Hannahville Indian Community Forestland Acquisition & Forest-Based Business Planning Initiative

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Abstract

Indian tribes are often constrained by their small community sizes, historical and political circumstances, and remote geography. The Hannahville Indian Community, located in the forested area of Michigan's Upper Peninsula, has a goal of expanding its land area and revenue options to combat these constraints through forestland acquisition. Because of the significant effort and capital needed to acquire land and ensure that it provides benefits to the community, tribal land acquisition requires extensive planning and thorough consideration of the costs and benefits land acquisition may provide the Tribe.

The Hannahville Indian Community Forestland Acquisition Planning project is an exploration of forestland acquisition particular to Hannahville. It aims to assist the tribal government by providing information on the biological and physical resources of forests in the region and possible revenue-generating activities associated with forestlands. References are given towards policy and social issues regarding tribal land acquisition. We give an example of a method to remotely identify land worth pursuing, which includes maps and descriptions of the applicable areas. Since commercial forestry had been singled out as a possible main interest in new land, we include descriptions of forestry and timber business operations, and a suggested method for determining the feasibility of forestry on any selection of land. Other land use opportunities are also described, such as for recreation and biomass, as applies to the forested areas within a limited distance of the Hannahville reservation. Where applicable, scenarios and recommendations accompany these subjects.

We recommend that the Hannahville Indian Community pursue a strategic combination of business ventures, including forestry, biomass and recreation. The final organization of these businesses will depend highly upon the type of parcel that Hannahville acquires. In order identify parcels for acquisition we have provided Hannahville with a remote sensing methodology that can be adjusted to identify land according to tribal priorities.

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i. Introduction

The Hannahville Indian Community is a Potawatomi tribe located in the central Upper Peninsula (UP) of Michigan. The Tribe has expressed interest in diversifying its revenue streams by acquiring land with the potential to generate income. They have begun early planning processes to identify and purchase large tracts of commercial forestland to meet this economic objective and to restore a communal land base. Since the Tribe does not have sufficient capital on hand for large land purchases, they are investigating financial strategies for purchasing land and paying off debt from land acquisition.

The Hannahville Indian Community Forestland Acquisition and Forest-Based Business Planning Initiative master's project aims to assist the tribe by providing an advanced decision making framework, information, and specific recommendations that may be directly applicable towards purchasing and managing land. This report includes a selection and description of parcels to support forest and tourism related businesses as well as other tribal community needs.

Many Indian communities are still recovering from a history of displacement and disenfranchisement by the US government. This history generally produced fragmented tribes that fit poorly and precariously in the US political system and without many opportunities for economic growth. Today, Indian communities that rely exclusively on gaming-related businesses for income may be at risk of losing financial security to economic downturns, unfavorable policy developments, or changing political landscapes (Hansen, 2011). Therefore, the Forestland Acquisition project can be broadly relevant to other communities, especially if its recommendations result in tangible benefits.

The Hannahville Indian Community is exploring land acquisition opportunities for three reasons: economic security, to provide land for future development and access to natural resources, and political enfranchisement. First, the Tribal government wishes to provide the best services possible for its members. Because of the unique way in which Indian governments operate within the US political system, the funds to provide these services come from a combination of federal programs and tribal businesses. Revenues from tribal businesses fund social services and core tribal infrastructure and other social benefits for the tribe's population, such as employment, trade skills, and economic growth. Excluding federal sources, the Hannahville government's funding comes primarily from the Island Resort and Casino in Wilson, Michigan, and its related operations, the golf course and gas station.

Second, additional land can promote the sustainability of the Tribe's development potential, natural resources, and ecosystem services. Tribal land provides tangible community assets such as housing and development locations; less tangible but equally important cultural services such as supporting social and cultural identity and providing locations for ceremonial activities; and ecological functions such as water purification and wildlife habitat. Many tribal members make regular use of their existing communal lands to hunt and gather firewood or other biological resources. These activities are directly dependent on the amount and quality of land and the resources upon it. Maintaining these activities is important, and one way to do so is by increasing the amount and quality of land available to use. Third, land has a symbolic meaning, and increased control over land is a symbolic success for any tribe in its position within the US political system (Smith, 2007). Land represents prosperity, and control over land represents sovereignty. An increase in tribal land signifies a reversal of the historical trend whereby American Indians were systematically deprived of opportunities for prosperity, property, and sovereignty.

The Hannahville Tribal government sees acquisition of forestland as an opportunity to expand the provision of cultural and financial services described above. To move ahead, they require knowledge about what qualities of forestland support their goals and how these qualities can be identified during land acquisition planning and decision-making.

ii. Project Goals and Objectives

This project researches the problems and opportunities faced by the Hannahville Indian Community for land acquisition. We hope this document will satisfy both the knowledge needs of the Hannahville government and our interdisciplinary academic research demands. This report is a reference created to the best of the knowledge and integrity of its authors, but does not replace the advice of accredited foresters, lawyers, or other relevant professionals. We encourage any tribe to seek trustworthy professional consultation in their land acquisition planning and decision-making.

