with the community taking ownership of the land, clearing and leveling the community greenspace as open park space for leisure and community events. Trees are planted and the earth berm constructed. As the priority framework develops, the community establishes and cultivates the community garden. Food harvested from the garden is stored in the cold storage modules that begin to develop at this time. Next, attention is turned to zoning and preparing the rest of the site for the building's beginning foundations. A turning radius determines the placement of the building plan from the west side. This sets the terms for the building's growth on site. The first un-heated production module is built followed by the first two phases of the greenhouse in the next year. As planning is underway for phase two and three of the production centre, mud is transported from the shoreline into the mud-vault and earth tubes, as the foundation is developed. The two production modules, when built will be heated for year-round use from the greenhouse. Small buildings crop up in the solar garden for solar dehydration, a moveable chicken coop, and composting.



Conceptual plan diagram outlining the building components, program zones, heating and water systems. This drawing represents the seed which guides the building's development.

Production Module

The 32'x36' production module is a basic gable-roofed form that houses community production activities such as food processing and preserving. This space is divided into one 32'x24' open space with 16' ceilings on the building's south side, and four 8'x12' sub-module spaces of post and beam structure on the north side. The large collective space receives light from clerestory openings and from ground floor windows. East and west ends of the building have large door openings that allow ample ventilation and access in the warm months, encouraging flow throughout the building. The 16' floor to ceiling height allows for over-size projects such as boat-building workshops, or for tractor or fork-lift accessibility. The sub-modules on the north serve as a support spine employing a system of flexible and re-configurable walls to promote a range of program opportunities.

The production module to the west side of the site is unheated and devoted for land production activities where produce from the solar garden and greenhouse can be managed year-round. Activities such as washing and cutting produce, cooking, preserving and packaging food. The module to the east side is designated for ocean production, taking

Sectional model of the production module and cold storage berm, showing basement mud vault and earth-tubes system, support modules with service space above and open attic space on the second level.

similar activities in localizing fish, seaweed and other ocean products for local purchasing and trade. The support modules in these units can serve as temporary storage for the movement of products, or for equipment storage that allows production activities to easily swap out.

The panel wall system is both interior and exterior and, with group effort, can be installed at different locations on the building's façade or within the internal post and beam structure. Built using standard framing techniques, these wall panels could be built by members of the community as a hands-on educational opportunity for skills development. Inside, flexible panel walls allow the 8'x12' modular space to add and subtract, forming 12'x16', 12'x24', 12'x32' spaces that can hold a range of program. The support modules can be used to support production activities such as storage or break-away zones for smaller activities. They can combine to create classroom, office or meeting room spaces, or for additional service space like washrooms or janitorial rooms. Light-weight movable

Sectional model of the north side of the production module showing on the left, the post and beam structure that creates the 8'x12' modular support space with accesible service space above; on right wall exterior wall panels and placement within the support modules.

walls can be used for increased flexibility, or more permanent walls can be designed to subdivide the space depending on the programmatic plug-in. Refit-able stairs would be constructed such that they could be reconfigured within a different module, allowing the building additional flexibility.

The future expansion zone to the north of the production module is left unbuilt as a 20' band of space reserved for the development of the support modules. A tendency in the region to begin with a basic structure, whether house or commercial building, and add additional attached forms in time in relation to evolving needs and financial opportunity is inspiration for the growth scheme of this building. As the designer cannot predict what needs may arise, or how programs or businesses that operate within this facility might grow, the north wall is flexibly designed for future expansion. The 8'x12', 12'x16', 12'x24', or 12'x32' spaces can grow outward 20' and up to two storeys high, connecting to the attic space above the production module. This allows the community to grow the building as needed as space for small businesses, semi-private or rental space, or any range of possible needs.

Accessible by the refit-able stairs, the large attic space has openings on both its gable ends, similar to many barns in the area as well as the fish shanties discussed earlier. Again, these openings allow cross-ventilation in the summer but also allow large items to be hoisted up for seasonal storage or for re-use at a later date. The attic is a storage home for donated materials that are no longer of use to their owner but that can be recycled, up-

Sectional model of interior of the production module showing flexible dividing walls that sub-divide space between the interior heated modules. A track system could be locally fabricated to allow these panels to swing at a right angle to allow the rolling panels to double as dividers between the module and the future lobby space.

cycled and re-used through a designated storage system and community recycling centre. Items such as household, electronics, books and toys, clothing, seasonal and processing equipment would be held here. Storage opportunities such as this could allow systems such as community tool shares to activate in the building, while community constructed movable furniture like tables, and storage units allow spatial re-configurations.

Cold Storage Module

Along the northern edge of the site, a long berm would be located to mitigate wind exposure on the production module and to create a sheltered and shaded work yard. Similar to the support modules of the production unit, the 8'x16' cold storage modules are embedded within the earth with an 8' column and beam spacing that supports flexible wall inserts. These units can be used as cold cellars for long and short-term storage, allowing cold holding units for ease of produce exchange. Other units can become organized as designated community food storage space with room for sorting and freezer lockers. Activities that benefit from cold environments are held here, such as butchering, making yogurt or other dairy production. The modules can also be used for the storage of seasonal equipment such as snowshoes, kayaks of canoes that can create a recreational rental service on site.

Sectional model of the greenhouse module showing hot air collection at the peak diverting below-ground under the future lobby space and into the mud vault storage below the production module. To the south, community planting beds are shown on the exterior, and within the greenhouse, planting beds and aquaculture tanks are modeled.

Greenhouse Module

The greenhouse module grows along the same 32’ spacing in parallel to the production module, and its form is derived exactly from the Ark project and scaled up slightly to meet the needs of the village. Ongoing participation in tending the greenhouse, which combines aquaculture and planting beds as a solar heating mechanism, is required through community roles of planting, cutting, picking, and feeding. The food products that are grown in this module are transported for processing in the production modules to become value-added products for local consumption. These products can help feed those who are involved in stewarding this system or can be sold or traded with the local restaurants or store, densifying the local food system.

Firmly embedded 4’ into the earth on the south-facing side, the greenhouse module has two rows of planting beds of 3’ and 4’ widths that sit below the large expanse of windows overhead. Elevated 2’ above the soil floor of the greenhouse are 4’ diameter aquaculture tanks sheltered below a white wall that both shades from and directs solar energy. Inset within this north-facing wall are shallow operable windows that allow ventilation in the summer, and upon completion of the lobby space, become a pleasantly warm seating area and visual connection to the internal eco-system. At the peak above the aquaculture

Sectional model of the greenhouse unit showing framed opening for future lobby development, hot air ducts, aquaculture tanks and planting beds. Openings in the north wall allow a visual connection from the lobby to the greenhouse and solar garden. Sliding window panels and shading system provide passive summer ventilation, and control of heat in the winter. A metal track at the window peak allows for hanging plant systems or hydroponics.

Sectional model of the greenhouse unit showing user interacting with the sliding window panel and bench seating along the north wall of the greenhouse. The openings allow a visual connection between the greenhouse and lobby space, and provide a pleasant warming area in the winter months.

tanks, a large air duct pulls excess hot air from the greenhouse unit into earth tubes that divert the air underground for storage in the mud-vault. The mud-vault system, based on an experiment conducted by the New Alchemy Institute following the Ark project, is located below the internal production modules as a heating device to both cool the greenhouse, and to heat the production units.

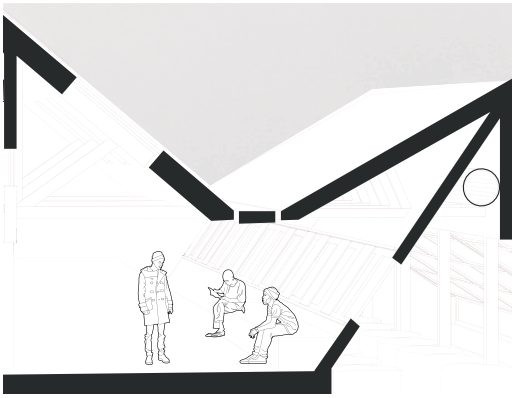
Solar Garden Module

The solar garden inhabits the space reserved on the southern half of the site where it will receive full solar exposure. It can be used as additional exterior space for planting fruit and produce through co-operative initiative, or individually tended beds. In time, this space could become a demonstrative organic farm similar to that of the New Alchemy Institute in Cape Cod by adding to an array of solar and aquatic components. Yard space could be devoted to raising poultry or other small animals, berry patches and fruit orchards. Other built components might include a composting centre that can process food scraps, seaweed and shells into usable nutrients for the planting beds. Other small structures might include beehives, composting toilets, tool sheds, solar dehydration or solar kilns as a small example of what is possible.