The specific goals and objectives of this project are to:

Goal 1: Help Hannahville progress in its land acquisition planning with a focus on ecological and economic sustainability

Objectives:

1A. Create a decision-making framework to facilitate identification of appropriate parcels of land and avenues of income generation to support land purchases

1B. Provide necessary information for decision-making in land acquisition activities undertaken beyond the life of this project or its immediate recommendations

1C. Illustrate climate change effects and adaptation strategies applicable to the region

Goal 2: Assess feasibility of potential forest-based business ventures

Objectives:

2A. Research business possibilities associated with the features of identified real estate

2B. Examine the challenges and benefits of pursuing identified real estate and business possibilities

2C. Research and identify “best practices” of sustainable forest-based businesses

Hannahville, American Indian History, and Land

PART I

Because this project aims to provide for the specific needs and requests of the Hannahville Indian Community, we should first understand the context of Hannahville and other Indian tribes in the US political and economic system. Since Indian tribes operate with different motivations and with different political and economic resources at their disposal than other governments and businesses, this section aims to introduce our subject community and the social, political, and economic space in which land acquisition occurs for Indian tribes. This information will help us better know the client and to tailor our investigation towards their interests.

To begin, we will introduce the Hannahville Indian Community, and then provide a brief overview of legislation passed in the twentieth century regarding tribal sovereignty, land ownership, and the development of gaming on reservations. Overviews of tribal land acquisition and examples of tribal forestry will follow.

1. History of Hannahville Indian Community

2. The Formation of Reservations, Tribal Development, and Tribal Economies

3. Indian Sovereignty, Government, and Economic Structure

4. Tribal Land Acquisition

1. History of Hannahville Indian Community

The Potawatomi originally occupied the land north of Lake Huron and Superior, but around 1450 A.D. they migrated south to the shores of what they called Mitchigami or Great Lake (Clifton et al., 1986). The Potawatomi people continued to live in Michigan's Upper Peninsula until the United States Federal Acts began to force the tribe off their land. The Indian removal act of 1834, the ratification of the Chicago Treaty of 1835, and Michigan achieving statehood in 1837 put pressure on Michigan's Potawatomi to relocate to other US states: Wisconsin, Kansas, and Oklahoma or into Canada (Ibid). However, not all of the Potawatomi moved out of the Upper Peninsula, Michigan permanently.

In 1853, some of the Potawatomi people returned to Michigan and settled along the Big Cedar River (Jensen, 2011). A small pox epidemic hit the Indian Community when they were located at Cedar River and killed 124 of the 137 of the people living there. The remaining 13 people were moved to Harris to be quarantined (Anthony, Personal Communication, 2012). Harris is named after Michael B. Harris, a postmaster who settled in the area in 1875, and later became a member of the district's legislature (Romig, 1973). During the small pox epidemic Harris had a buckboard of food and supplies delivered to a designated spot near where the people were living. A buckboard is a horse drawn cart with a flat back and a platform seat. After the delivery was made a member of tribe would retrieve the food and supplies and the buckboard would be collected at a later time. Frances Densmore (1949) reports that the delivery of food and milk saved the Potawatomi people from starvation during the time that they were quarantined. These deliveries continued until the small pox epidemic passed and the disease was no longer contagious (Anthony, Personal Communication, 2012).

In 1883, Peter Marksman, a Chippewa Methodist minister helped the Potawatomi put their land in Harris into trust (Anthony, Personal Communication, 2012). The Potawatomi people named their community after Marksman's wife, Hannah (Michigan Commission on Indian Affairs, 1970). The community was established by an act of Congress in June of 1913. The Indian Reorganization Act of June 18th 1934 (48 Stat. L. 984) organized the Potawatomi into the Hannahville Indian Community. Historical studies of Hannahville Indian Community report between that between 3,359 and 3,369 acres of land originally made up the reservation (Densmore, 1949; Munson, 1970). Hannahville's constitution was approved on June 23rd 1936, and their constitution was ratified on August 21, 1937.

Today Hannahville has 5,700 acres in reservation trust and they own and operate the Island Resort Casino, the Health Department, and the Potawatomi Heritage Center. The 12-member Tribal Council and the chairperson, presently Kenneth Meshigaud, govern the tribe.

2. The Formation of Reservations, Tribal Development, and Tribal Economies

2.1. Colonial and Revolutionary America

The first reservations were established as a result of increasing tensions between the Powhatan – a Virginia Algonquin confederation of over thirty tribes – and the English as the settlers expanded up the James River in Virginia. In 1676, Nathaniel Bacon, an English aristocrat, led a series of attacks on Indians in the colony. He attempted to have the governor appoint him commander-in-chief in the Indian war, but the governor of Virginia declared him a rebel and "Bacon's Rebellion" collapsed shortly after. As a result of the rebellion, several small reservations were established for the survivors of the tribes that once comprised the Powhatan confederation (Calloway, 2008).

As the new nation of the United States developed, its government modeled Indian policy after that of the British. An Indian department was created to form the rules for the sale and transfer of Indian lands. The United States Constitution established federal authority over the conduct of Indian relations; this permitted only the federal government to negotiate and make treaties with Indian nations (e.g. US Const. Art. 1, sec. 8; Art. 1, sec. 10). The War Department assumed responsibility for Indian affairs since both the British in Canada and the Spanish in Florida encouraged and supported Indians living in US territory to resist American expansion. The Indian Office, also known as the Bureau of Indian Affairs, formed in 1824. It wasn't until 1849 that it was transferred from the War Department to the Department of the Interior (Calloway, 2008).

The basic objective of the United States Indian Policy from the end of the Revolution to the 1830s was the acquisition of lands between the Appalachians and the Mississippi. As Americans acquired these lands, they established the legal framework by which the United States, and not the Indians, had power of ownership (Calloway, 2008).