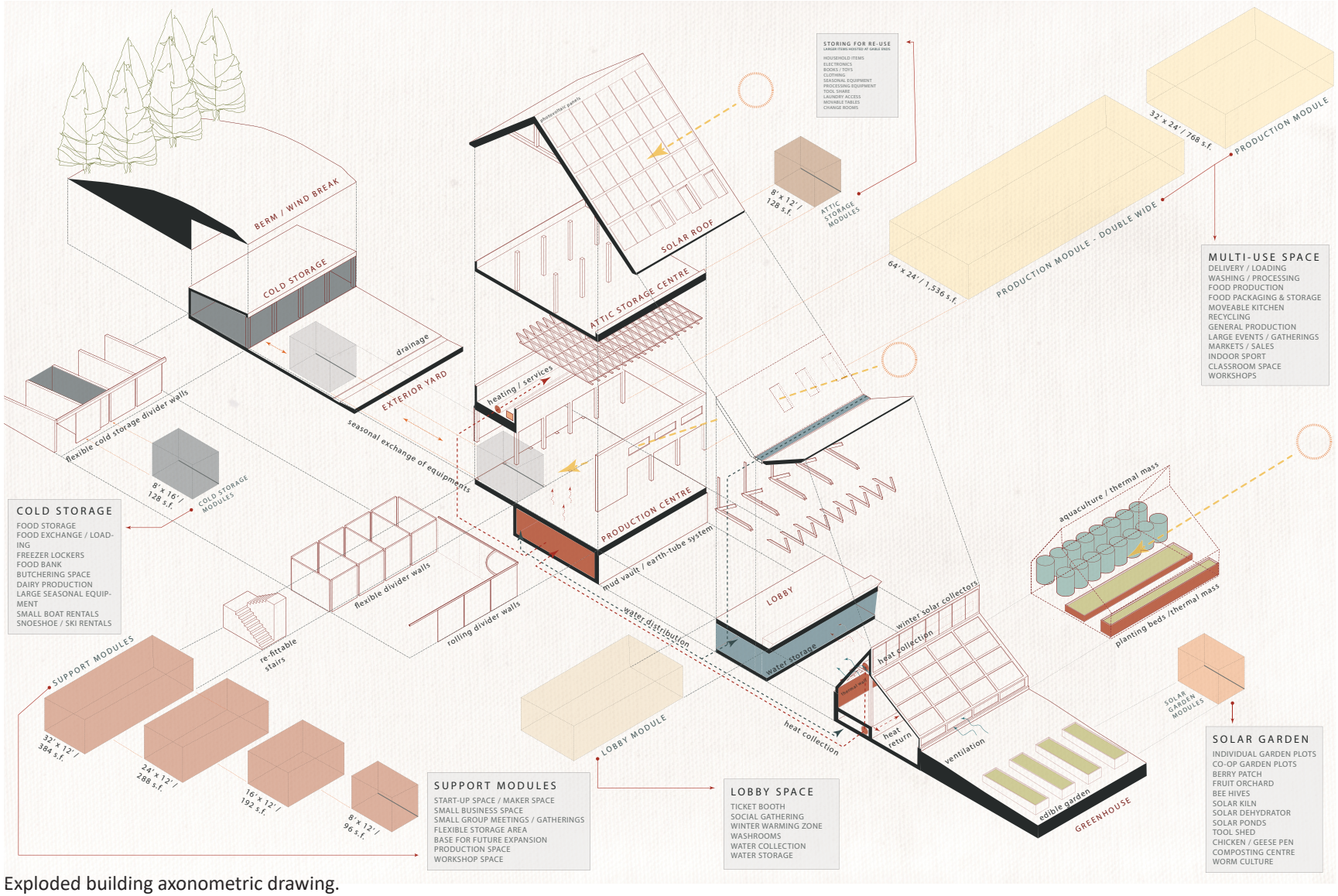
Lobby

As the building develops spatially through phasing, it may become necessary to create a connection point between the production module and the greenhouse in the form of a multi-purpose lobby space. A suspended butterfly roof is attached to the two existing structures that are spaced 16’ apart. On the north, the roof ties into and continues the existing roofline of the production module and is braced onto the supporting beam below. This allows additional space for solar panels, and skylights allow sun to continue to penetrate into the main production space. Of a different slope, the south side roof attaches to the peak of the greenhouse, again bracing back into its structure below, to create a shallower slope for winter snow removal from the drainage system. The lobby functions as a water collection unit by gathering water from both roofs and sending it through a natural water filtration system before being stored in a large cistern below the lobby floor.

Unveiling its interconnections, the lobby would expose to building users and visitors of the systems and processes within the building and create a point in which to congregate and learn. The roof is designed in separate halves to allow the large transparent gutter to be exposed to those standing below it, visually connecting it to the natural water filtration tank that is on display. This transparent tank is made up of several layers of sand, earth, and small rocks to naturally cleanse the water before it sinks by gravity to the cistern. Directly below the transparent gutter strip in the roof, another long window in the floor exposes the water tank below along with the air ducts and water pipes that service the production module. This space can be used as overflow from events in the main space, or as a control point for accessing the greenhouse or production modules. It allows space for components such as ticket booths or tables and provides access to washrooms.



Section through lobby space showing roof construction with roof gutter.



Exploded building axonometric drawing.

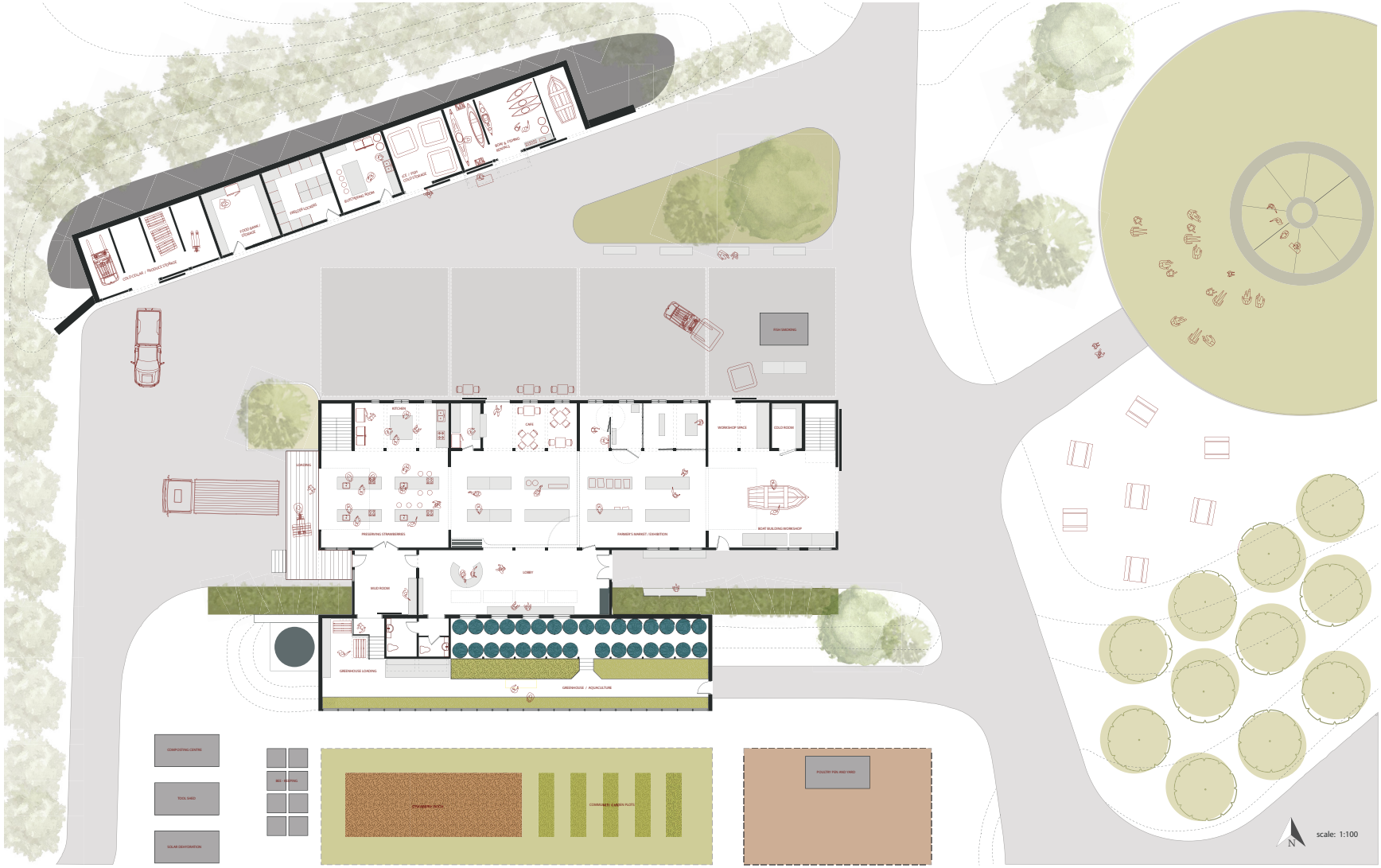
Sectional model showing all four building module compenents assembled together along a north-south axis where building growth takes place along an east-west axis by replication of its form. The greenhouse module plugs into the production module underground to provide its serviced areas with heat stored in the underground mud vault.

Seasonal Adaptability

The building, through its flexible components and the actions of the community stewards, adapts to the spatial requirements of seasonal programmatic changes. The building develops spatially according to local resource availabilities, and its components interconnect such that the building's system shifts incrementally over time forming more efficient patterns of use. The building accommodates an input of food and other local materials while fueling the local economy and out-putting value added products and services. Community participation in this facility leads to skills development through hands-on learning and knowledge sharing, a heightened sense of purpose and integrity within the community, and an overall pride in one's community

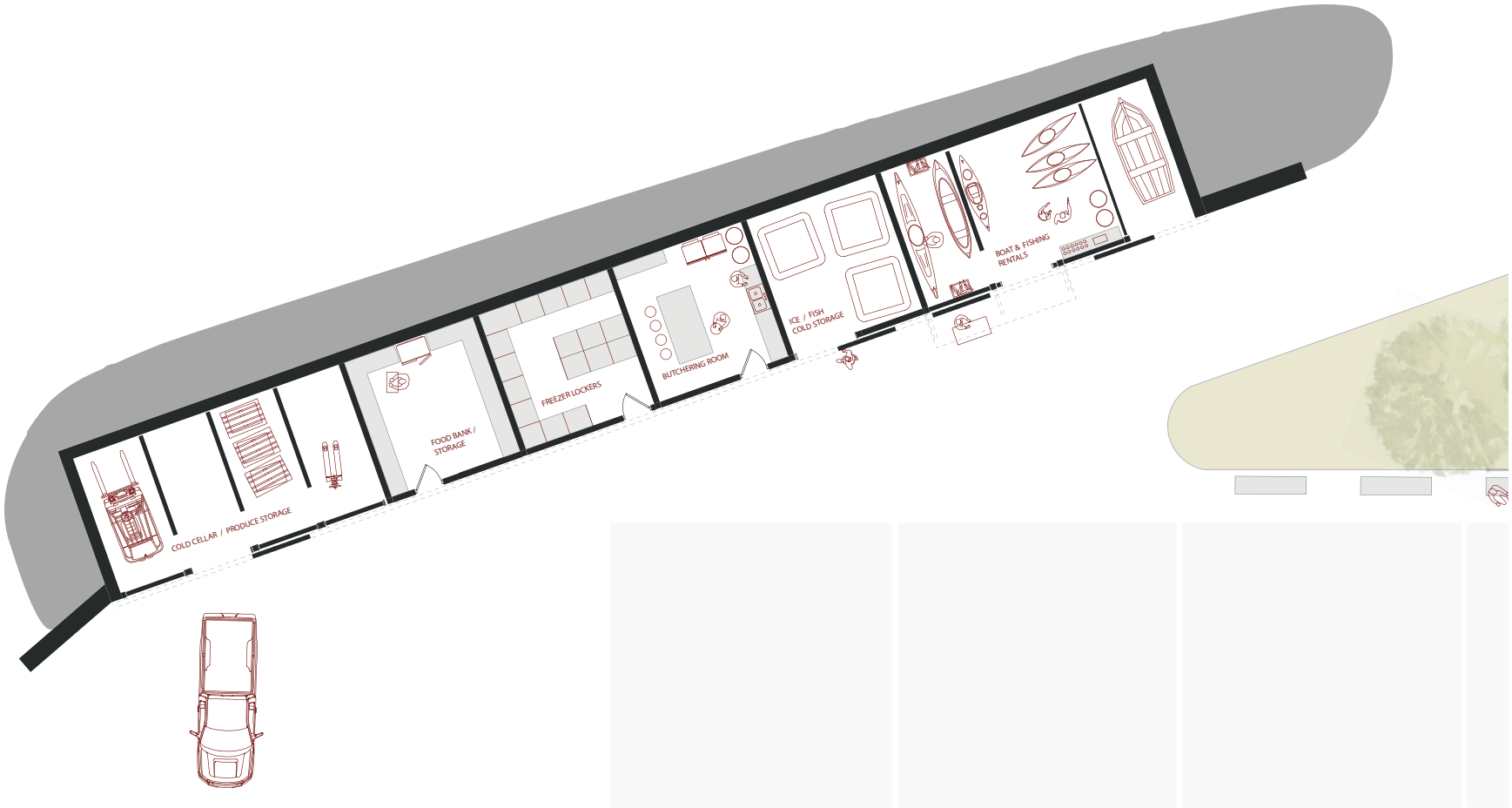
To test the design's ability to adapt to seasonally shifts, the modules were applied to the site and developed into the following seasonal occupation drawings. Here, a specific architectural design is built on the abstracted plan diagram outlining its systems. Although the drawings describe particular applications of module components, the building could have developed quite differently in reality under community guidance. The seasonal descriptions offer possible starting points for the community to imagine what it might create through active participation and are only a very basic starting point for development. The design tries to encompass a logical application of form and program that might potentially arise within a community co-operative setting and represents the fully developed growth pattern.

The summer tourism season is the liveliest time and is the opportunity for the village to shine as an example of society in action for sustainable development. The building has its east and west ends open, inviting people to wander into the local farmer's market, and other activities such as berry preservation and boat-building workshops. A kitchen installed in the support modules on the west end prepares lunch items using food grown on site to be sold in the canteen that is located beside it. An art exhibition displays the work of local artists. A rolling door on the north side of the eastern production module for loading and unloading fish into the cold storage unit. A fish-smoking structure has been built in the outdoor work-yard and the community member who tends it teaches the curious about its method.



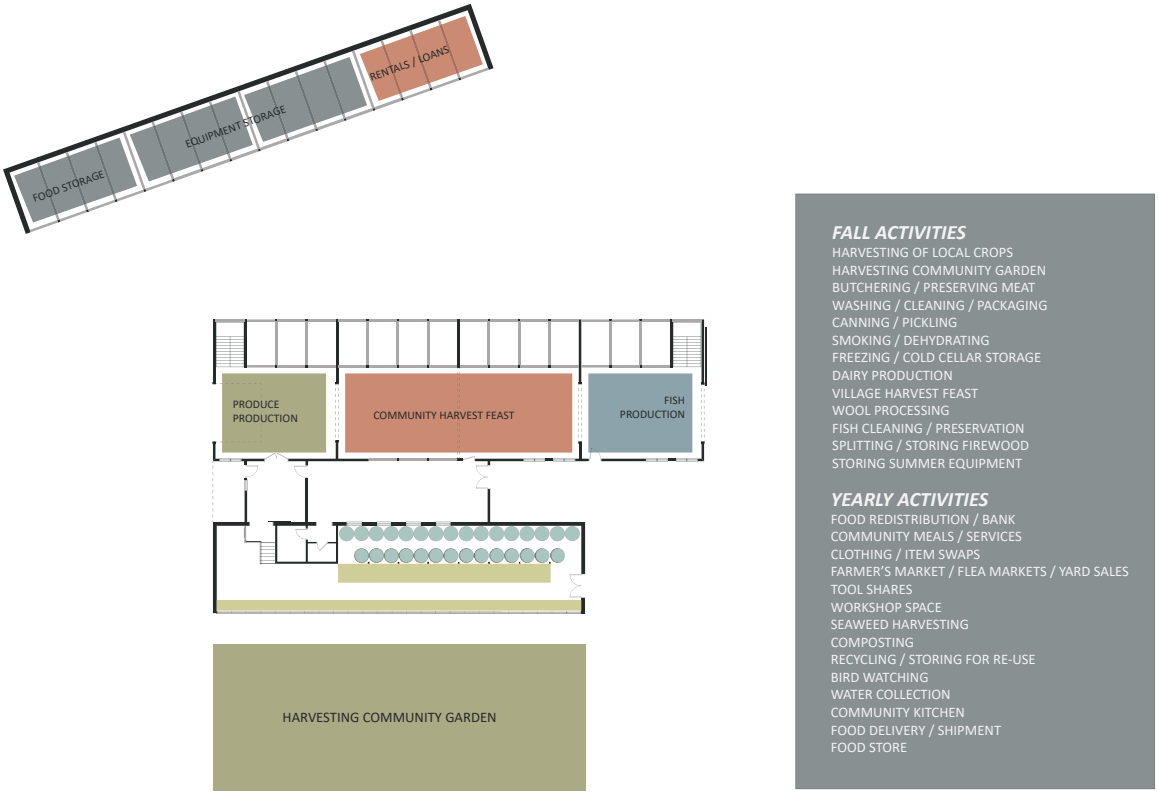
Building plan showing summer programmatic occupation within the building modules. The community green is hosting local music talent, and the solar garden is producing berries for a strawberry social.

Plan showing summer occupation. The interior production modules are holding a farmer's market while the land production module is devoted to preserving the produce being grown in the solar garden. Boat-building workshops can take place in the sea production unit while fish smoking takes place in the workyard.