2.2. Cherokee Nation v. Georgia

In 1831, the US Supreme Court decided in Cherokee Nation v. Georgia (30 US 1) that tribes were not independent nations with their own acknowledged political systems, but rather "domestic dependent nations." The opinion led to the formalization of the territories and peoples of the tribes under the protection of the federal government while leaving a tenuous degree of sovereignty to the tribes for actual governance. The US government took sovereignty over land and property away from Indians by way of judicial review. This allowed legally expedient access to western territories through the promise of autonomy, which transformed into autonomous dependence (Wirth and Wickstrom, 2002).

However, the Supreme Court decision did not entirely favor Georgia. By putting Indian tribes and their territories under federal guardianship, the federal government essentially barred states from exercising independent state-tribe relationships and forming treaties that would challenge federal interest in Indian land claims (Mays and Taggart, 2005). For Indians, this resulted in their displacement to poor reservation lands and the "protection" to be administered by the Department of Interior (DOI), a land agency that was not previously involved with overseeing the wellbeing of people (Wirth and Wickstrom, 2002). Supreme Court interpretations have had varying effects of enforcement and agreement among the affected parties. The changing nature of constitutional theory and the practical necessities of intergovernmental relations resulted in a pervasive confusion of where jurisdiction ultimately lies (Wirth and Wickstrom, 2002). From this time, Indians were subsumed into the US system of governance, but without recognized statuses of citizenry for their members or states for their territories.

2.3. The Dawes Allotment Act, 1887

Congress passed the Dawes Act, also called the General Allotment Act, in 1887 as a mechanism to assimilate Indians into mainstream Anglo-American culture and to gain access to Indian lands and resources set aside through reservations in various treaties. The Dawes Allotment Act terminated communal ownership through five provisions: (1) the Act authorized the president to assign allotments of 160 acres to heads of families, (2) Indians were to select their own lands, but if they failed to do so, the Bureau of Indian Affairs agent would make the selection for them, (3) the government would hold the title to the land in trust for twenty-five years, preventing its sale until allottees treated it as real estate, (4) all allottees and all Indians who left their tribal ways and assimilated into society were to be granted citizenship, and (5) surplus reservation lands [in excess of the allotted acres] could be sold [by the United States]. Indians whose lands were allotted became US citizens, and their lands could now be taxed by the state and land transfers treated as individual sales of property (Calloway, 2008). As a result of this Act, many tribes lost a substantial amount of communal land, which decreased nationally from 138 million acres in 1887 to 48 million acres at the time of the Act's repeal in 1934.

2.4. The Indian Reorganization Act, 1934

Two provisions in the Indian Reorganization Act had profound economic impact on tribes. The first was that Indians living on reservations were now allowed to establish local self-government and tribal corporations to develop reservation resources. The Secretary of the Interior would issue a charter of home rule, granting an Indian community greater responsibility over its own affairs and allowing tribal members to vote on these affairs through tribal elections. The other important provision written in the Indian Reorganization Act was the termination of the Dawes Act. Further allotments of Indian lands were prohibited. The bill provided for consolidation of allotted lands into units for community use and provided $2 million each year to purchase lands for the tribes (Calloway, 2008).

The Indian Reorganization Act (IRA) gave back to Indian tribes a degree of autonomy in their self-government and economic interests. However, it was done in a way that reflected less their own traditional systems and more that of the US system (Mays and Taggart, 2005), but with an important exception. The US system at this time included the recently created power of income taxes and other forms of taxes, such as property and excise. These funds allowed greater provisions for public works and the privilege of bargaining positions. By the time of reorganization, the US had left Indian tribes bereft of the tools and powers to take advantage of these developments. Their remaining lands were not only incapable of supporting economic progress, but remained in the trust of the Bureau of Indian Affairs (BIA) and did not belong to them.

2.5. House Concurrent Resolution 108: Termination of Federal Trusteeship over Land and Affairs of Indian Tribes, 1953

The US government decided to hasten the process of Indian assimilation into American Society by terminating its government-to-government relationship with select Indian tribes. Through House Concurrent Resolution 108 of 1953, tribes deemed to have made the most social and economic progress were identified as eligible for termination. The tribes selected by the government included the Six Nations of New York, the Potawatomi of Kansas, the Klamath of Oregon, the Hoopa of northern California, and the Menominee of Wisconsin. The goal of the termination era was to make Indians within the territorial limits of the United States subject to the same laws and responsibilities as are applicable to other citizens of the United States (Calloway, 2008). Under the Termination Plan, all Indian tribes in the United States were to assimilate into the nation. The Bureau of Indian Affairs was to dissolve. All the treaty rights guaranteed to Indian tribes were to be

eliminated, and all Indian people to become United States citizens. (We have included a description of the specific effects federal termination policy had on one tribe, the Menominee Nation of Wisconsin, in section 4.6.)

2.6. Indian Gaming Regulatory Act of 1988

In 1987, the Supreme Court ruled in California v Cabazon (480 US 202) that a state that permitted any form of gambling could not prohibit Indians from operating gambling facilities. Congress passed the Indian Gaming Regulatory Act the following year. This act allows tribes to conditionally operate Class III or casino-type gaming. To do so, the tribe must place a request to the state where the casino will be located, and then negotiations for a compact takes place before gambling is permitted. As a result of this act, tribes with few resources and limited economic opportunities turned to gaming to generate income and employment (Calloway, 2008). Because income generated on reservation land is exempt from federal and state taxes, gaming is often a lucrative enterprise for tribes.

3. Indian Sovereignty, Government, and Economic Structure

The uncertain legal standing of Indian tribes resulted from the evolution of intergovernmental relations that characterized their submission, expulsion, and eventual incorporation over decades of US expansion and political reorganization. In the beginning of Indian and US government relations, each had a perspective of the other as a unique and politically identifiable entity. As such, the US government dealt with Indian tribes as they would foreign states; through the practice of forming treaties with tribes, the US government recognized tribes as self-determined communities holding certain structures, rights, and forms of government (Wirth and Wickstrom, 2002). The US followed the same procedures used with other foreign nations. Just as US territories can later submit for statehood, so could Indians and their lands (Wirth and Wickstrom, 2002). This presumption lies on the recognition by both parties of clear territory and ownership of property and the exclusive control over land and resources, which forms the most basic grounding of Indian tribes' claims to sovereign status. Tribes occupied areas first, and their land had to be taken by trade, treaty, or war (Henrix, 2005). A decrease in federal funding for tribal communities pushed tribes, perhaps prematurely to search out other economically viable opportunities. Beginning in the 1970s, there has been a federal policy shift toward tribal self-determination. The shift made it possible for tribes to exert increased control over their development goals, programs, and economies (Cornell and Kant, 1992).

3.1. Present-Day Tribal Economies and Governments

Indian governments are characterized by different methods of funding than that of state or local municipal governments. The most visible enterprises are tribally run casinos. Other businesses may include natural resource sales, recreation, hospitality, and retail. Tribal businesses fund tribal governments, which in turn provide public services in lieu of taxes on their members.

Tribal communities often face problems of economic, social, and political underdevelopment. The reasons for underdevelopment are apparent in expropriation of Indian resources and decades of paternalistic control over reservation affairs (Jorgensens, 1975; Cornell and Kalt, 1990). Whatever the reason for underdevelopment, tribes often are faced with few choices, living in poverty in their home territories and reservations or abandoning it to seek stability in cities and markets in the greater United States. Large portions of American Indian reservations are below the poverty line and many reservation economies are heavily dependent on federal government employment and federal welfare or other transfer payments (Cornell and Kalt, 1990). On average, Native Americans have lower levels of income and education, and have a poverty rate doubled of the national average (Wolfe et al., 2012).

Poverty is closely tied to unemployment among tribal members. Historically, unemployment has been a problem for tribes and is commonly linked to lack of economic viability and education in communities. Without tribally owned businesses, federal dollars do not stretch far enough. Even in present day, according to Algernon Austin from the Economic Policy Institute, Native American unemployment in the Midwest in the second half of 2010 was 19.3%, up from 9.0% in 2007 (2010). The effect of recent economic downturns on the federal government and a decrease in federal funding explains some of this increase in unemployment. The problems of poverty, unemployment, and underdevelopment in tribal communities are complex and often crippling. An efficient economic system is integral for stability and development with a tribal community.

Cornell and Kant (1992) categorized tribal economic systems into four categories: federal control, tribal enterprise, micro enterprise with tribal ownership, and private enterprise with non-tribal ownership. No one system can be applied to all tribes. More commonly, a

combination of more than one economic system is practiced. The systems most often used by tribes include federal control and tribal enterprise. Micro-enterprise with tribal member ownership and private enterprise with non-tribal member control are less practiced (Cornell and Kalt, 1992).

Federal control is often the default system for tribes. This system is common when tribes cannot be fully supported by their own economies and need government assistance. A federally controlled economy relies heavily on the BIA to manage economic affairs and act as the decision-maker for activities and investments (Cornell and Kalt, 1992). This economic model makes tribes dependent on the federal government and may stifle the process of nation building and tribal autonomy (Cornell and Kalt, 1992).

Tribal enterprise is a form of business development that is managed by the tribe. Tribes run businesses as a means for economic survival. Many tribes have similar development goals: economic well-being, political, and social sovereignty (Rand and Light, 1996). These goals are fundamental in forming a successful, thriving tribal economy while sustaining traditional culture and beliefs. Flourishing businesses are the foundation for economic success and sustainable development in tribal nations. It is not merely about making money, but also providing fundamental services for tribal members, like schools, health care, functioning tribal councils and other service providing institutions. Business affairs are not easily separated from tribal government and politics, which can cause damage to the enterprise's overall development. Often tribal leaders run both the government and the business. However, successful tribal leaders may not be successful in business, and for certain areas of business like employment, payroll, hiring, purchasing, and salaries, politics should not be involved (Cornell and Kalt, 2003).

Micro-enterprise with tribal ownership and private enterprise with non-tribal ownership act as a series of sub-enterprises or small business similar to small, rural towns in the greater US (Cornell and Kalt, 1992). These economic systems can be successful for tribes, but they often fall short of total success, especially when the goal of nation building is a priority. Regardless of the system, the major goals of economic stability are for forming successful businesses that ensure stability for the tribal community.