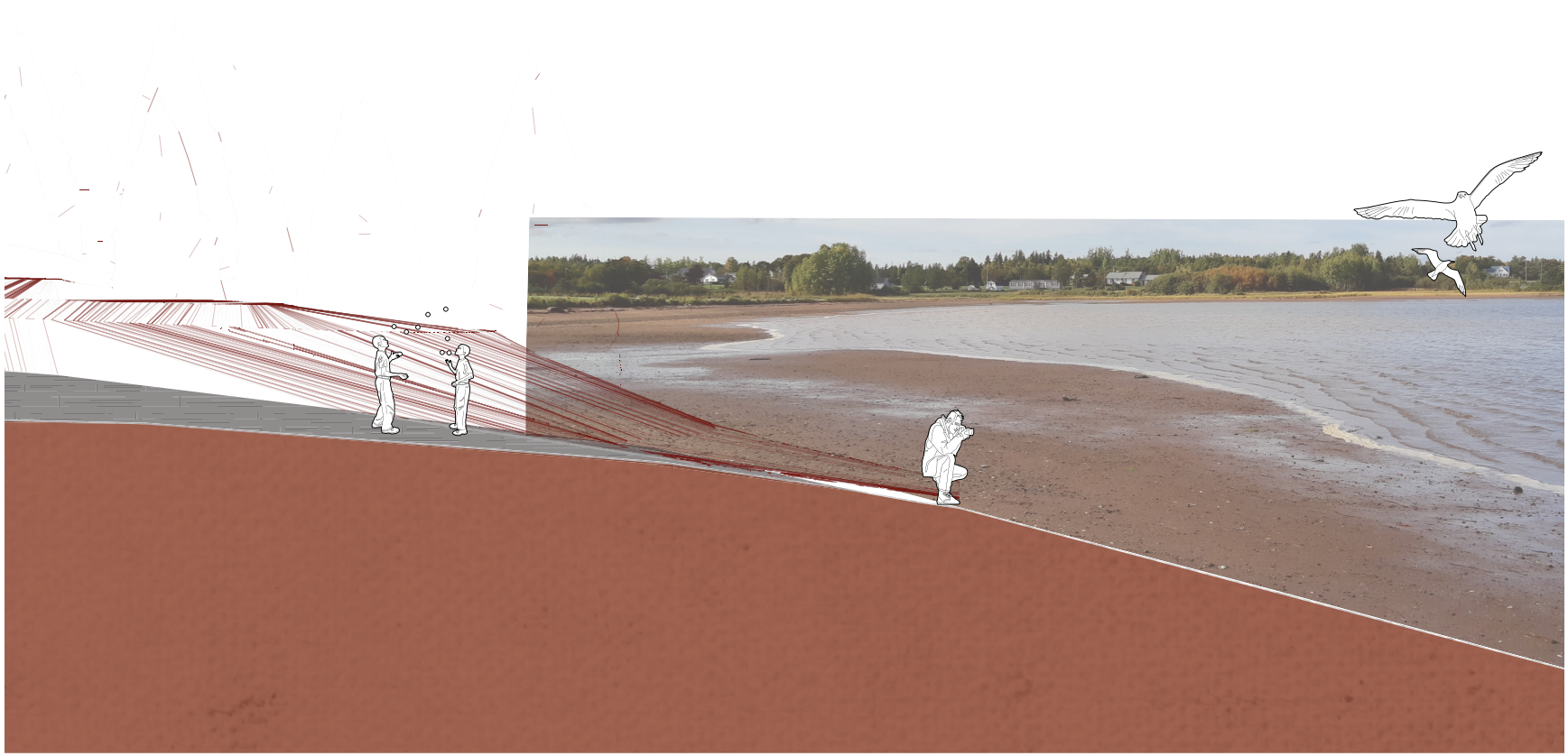


Plan showing summer occupation within the cold storage modules. The west end is cold cellar storage for produce with a community food bank next door. Two modules are devoted to community freezer lockers, and next to this is a small butchering room. On the east end, a boat rental space has been set up.

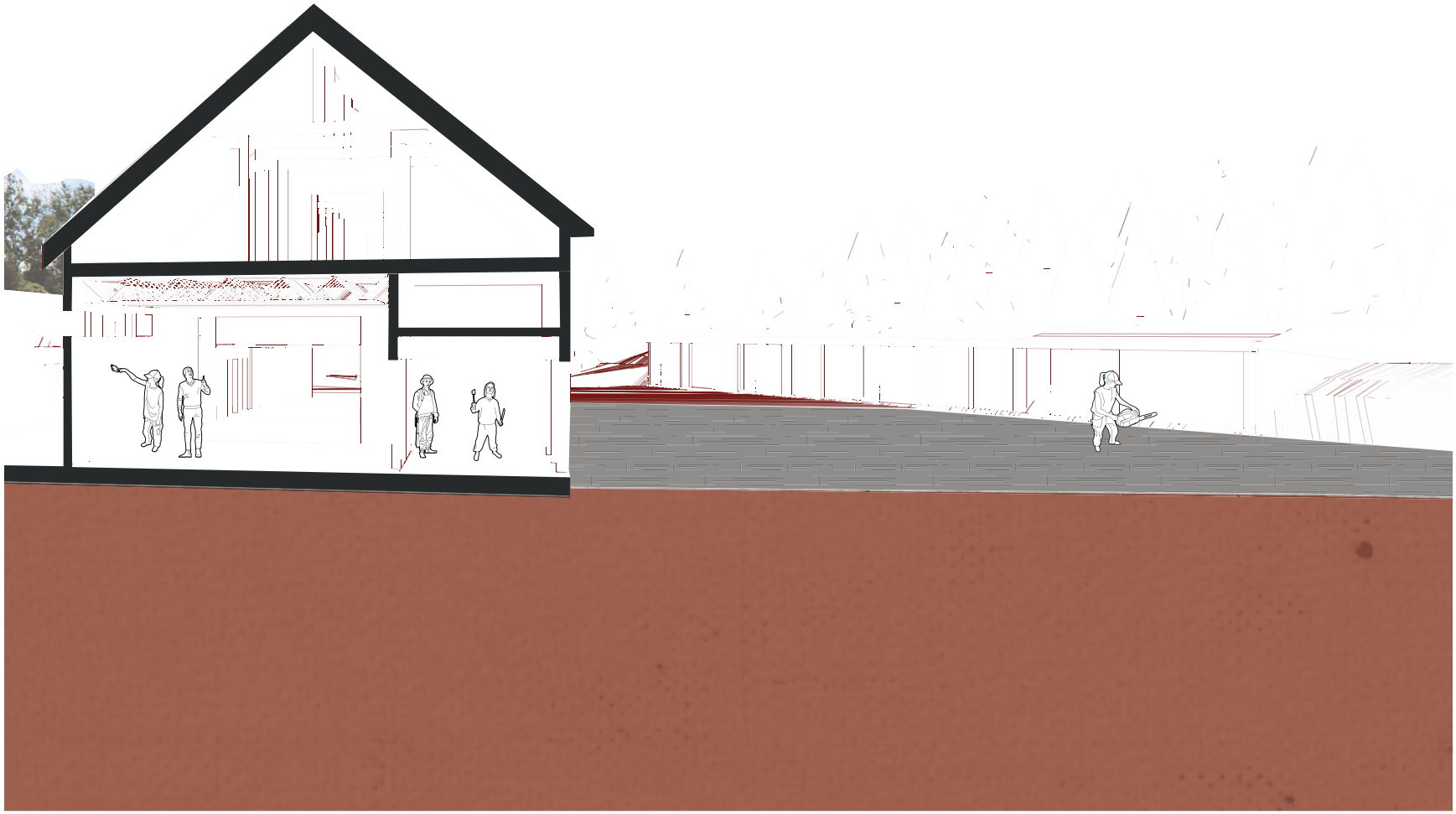
The fall is the time for the local harvesting of crops as well as the community garden, keeping the land production module busy throughout the season as the community prepares for winter. Local livestock can be butchered and preserved on site by curing, smoking and freezing and sold or traded at the store. Fish production and storage continues through the fall in line with the fall fishery. Produce and fish are washed, and prepared for packaging for distribution or frozen, canned, pickled or dehydrated for later use, and stored in the cold cellars. Once the hard work of the harvest is complete, the community celebrates by hosting the entire village for a feast. In the work-yards, local trees can be processed into firewood which is a primary heat source for many here in the winter. The solar garden can be cleaned and fixed up in preparation for the winter, and its equipment and tools stored in the storage berm. At this time, exterior panel walls on the north side that have window or door openings can be swapped out to install solid walls. The community must now turn their attention to tending the greenhouse planting beds to cultivate a fresh supply of winter produce.