It is important that tribal economies prove to be monetarily lucrative, but success is more than just income generation. The theory of nation building described by Cornell and Kalt (1992) is a system where both businesses and human beings prosper. Natural resources and financial capital alone is not the only barometer of success, instead Nation Building emphasizes education, jobs, judicial systems and flourishing business (Cornell and Kalt, 2003). The Harvard Project studied 67 tribes across American and found that tribes with judicial systems have a lower unemployment rate by 5% (Cornell and Kalt, 2003). The nation building strategy promotes an independent judicial system that sets equal and fair standards, reassures investors, and allows local tribal owned businesses to prosper is a key component to economic security (Cornell and Kalt 2003). This proves to be sustainable and important for continued development because problems are addressed in a more comprehensive and ambitious manner that promotes investment with the tribe (Cornell and Kalt, 2003). Investment into the tribe can provide monetary profits, as well as improvement in quality of life, and reduce dependence on the federal government while increasing tribal sovereignty (Cornell and Kalt, 2003). This economic model is structured so that tribal governments make key decisions on: public and private ownership, business law, regulation and taxation, and provision of basic social services (Cornell and Kalt, 1992).

3.2. Tribal Gaming

Tribes have attempted a vast range of business ventures, but the most well known are those based upon gaming, casinos and bingo. In the 1970s, a few tribes and individual Indians set up small gaming operations as entertainment and as moneymaking enterprises. State

compacts are not uniform amongst all tribes and states, and often involve some form of revenue distribution, since Indian wealth is not taxable by the state. This agreement forms a significant portion of state-tribe intergovernmental relations among tribes that provide gaming. Gaming has provided a major mechanism for raising capital for tribal governments in the absence of the ability to tax land or the willingness or meager prospects of taxing income, and has become a big contributor to Indian self-sufficiency and political clout (Mays and Taggart, 2005).

Tribal revenues have dramatically increased (Cornell, 2008) despite the restrictions that accompanied the Indian Gaming Regulatory Act of 1988. It is successful because formal gaming in Indian country is structured like a governmental activity. "Indian gaming enterprises are owned not by individuals, but by Indian nations. In this sense at least, tribal gaming more closely resembles state lotteries than the private sector gambling of Las Vegas or Atlantic City" (Cornell, 2008). In the example of the Oneida Tribe in New York, they used their gaming revenue to provide considerable services for their members. These included a council house, health services center, cultural center and museum, a recreational center, gym, youth center, senior center and playground, roads septic system and a burial ground (Rand and Light, 1996). Gaming income provided the resources the tribe needed, and their tribal economies relied heavily on the gaming for support. Hannahville is an example of an Indian community that uses income from a casino to fund the tribal economy and public projects. Their tribal operating budget before they built the casino was $250,000 and now it is over 25 million (T. Mancilla, Personal Communication, 2012). With the increase in income the tribe was able to build a school, health center, administration building, and a heritage center.

Gaming has had an overall positive effect on tribal economies. However the extent of this impact is not easily quantifiable. For the individual tribal member, the opportunity for a job can be important for their family's economic stability. Some individuals have expressed concerns about the long-term impacts of gaming on tribal societies and economies. Concerns range from the fear that tribal individuals may become gambling dependent to a desire that the tribes pursue economic development strategies that may be more compatible with traditional Indian culture (Vinje, 1996). Cornell reports that citizens from successful gaming tribes in the Southwest and northern Midwest are concerned that gaming and income maximization have monopolized tribal government decisions at the expense of indigenous culture (2008). Anders reports that increased income from gaming for individual tribal members can undermine the cultural integrity of Indian community (1998). Despite the income generation and community development opportunities gaming has brought to tribes, it does not provide the long-term solution to support the tribe's economy.

While a prominent element of many tribal economies, it would not be correct to characterize gaming as the epitome of Indian entrepreneurship. The prominence of gaming has contributed to the visibility of Indian communities in their states, government negotiations, and in the news. Gaming remains a controversial topic in the public opinion of both Indians and other Americans, and some nations have resisted the opportunity for ethical, cultural, or political complications. Moreover, even though gaming is a growth industry, its future is uncertain for Indian tribes. Michigan Native American tribes have the market share of gaming, but have limited access to commercial markets and industry. They are now challenged not only by local and national politics but by gaming competition from states. Racetracks with slots and/or table games deemed racinos have been gaining popularity since the 1990's (Thompson, 1999), and are direct competition to tribal casinos. Racinos have been established in Rhode Island (1992), West Virginia (1994), Delaware (1994), Iowa (1994), Louisiana (1994), New Mexico (1997), New York (2001), Oklahoma (2004), Pennsylvania (2004), Maine (2004), and Florida (2006) (Barrow and Borges 2010). Non-tribal racinos are a threat to tribal gaming. In 2008, racinos generated $2.6 billion in revenues (Barrow and Borges, 2010). As of 2012, the state of Michigan has not yet allowed the establishment of racinos.

In Michigan, where gaming now provides financial security to all twelve of its federally recognized tribes, inter-tribal competition is stiff and competition by tribal and non-tribal entities is detrimental to any individual tribe's profits. This includes the MGM Grand, Greektown, and MotorCity casinos in Detroit, MI and Caesars Casino in Windsor, Canada. When Michigan introduced commercial casinos in Detroit, the state broke the exclusivity provisions of its compact with the Native American tribes (Hill, 2009), and put the Detroit casinos in direct competition with tribal owned casinos. Competition is not limited to state or privately owned racinos, and commercial casinos. As more tribes enter the gaming business the competition for a limited number of gaming dollars also increases (Cornell, 2008). Competition from tribal and non-tribal gaming has caused a decrease in the growth of Indian gaming revenue in 2006 (Meister, 2007). If competition increases from the establishment of more gaming venues (both tribal and non-tribal owned) then the decrease in revenue could continue. Gaming will likely continue as an important source of revenue for the tribe, but business diversification will promote a sustainable portfolio and allow the tribe to integrate within the larger commercial environment. By expanding beyond gaming, tribes can reduce the risk of economic collapse if gaming becomes unreliable for income generation, and provide economic stability in the long-term (Meister et al., 2009).