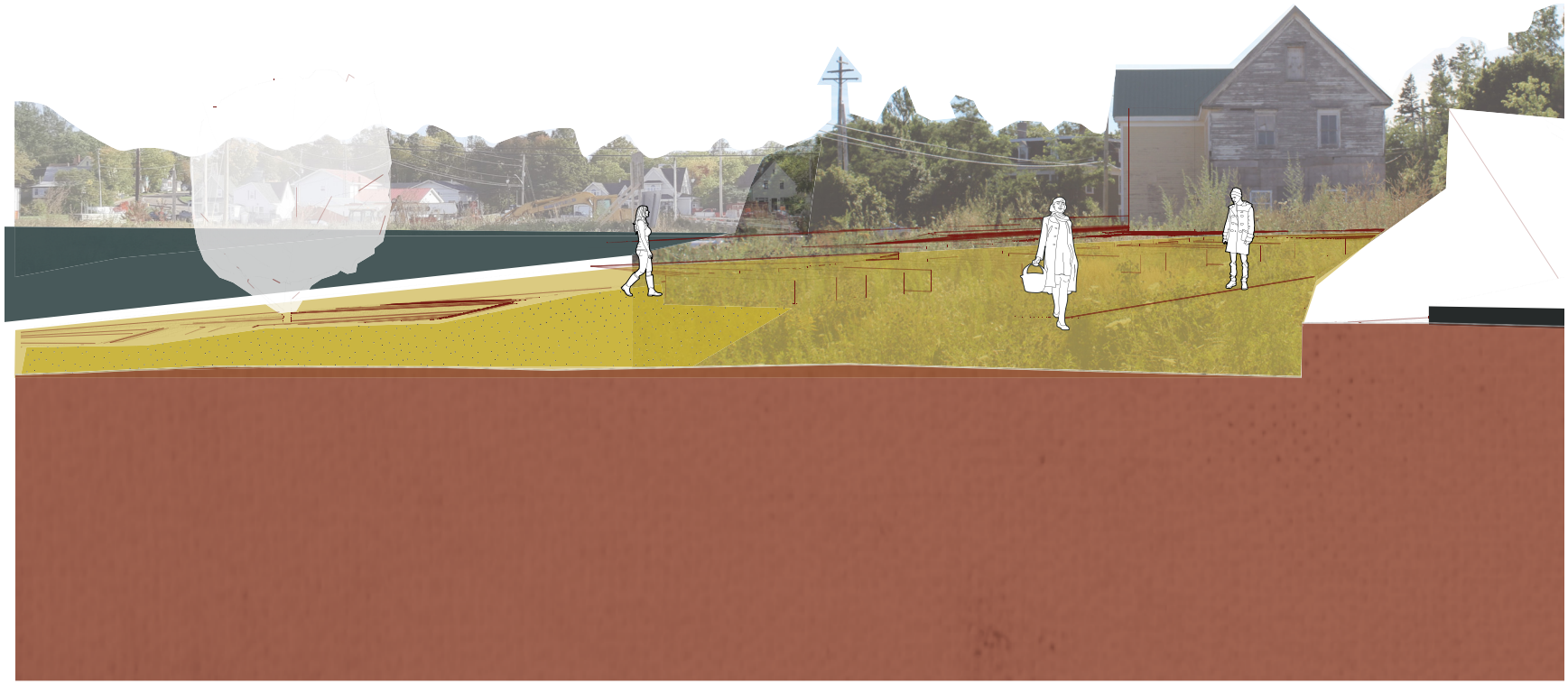
Conceptual plan illustrating possible programmatic plug-in for the building in the fall. At this time, the harvesting of local fruits and vegetables is the dominant activity, but the sea production module is still in operation preserving and storing fish for the winter. Items that need to be stored for winter are done so at this time in the cold storage berm that houses the community food supply.



Section facing west showing grade to the muddy shoreline near the end of the earth berm overlooking a view to Machon's Point. This section, which is part of the following, illustrates fall occupation of the site. A photographer finds a vantage point looking down the South River while two children blow bubbles and play on site.

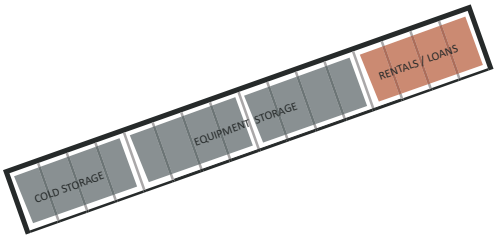


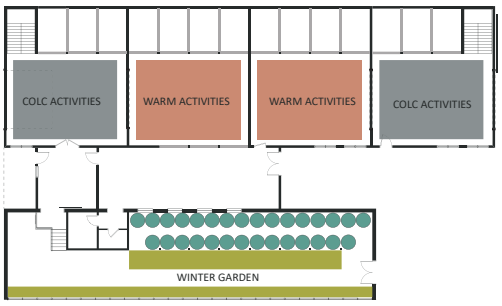
Section facing west through the production module and work yard overlooking the storage berm. This section, which is part of the preceding, illustrates fall occupation of the site. Someone uses the work-yard to chop up wood for the winter, people are painting and fixing up the interior before winter.



Section facing west through the solar garden with a view of the bridge and community in the near distance. This section, which is part of the preceding, illustrates fall occupation of the site. People in the solar garden are picking any remainging late crops.

In the winter, the cold production modules on the east and west end of the building fall into dis-use but serve as a climate buffer, helping keep the internal heated modules sheltered from the wind. The greenhouse becomes an important zone at this time as the building's heating unit and source of fresh vegetables. This slower season is when the community has more frequent meetings to re-assess the village priority framework, the buildings program-component relationships, and to plan for the upcoming farming and fishing season. The support modules can turn into smaller classroom and meeting spaces at this time, and both these and the collective area can provide supplemental space for the community school activities. Cooking classes, workshops, and crafts-making enhance the communities trade of skills, always inviting new talent and opportunities. A kitchen and moveable workstations allow community members to meet to prepare meals and compile grocery items for delivery to the elderly through a senior meal service. In the cold storage berm, produce is regularly retrieved for the community food bank or for use in the production module. The boat rental space can adapt to winter equipment such as skis and snowshoes.





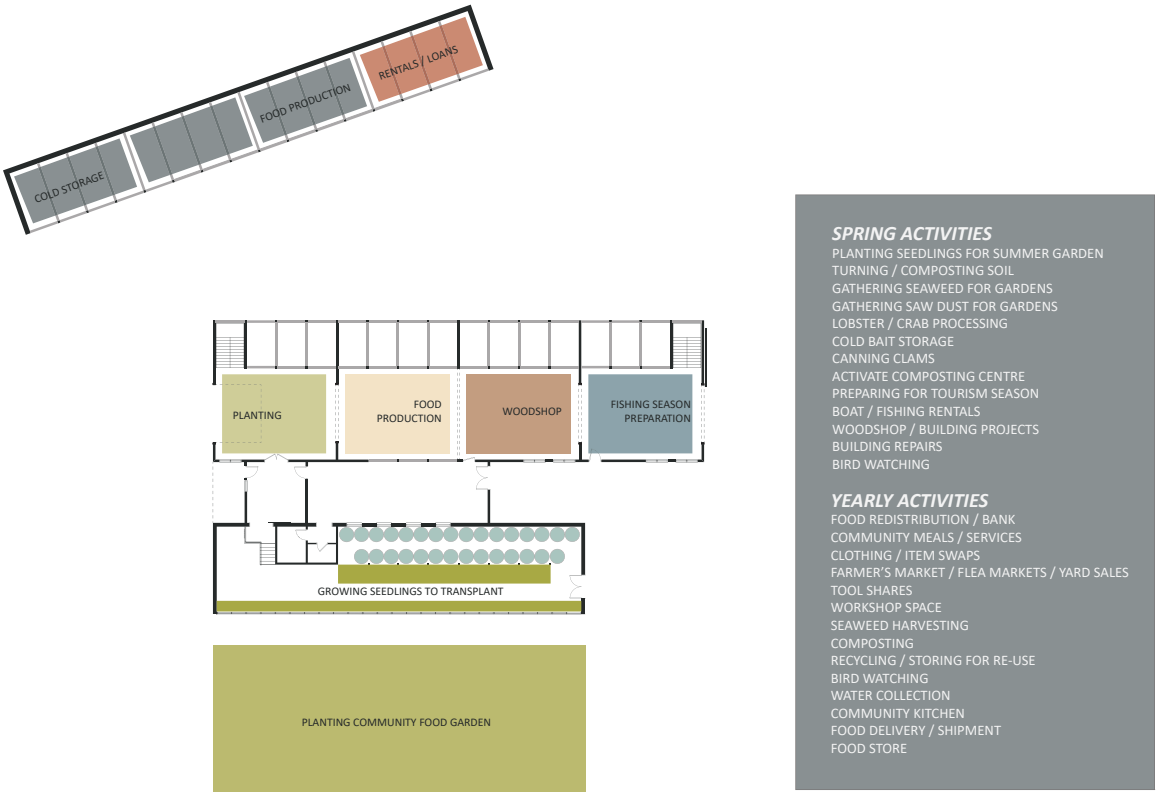
WINTER
CRAFTING / MAKING
REPAIRING SUMMER ITEMS
PREPARING FOR FISH. / FARM. SEASON
GREENHOUSE GARDEN / AQUACULTURE
ICE FISHING
ICE SKATING / SKIING / SNOW SHOE RENTAL
COOKING CLASSES
FOOD PRODUCTION / STORAGE
COMMUNITY SCHOOL PARTNER LOCATION
COMMUNITY - YEARLY REVIEW
EDUCATIONAL CLASSES
LEARNING WORKSHOPS

YEARLY ACTIVITIES
FOOD REDISTRIBUTION / BANK
COMMUNITY MEALS / SERVICES
CLOTHING / ITEM SWAPS
FARMER'S MARKET / FLEA MARKETS / YARD SALES
TOOL SHARES
WORKSHOP SPACE
SEAWEED HARVESTING
COMPOSTING
RECYCLING / STORING FOR RE-USE
BIRD WATCHING
WATER COLLECTION
COMMUNITY KITCHEN
FOOD DELIVERY / SHIPMENT
FOOD STORE

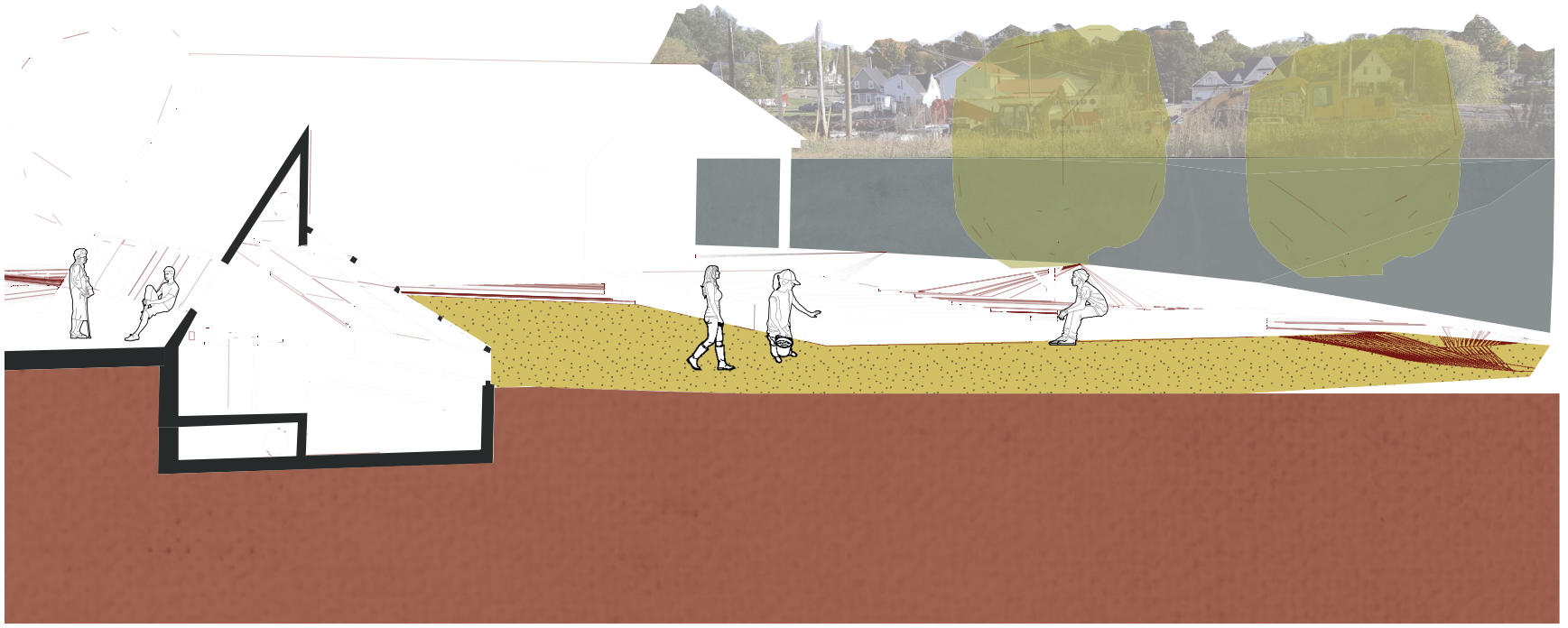
Conceptual plan illustrating possible programmatic plug-in for the building in the winter. At this time, outdoor activities slow down along with food production following the harvest. The internal production modules are the only ones heated at this time, and the greenhouse comes to life as a heating component for the production facility.

Section facing south through the production module, lobby and greenhouse. This section illustrates winter occupation of the site which is now primarily within the building. The solar garden becomes an active fresh food source for the community and can operate in connection with the local grocery store and restaurants, as well as provide food for the community food bank, and to be made into pre-packaged products for sale or trade.

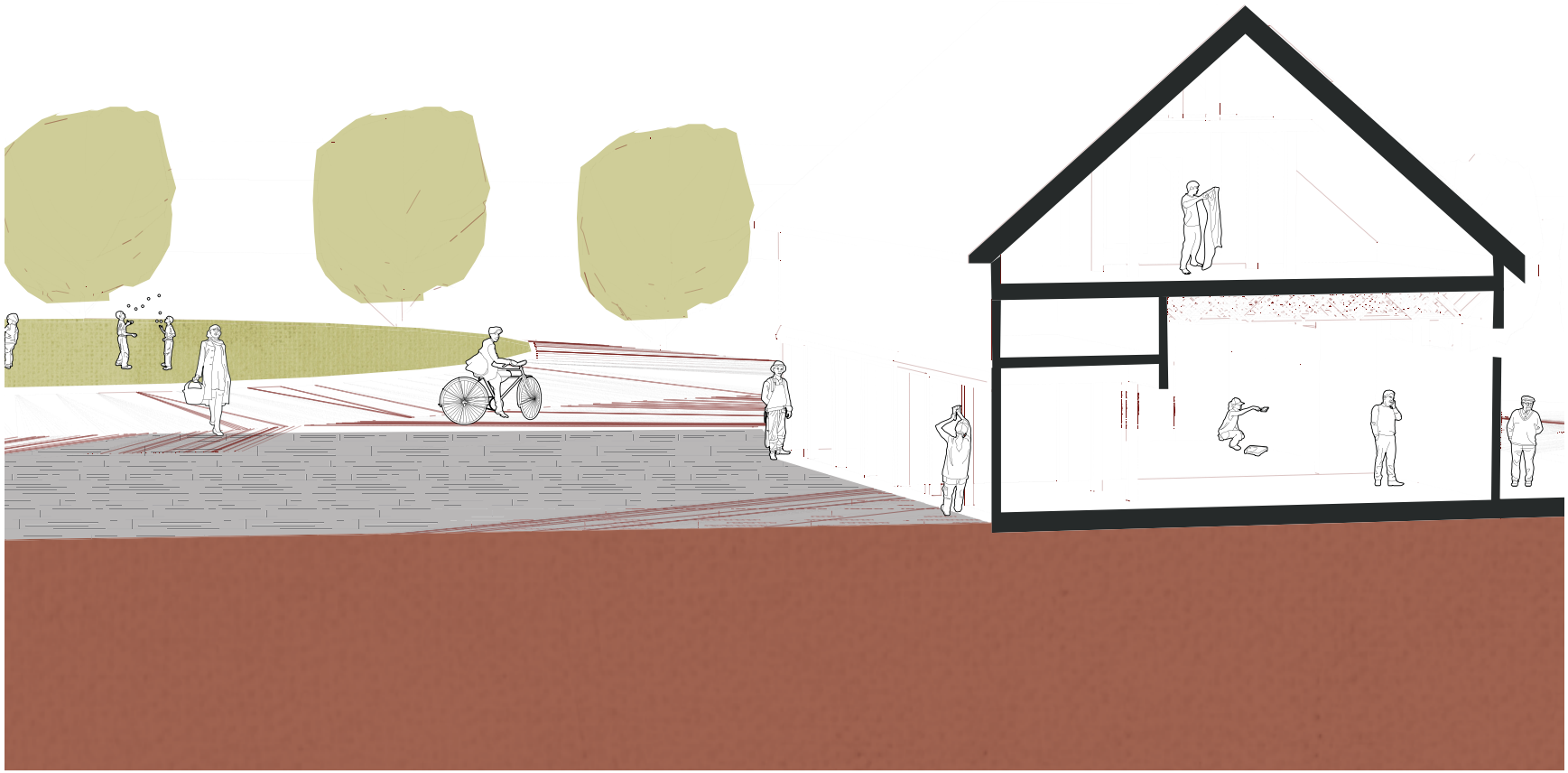
Spring is a time of re-growth, and the site comes to life again as garden plots are prepared for planting, seedlings are started in the greenhouse, and compost is turned over. The fishing season begins, and the rental space opens now to sell licenses and rent fishing rods. Binoculars are donated to the centre and a bird watching club or conservation group forms as an activity for young and old to learn about their local natural habitats. Within the production centre, preparation is underway for the upcoming tourism season as the community adjusts the building's components to suit the planned programming of the following season. Regular drop-off of unwanted items might increase as the locals engage in their spring cleaning purges. These items are hoisted into the attic and slotted for storage in their appropriate area. A production module can become devoted for a time to a woodshop to take on various building projects or repairs, and movable tool storage components can be constructed to create a community tool sharing service. Outside, the community green again comes to life as residents come and enjoy campfires and story-telling, outdoor concerts and picnics, eat from local food trucks, or just enjoy the view while socializing.