3.3. Moving Beyond Gaming: Menominee Tribal Enterprises as an Example of Tribal Business Ventures Beyond Gaming

Economic and political shifts can impact tribal economies in major ways. A diversified portfolio of businesses may help tribal economies to gain resiliency in the event these shifts. This next section discusses the Menominee tribe as an example of a tribe that ventured beyond gaming into sustainable forestry to diversify their revenue stream. Our team spent time with Larry Waukau, president of Menominee Tribal Enterprises, and gained an understanding of a sustainable forestry operation. With this knowledge, we sought to inform Hannahville of the potential to enter into the forestry business.

3.4. Indian Country Forestry

At the start of the treaty era in the early 1800s, Menominee occupied a land base estimated at 10 million acres. Through a series of seven treaties with the US government during the 1800s the land based eroded to 235,523 acres. In 1872, the Menominee gained temporary federal permission to harvest and sell their own timber. In 1890, Congress passed a permanent provision for the Menominee to harvest their timber under government supervision. The Menominee were one of the first tribes targeted by the federal program of Termination signed by President Eisenhower in June 1954. This policy terminated US jurisdiction over the Menominee Tribe and ended their tribal sovereignty. On April 30, 1961, the reservation became Menominee County, and all tribal property and assets were held by Menominee Enterprises, Incorporated. All federal services ended with the assumption that the tribe could support itself. Termination of the Menominee Tribe led to a drastic decline in tribal employment, increased poverty, and brought about devastating reductions in basic services and health care.

Without federal protection, tribal lands had the potential to pass into the hands of non-Indians. In 1970, several Menominee tribes banded together and created the Determination of Rights and Unity for Menominee Shareholders (DRUMS) group, which sought to end termination and restore their status as a federally recognized tribe. On December 22, 1973, President Nixon signed the Menominee Restoration Bill into law. In April 1975, the lands of Menominee County reverted back to Trust and Management Agreement with the Secretary of the Interior, and in 1976 the Menominee approved a new tribal constitution. The new tribal legislature took over governance in 1979, and gave the Menominee Tribe the right to manage its forests with oversight from the federal government, but with the provision that

the Tribe cannot sell or trade land without Congressional approval. The agreement, which is still in effect, requires the Tribe to develop and follow a Forest Management Plan that "shall provide for the continuing operation of such land on a sustained yield basis". The Management Plan is developed by Menominee Tribal Enterprise's (MTE) forestry personnel, then approved by the Tribal Legislature, and then submitted to the Secretary of the Interior for final approval. The Forest Management Plan can be amended as long as it meets federal guidelines. The Secretary of the Interior must approve the management of the Menominee forest annually and has a responsibility to protect and improve forest resources for future generations. Through the BIA, the Secretary provides the ways and means to manage the forest for the Tribe's use, including timber and recreation (Huff and Pecore, 1995). Over 220,000 acres of reservation land are forested with white pine, Eastern hemlock, sugar maple, red maple, red oak, basswood, and yellow birch. Over 2 billion board feet of lumber have been removed from the forest in the last 140 years and yet the volume of sawtimber on the Reservation is greater than when the Reservation was established in 1854.

4. Tribal Land Acquisition

4.1. Challenges and Opportunities of Land Acquisition

As have other tribes, Hannahville has identified land acquisition as a method of economic diversification as well as part of planning strategies for securing tribal wellbeing, development, and cultural benefits into the future. For many tribes, land is not just a financial asset but also a territory on which to expand the community and exercise self-governance. Acquiring land remains a difficult but worthwhile economic and political strategy to explore.

Tribal economic development is difficult and risky. When tribal governments invest in new businesses, they do so with community funds that may have gone to other projects with direct benefits to tribal members. Success or failure of these businesses determines the fate of community money. The hope is that a business will be sustainable and provide employment for tribal members and regular returns that can improve the provision of services to the community. Unfortunately, many of these business ventures fail completely or cannot sustain themselves without continual outside support; casinos are among the few visible success stories that overshadow collapsed efforts and years of disappointment. Examples of consistently profitable tribal business that can contribute significantly to community funds other than gaming are lacking. Of the examples that do exist are of businesses that take advantage of natural resources, such as timber or mineral deposits.

Economic expansion and growth is constrained by available resources, whether it is human, financial, or natural capital. The region a tribe inhabits largely dictates these resources and their ability to make use of them. While in a relatively remote area, Hannahville is situated in a region with marketable natural resources, a tourism economy and infrastructure, and an established surrounding business environment that includes its casino, the town of Escanaba, highways, and established timber mills and other processing facilities.

Land is an asset, and it can pay dividends when its natural resources are utilized as part of a tribe's range of business operations. Land acquisition serves multiple purposes in addition to income generation, such as providing nature-based amenities or space for tribal members' activities. Land acquisition is also important for the reclamation of the tribe's land base, in amount and location. It is an attractive prospect on which to base future investment.