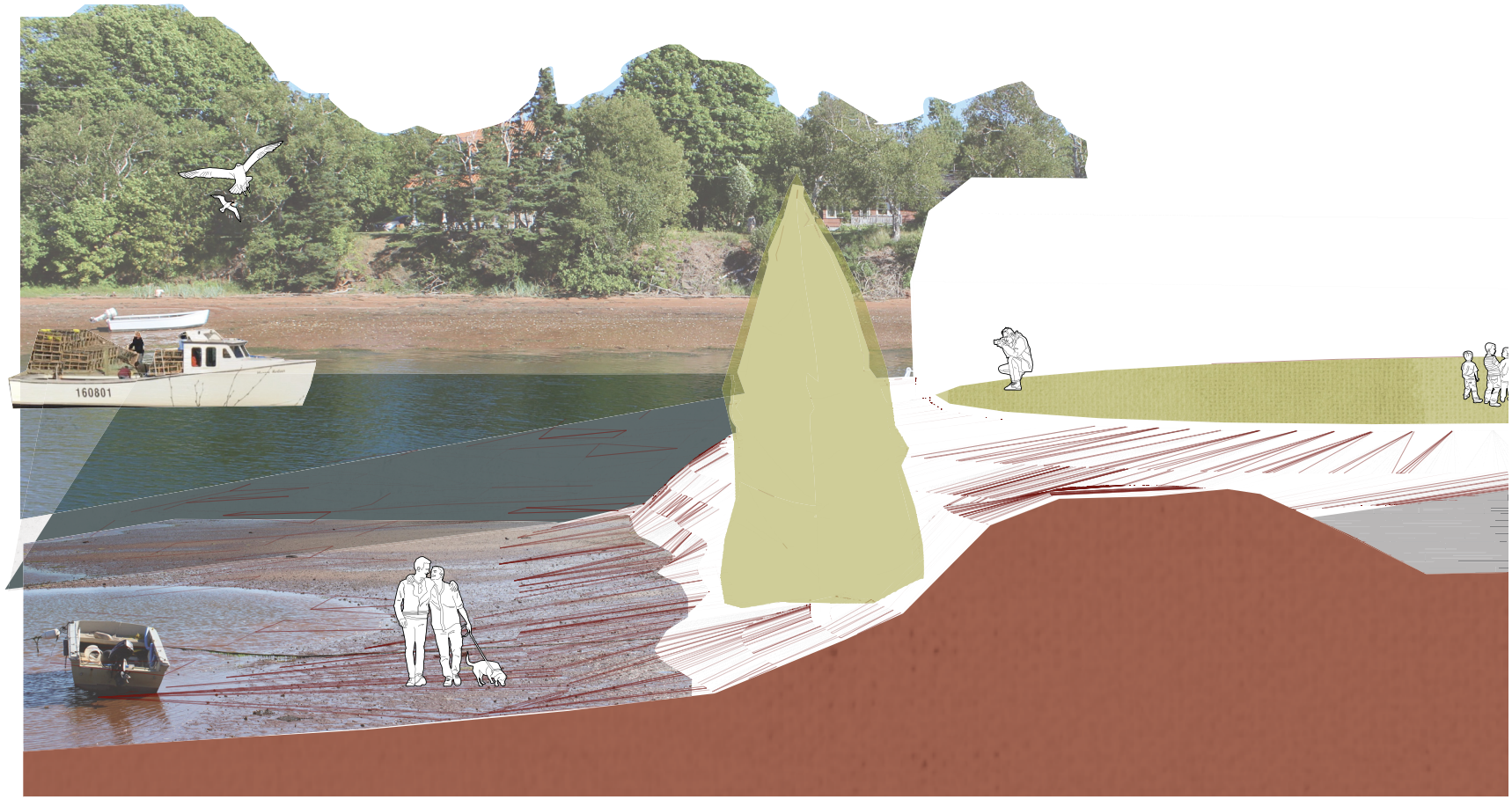
Conceptual plan illustrating possible programmatic plug-in for the building in the spring. At this time, the solar garden comes to life as the community engage in re-planting. Seedlings are started in the greenhouse and the composting station is activated. The building is re-configured at this time to begin developing its more open summer form for the tourism season.



Section facing west through the greenhouse module and solar garden which are busy cultivating seedlings and crops. The view directly overlooks the village and the solar garden is prominently on display as a major organic food source for the community. This section, which is part of the following, illustrates spring occupation of the site.



Section facing west through the main production centre and work-yard. The community green is bounded by the fish shanties below, the ocean and the outdoor work-yard. In the building, repairs are being made as a workshop space is set up for new constructions. This section, which is part of the preceding, illustrates spring occupation of the site.



Section facing west through the end of the earth berm showing a boat loaded with traps entering the harbour. A couple uses the shore access from the community green to take a leisurely stroll and a small boat is left moored for later clam digging activities.This section, which is part of the preceding, illustrates spring occupation of the site.

CHAPTER 6: CONCLUSION

> Connectedness is a particular way of design thinking that maximizes mutual social and ecological benefits by expressing fundamental associations – often unknown or unseen locally – between the parts of an ecosystem, a city, or an individual site. Connectedness enables. Disconnectedness disables (Hester 2006, 50).

This thesis sought a form of architecture that could facilitate social, ecological and economic re-connections to foster regeneration and self-reliance in rural Prince Edward Island communities. On a metaphorical level, the project developed a method of planting a seed within rural communities for self-empowerment in re-localizing for self-reliance. The architect, as a cultivator, builds a relationship with the community such to develop an ecologically sustainable community framework. Evolving over time through community co-operation, the framework helps to enable sustainable adaptations within the everyday life of the village and its citizens.

A flexible building framework allows the community to take an iterative process of re-evaluation to determine its next stage of programmatic form. It creates space for community dialogue, meaningful action, innovation and knowledge transfer. Balancing social, environmental and economic needs, the community production centre takes shape over time in relation to the forces and needs which inform it. Cultivating a sense of empowerment within the community, involvement in the design and build of their facility unveils skills and allows each person to make a meaningful contribution alongside friends, family and neighbours.

This project does not aim to be a solution, but rather, it is a means to heighten community engagement, to foster empowerment within the community to begin taking their own actions towards sustainable futures. It is an idea of building that holds the flexibility to allow the community to continuously re-evaluate its systems and needs, while inviting the community to grow the building themselves. This thesis proposes that architecture need not be a finished product because unfinished designs invite the community to take ownership over their own space and adjust it to suit their own frequently changing needs.

REFERENCES

Baldwin, Douglas. 2009. *Prince Edward Island: An Illustrated History*. Halifax, NS: Nimbus Pub.

Bateson, Gregory. 1973. *Steps to an Ecology of Mind*. New York: Ballantine Books.

Berger, A., and Mikmak Foundation Wouter. 2009. *Systemic Design can Change the World*. https://books.google.ca/books?id=JML2SAAACAAJ.

"Buddhist Monks Welcome Islanders, N.S. and N.B. Residents to Monastery during Open House." 2018. *The Guardian*, May 13. https://www.theguardian.pe.ca/news/local/buddhist-monks-welcome-islanders-ns-and-nb-residents-to-monastery-during-open-house-209930/.

Bumsted, J.M. 2019. "PEI Land Question." *Canadian Encyclopedia*. https://www.thecanadianencyclopedia.ca/en/article/pei-land-question.

Cavers, Matt. 2016. "Dollars for "Deadbeats": Opportunities for Youth Grants and the Back-to-the-Land Movement on British Columbia's Sunshine Coast." In *Canadian Countercultures and the Environment*, edited by Colin Coates, 179-192. Calgary, Alberta: University of Calgary Press.

Certeau, Michel de. 1988. *The Practice of Everyday Life*. Berkeley, Calif.: University of California Press.

Coates, Colin MacMillan. 2016. *Canadian Countercultures and the Environment*. Calgary, Alberta: University of Calgary Press.

Cole, Raymond J. 2012. "Transitioning from Green to Regenerative Design." *Building Research & Information* 40 (1): 39-53.

Community Access Program. 2018. "Island Narratives Program." Accessed September 24, 2018. http://vre2.upei.ca/cap/murray.

Cowan, Stuart, and Sim Van der Ryn. 1996. "Ecological Design." In *The Ecological Design and Planning Reader*, edited by Forster Ndubisi, 191-202. Washington, DC: Island Press.

Critchlow, Keith. 1980. "Ourkind." In *The Village as Solar Ecology*, edited by John Todd and Nancy Jack Todd, 26-27. Cape Cod, Massachusetts: The New Alchemy Institute.

Earle's Picture Restoration. 2019. *Facebook*. https://www.facebook.com/pg/EarlesPictureRestoration/photos/?ref=page_internal.

Ervin, Susan. 1980. "Some Considerations for Agriculture in a Solar Village Ecology." In *The Village as Solar Ecology*, edited by John Todd and Nancy Jack Todd, 67-68. Cape Cod, Massachusetts: The New Alchemy Institute.

Faud-Luke, Alastair. 2009. *Design Activism: Beautiful Strangeness for a Sustainable World*. London; Sterling, VA: Earthscan.

Fraser, Sara. 2019a. “Amish 101: What Islanders can Expect from their New Neighbours.” *CBC*. Last modified April 15. https://www.cbc.ca/news/canada/prince-edward-island/pei-amish-ontario-1.3536206.

Fraser, Sara. 2019b. “P.E.I. Buddhist Monks Welcome Outside World this Weekend.” *CBC*. Last modified May 2. https://www.cbc.ca/news/canada/prince-edward-island/pei-monks-open-house-little-sands-1.3562409.

Gauzin-Müller, Dominique, Institut français d’architecture, and Cité de l’architecture et du patrimoine. 2009. *Ecological Living: What Architecture for a More Sustainable City?*. 1st ed. Arles: Paris: Actes sud; Paris: Cité de l’architecture et du patrimoine.

Government of Prince Edward Island. 2018. “Agriculture on PEI.” Last modified July 26. https://www.princeedwardisland.ca/en/information/agriculture-and-fisheries/agriculture-pei.

Government of Prince Edward Island. 2017. “GIS Data Catalog.” http://www.gov.pe.ca/gis/index.php3?number=77543.