4.2. Land in Trust

Tribes may place land in trust status or purchase it as non-trust property (fee simple). Trust status confers to the Secretary of the Interior title to and administrative power over land held by individual Indians or tribes, and by doing so grants some responsibility for using the land towards the Indians' benefit. Both trust and fee simple ownership has its limitations, complications, and benefits. The legal status of a landholding determines in some part its profitability for a particular use, the specific rights that come with it, and the process of adding it to the collection of tribal assets.

Once land is placed into trust status, as stated in Section 5 of the Indian Reorganization Act, the land is freed from federal and state taxes (25 U.S.C. § 461.5, Sheppard, 1999). In trust status, lands cannot be sold or traded without Congressional approval. Title to land is transferred to the Secretary of the Interior to be held in trust for the tribe (Huff and Pecore, 1995). There are three primary reasons that Indian tribes take land into trust: to facilitate tribal self-determination through governmental offices, healthcare, and public services; for economic

development; and for Indian housing (Scrivner, 2003)

To put land in trust status, the tribe will need to submit an application that addresses the existence of the statutory authority to acquire the land, the need for the land, the purpose for which the land is going to be used, the impact on the state and local political subdivisions, any jurisdictional problems, the ability of the BIA to discharge additional responsibility, and compliance with National Environmental Policy Act (NEPA), and an Environmental Impact Statement (EIS) (Scrivner, 2003). The likelihood of placing land in trust diminishes with the distance from existing land in trust and reservation boundaries (Smith, 2007).

4.2.1. Advantages and Disadvantages of Holding Land in Trust

There are advantages for tribes and their members to have land in trust status. Indians on trust land are ordinarily exempt from certain state laws, including local zoning and regulatory requirements, and state criminal and civil jurisdiction, unless the tribe consents to such jurisdiction (Grover, 2006). Income that Indians derive directly from trust lands is immune from state and federal income taxation as well (Grover, 2006).

One disadvantage to having lands held in trust is that the land cannot be easily used as collateral for capital loans. The typical fee simple owner of large amounts of land can borrow against that land in order to finance enterprises, either on the land or elsewhere. Tribal trust land, however, cannot be mortgaged. While many tribes have been able to finance enterprises through leasehold mortgages on property on the land, the leasehold lacks the security and marketability of title to the land itself. Thus, the tribes can borrow only a fraction of the value of the land, and only at the premium interest rate that lenders apply to higher risk loans (Grover, 2006).

4.3. Fee Simple Lands

A tribe may own property without putting it into trust, and fee simple ownership has legal and operational benefits and disadvantages. Among the benefits of fee simple landholding is the benefits of real property ownership. This includes the removal of restrictions on the land for its lease or sale. Real property ownership preserves the tribe's land base because interests in land held in trust may not be sold or otherwise alienated without an Act of Congress (Sheppard, 1999). However one of the major disadvantages is that once land is put into fee simple then it is subject to taxation.

4.4. Examples of Active Land Acquisition Programs

Hannahville is among many tribes engaged in land acquisition planning. The strategies, motivations, successes, and failures of others may inform us of models of land acquisition planning to explore and lessons to guide future efforts.

4.4.1. Yavapai-Apache Nation Example

The Yavapai-Apache Nation (YAN) in Arizona's Verde Valley has used the revenues from Cliff Casino Resort to reinvest in other business ventures. The Nation is made up of two tribes, the Tonto Apache and the Yavapai. Their gaming operation has impacted the Nation by increasing employment opportunities offered by the casino complex and providing revenue for investments in non-gaming resources (Verde Independent, 2008).

The Yavapai-Apache Nation is working to diversify its economy due to the uncertainty in the future of Arizona's gaming policies and

the state's demand for a progressively larger share of tribal gaming revenue. While unemployment was high prior to the casino's construction, the economic viability of the operation has provided sufficient jobs to the population. As the tribe's economic conditions improved, members recognized the need for other long-term investments, such as infrastructure improvements and the acquisition of land (Piner and Paradis, 2004). They have also engaged in philanthropic activities in an effort to form relationships with communities in the Verde Valley (Beauty, 2010).

Piner and Paradis (2004) point out the connectivity of casinos and the large crowds they attract for potential tourist activities. Tourism is an industry that can complement the economic contributions of the casino. However, tourism should follow an economic premise that incorporates tribal decision-making and perspectives into the long-term planning (Martin, 1998) to establish long-term viability. The shifts away from the casino's economic model towards a more integrative system are why YAN's story is seen as a success (Van Otten and Vasquez, 1992).

In addition to the business-related ventures that the Nation is researching, YAN used gaming revenues to form a Land and Water Program to investigate purchasing properties outside of the reservation. Land reclamation is indicated as one of the foremost ventures of YAN (Kwail, 2012). Before opening the casino in 1995, the Yavapai-Apache Nation reservation had an area of 653 non-contiguous acres. Seventy-five acres were considered commercial and the tribe had a few small businesses along Interstate 17, which provided unskilled employment for tribe members (Piner and Paradis, 2004). The small and patchy nature of their holdings made land acquisition a priority for the tribe. By setting aside casino revenues, they invested in a small Land Acquisition Department that eventually became a permanent department with multiple employees. Today YAN holds around 1,900 acres of land (Counts, 2006).