Government of Prince Edward Island. 2017. *Recruit, Retain, Repatriate: A Population Action Plan for Prince Edward Island*. Charlottetown, PEI. www.Mighty-PrinceEdwardIsland.ca.

Great Enlightenment Buddhist Institute Society. 2019. “About Us.” Accessed July 11, 2019. https://gebis.org/.

Greene, Wade. 1978. “A Conversation with the New Alchemists.” *Environment* 20 (10): 25-28.

Guy, Simon, and Graham Farmer. 2001. “Reinterpreting Sustainable Architecture: The Place of Technology.” *Journal of Architectural Education* 54 (3): 140-148.

Hornborg, Anne-Christine. 2007. *Mi’Kmaq Landscapes: From Animism to Sacred Ecology*. Aldershot, England; Burlington, VT: Ashgate.

Illustrated Historical Atlas of the Province of Prince Edward Island. 1995. Philadelphia: J.H. Meacham and Co.

Kyte, Lindsay. 2019. “The Town of Peace and Kindness.” Last modified October 1. https://www.lionsroar.com/the-town-of-peace-and-kindness/?fbclid=IwAR2Lvu0PVDK3IB_ab632aM98-bQ4ueTArcLPDUjfspsyLUMO7arNOSGKQ.

Li, Feng, Xusheng Liu, Xiaoling Zhang, Dan Zhao, Hongxiao Liu, Chuanbin Zhou, and Rusong Wang. 2017. “Urban Ecological Infrastructure: An Integrated Network for Ecosystem Services and Sustainable Urban Systems.” *Journal of Cleaner Production* 163: S18.

Lister, Nina. 2016. “Is Landscape Ecology?”. In *Is Landscape...?: Essays on the Identity of Landscape*, edited by Gareth Doherty and Charles Waldheim, 115-137. New York: Routledge.

Lyle, John Tillman. 1994. *Regenerative Design for Sustainable Development*. New York; Toronto: John Wiley.

MacDonald, Mitch. 2016. “Amish are on the Way.” *The Guardian*, February 3. https://www.theguardian.pe.ca/news/local/amish-are-on-the-way-100967/.

MacEachern, Alan Andrew. 2003. *The Institute of Man and Resources: An Environmental Fable*. Charlottetown, P.E.I.: Island Studies Press.

MacEachern, Alan, and Ryan O’Connor. 2009. “Back to the Island: The Back-to-the-Land Movement on PEI.” http://niche-canada.org/member-projects/backtotheisland/narrative2.html.

MacEachern, Alan, and Ryan O’Connor. 2016. “Children of the Hummus: Growing Up Back-to-the-Land on Prince Edward Island.” In *Canadian Countercultures and the Environment*, edited by Colin Coates, 261-278. Calgary, Alberta: University of Calgary Press.

Mannell, Steven. 2018. *“Living Lightly on the Earth”: Building an Ark for Prince Edward Island, 1974-76*. Halifax, Nova Scotia: Dalhousie Architectural Press.

McDonough, William, and Michael Braungart. 2002. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press.

McHarg, Ian L. 1992. *Design with Nature*. New York; Toronto: Wiley.

McHarg, Ian L. 2006. *The Essential Ian McHarg: Writings on Design and Nature*. Edited by Frederick R. Steiner. Washington, DC: Island Press.

McKnight, John. 2010. *The Abundant Community: Awakening the Power of Families and Neighborhoods*. Chicago: American Planning Association; San Francisco, CA: Berrett-Koehler Publishers.

Meadows, Donella H. 2009. *Thinking in Systems: A Primer.* London; Sterling, VA: Earthscan. https://search.library.wisc.edu/catalog/9910100084402121.

Moore, Kathryn. 2016. “Is Landscape Philosophy?”. In *Is Landscape ...?: Essays on the Identity of Landscape*, edited by Gareth Doherty and Charles Waldheim, 285-301. New York: Routledge.

Ndubisi, Forster. 2014. *The Ecological Design and Planning Reader*. Washington, DC: Island Press.

Prince Edward Island Department of Agriculture and Fisheries. 2016. *2016 Guide for Beginning Farmers on Prince Edward Island *. Charlottetown: Government of Prince Edward Island.

Prince Edward Island Department of Finance. 2018. *Gross Domestic Product (GDP) by Industry*. https://www.princeedwardisland.ca/en/information/finance/gross-domestic-product-gdp-industry

Prince Edward Island Statistics Bureau. 2016. *2016 Census: Population and Dwelling Counts*. Charlottetown, PEI. http://www12.statcan.gc.ca/census-recensement/index-eng.cfm?HPA=1.

Public Archives and Records Office of Prince Edward Island. 2019a. Elliot J. Lumsden fonds (Acc2689). Accessed March 2, 2019.

Public Archives and Records Office of Prince Edward Island. 2019b. John Brooks collection (Acc4223). Accessed March 2, 2019.

Public Archives and Records Office of Prince Edward Island. 2019c. Rena Howe collection (Acc4483). Accessed March 2, 2019.

Public Archives and Records Office of Prince Edward Island. 2019d. PARO Map collection (Map 4, 174). Accessed March 2, 2019.

Rankin, Allan. 2014. "We can Learn from the Amish's Independent Spirit." *Eastern Graphic*. November 26. http://www.peicanada.com/eastern_graphic/opinion/article_af495cd8-74db-11e4-9830-6ffde6943f72.html.

Richards, Delite. 2019. Photos of Lobster Fishing in Murray Harbour PEI.

Robinson, John. 2008. *Infrastructure & Communities the Path to Sustainable Communities*. Victoria, B.C.: Pacific Institute for Climate Solutions, University of Victoria.

Rural Municipality of Murray Harbour. 2019. "Community of Murray Harbour." Accessed July 20, 2019. http://murrayharbour.ca/.

Russell, Nancy. 2018. "Province Hopes to Get Islanders to Come Home from Away." *CBC News*, August 1. https://www.cbc.ca/news/canada/prince-edward-island/pei-come-home-campaign-population-1.4769756.

Schmidt, Robert. 2016. *Adaptable Architecture: Theory and Practice*. London; New York: Routledge, Taylor & Francis Group.

"South River Murray Harbour Port Marina." 2019. Accessed June 21, 2019. https://marinas.com/view/marina/8qc61r_South_River_Murray_Harbour_Port_Marina_Murray_Harbour_PE_Canada.

Stewart, Dave. 2018. "Buddhists Proposing New P.E.I. Monastery." *The Guardian*, June 6.https://www.theguardian.pe.ca/news/local/buddhists-proposing-new-monastery-216056/.

Syse, Karen Lykke, and Martin Lee Mueller. 2015. *Sustainable Consumption and the Good Life: Interdisciplinary Perspectives*. Abingdon, Oxon; New York, NY: Routledge.

Thomas, Jill. 2019. Photos of Amish-built horse barn on PEI.

Thompson, William Irwin. 1980. "The Need for Villages." In *The Village as Solar Ecology*, edited by John Todd and Nancy Jack Todd, 14-15. Cape Cod: The New Alchemy Institute.

Todd, John, and Nancy Jack Todd. 1980. "The Village as Solar Ecology." Cape Cod: The New Alchemy Institute.

Todd, Nancy Jack. 1993. *From Eco-Cities to Living Machines: Principles of Ecological Design*, edited by John Todd and Nancy Jack Todd. Berkeley, Calif.: North Atlantic Books.

Tourism Prince Edward Island. 2019. “Murray Harbour.” https://www.tourismpei.com/points-east-pei/murray-harbour.

Trim, Henry. 2016. “An Ark for the Future: Science, Technology, and the Canadian Back-to-the-Land Movement of the 1970s.” In *Canadian Countercultures and the Environment*, edited by Colin Coates, 155-167. Calgary, Alberta: University of Calgary Press.

Van der Ryn, Sim. 2007. *Ecological Design*. Washington, DC: Island Press.

Van der Ryn, Sim. 1980. “The Sustainable City.” In *The Village as Solar Ecology*, edited by John Todd and Nancy Jack Todd, 81-83. Cape Cod: The New Alchemy Institute.

Wackernagel, Mathis. 1996. *Our Ecological Footprint: Reducing Human Impact on the Earth*. Gabriola Island, BC; Philadelphia, PA: New Society Publishers.

Wade, Nicholas. 1975. “New Alchemy Institute: Search for an Alternative Agriculture.” *Science* 187 (4178): 727-729.

Walker, Andy. 2017. “’Gentle People for a Gentle Island’ - Amish Establishing Firm Roots in Kings County.” *PEI Canada*, July 21. http://www.peicanada.com/article_343ed840-e13-11e7-8835-4bb656302a8.html.

Warburton, Diane. 1998. *Community and Sustainable Development: Participation in the Future*. London: Earthscan Publications.

Wells, Malcolm. 1980. “Solar Village Principles and Construction Ideas.” In *The Village as Solar Ecology*, edited by John Todd and Nancy Jack Todd, 44-45. Cape Cod, Massachusetts: The New Alchemy Institute.

Weyler, Rex. 2013. “Nature’s Apprentice: A Meta-Narrative for Aging Empires.” *Manoa* 25 (1): 186-196.

Williamson, T. J. 2003. *Understanding Sustainable Architecture*. London; New York: Spon Press.