4.4.2. Oneida of Wisconsin

The Oneida of Wisconsin created and implemented a land use plan in 1987 to clearly indicate to all Tribal members and to the public their intentions for land use and acquisition. The plan provides for the implementation of a national method of acquiring tribal lands by identifying the best possible prospects for acquisition. The plan provides for the provision of policies, laws, regulations, and procedures for the administration of lands under the ownership and jurisdiction of the Oneida Tribe and its members. Oneida's Land Acquisition Plan ranks five land use priorities based on the current needs, future goals, and objectives of the tribe, ranked from highest to lowest as follows: residential, commercial, forestry, agriculture, and conservancy (General Tribal Council Resolution No. 7-3-89-B).

Forest-Based Businesses, NTFPs, and Valuation

PART II

As was mentioned previously, two of the Tribe's requirements of land acquisition are (1) the land must be forested and remain in forest, and (2) the land must pay for itself eventually. To satisfy these requirements, we explored three areas of business activity that may produce revenues at or in excess of the cost of acquiring and owning the land and that maintain the forest intact: timber sale, biomass production for energy, and recreation. We explain the general operations for each, the applicability to the region proximate to the Hannahville Indian Community, and assessments of their feasibility and financial returns.

5. Forestry

6. Biomass Production

7. Recreation, Hunting, and Fishing

8. Non-Timber Forest Products

5. Forestry

The buyer and seller of timber in timber transactions have conflicting interests – the buyer to get as much timber at least cost, the seller to get the highest return – and also often different levels of understanding about forestry. It is the concern of the seller to get a fair price on his timber, which would require an objective understanding of his timber independent of the figures given him by the buyer. The price could then be fairly negotiated. This knowledge divide may be bridge by the hiring of a disinterested forester to appraise the value and volume of the timber for sale. Even then, this information needs to be clearly communicated and understood by the seller. Furthermore, acquiring forestland requires a buyer's perspective and knowledge of timberland values to get a fair price and make the substantial decision of following through with a purchase. The following section will serve to inform Hannahville of the parts and process of timber sale and management so the Community may enter into a decision to sell timber well informed.

5.1. Michigan's forest and forestry, past and present

The most common species in Michigan are sugar maple, red maple, northern white cedar, quaking aspen, northern red oak, white pine, big-tooth aspen, Eastern hemlock and basswood. This will vary by area according to diversity in landforms. Sugar maple is the most common species and along with red maple, red oak, quaking aspen and Northern white cedar makes up half the volume found in Michigan forests (Cook, 2012). The most common forest type in the Upper Peninsula is Northern hardwoods, where at least 50% is sugar maple. Other associates of this forest type are red maple, basswood, birch, Eastern hemlock and beech in the eastern UP. The second most common forest type is northern swamps dominated by northern white cedar (Cook, 2012). The upland forests of the Upper Peninsula consist of mesic Northern forest (Northern hardwood and Eastern hemlock-hardwood), dry-mesic northern forest (pine-hardwood), dry northern forest (pine) and boreal forest.

In Delta Dickinson and Menominee Counties the most common species by volume are: Northern white cedar, sugar maple, red maple, quaking aspen, white pine, balsam fir, red pine, paper birch, Eastern hemlock, and basswood. In Marquette, Alger, Counties, the most common species by volume are sugar maple, red maple, Northern white cedar, white pine, Eastern hemlock, red pine, beech, black spruce, yellow birch, and balsam fir. In Alger, Delta, Dickinson, Menominee and Marquette County forest type and trees with larger basal areas have increased in the 30 years from 1980-2010 (USFS, 2006). This is likely related to a decline in the timber production industry. As many species of trees are on harvest rotations of 50 or more years, an investment in timberlands with proper management now will be an investment in the future of the industry.

A healthy forest is an asset for biodiversity and ecosystem services as world markets change and global forests become more susceptible to disease and pestilence, due to climate change and more chemical resistant pests. The USFS Forest Health report shows low mortality and low risk of mortality in Michigan forests (USFS, 2009). However, significant risks do exist and land-managers can play a decisive role in the magnitude of an outbreak by managing for a diverse forest. The most virulent threats in Michigan are emerald ash borer, beech bark disease, eastern larch beetle, gypsy moth, oak wilt, and jack pine budworm (Hansen and Brand, 2004).

Michigan has a long history of forestry, with 1,600 sawmills in operation by 1873 (USFS, 2002). About 53% of Michigan is currently covered with forest, including forested agricultural or urban land uses. Within these forests there are over 75 identified tree species

with the largest type of forest being northern hardwoods, which includes maple, beech and birch. During the European settlement and post-European settlement periods, Euro-American settlers placed significant pressure on the forestlands of what is now the State of Michigan. As people moved west, this time saw the rise of commercial logging operations, which were vital in building cities like Chicago and Detroit. However, at the turn of the 20th century there was a realization that neither Michigan's, nor the nation's, forests would last forever. This time period saw the rise of the US Forestry Service and the Michigan Forestry Commission as a wave of forest conservation swept across the country.

Forestry is still a large economic driver in Michigan, especially in the Upper Peninsula. As of 2002, Michigan had 273 sawmills, 4 veneer mills, 8 pulp mills, and at least 30 other product mills (MDNR, 2003). Over 2,600 businesses in Michigan are engaged in forest-based industry (MDNR, 2003).

Of the 36 million acres of land in Michigan, 19.3 million are forested, and 18.6 million acres are classified as timberland (USFS, 2002). This means the land is suitable for production of timber crops that are not administratively withdrawn from timber production. Michigan has the fifth largest area of timberland in the United States and the second most state-owned land after Alaska (Cook, 2011). Of the 18.6 million acres currently classified as timberland, softwoods represent 25% and hardwoods 75% of the total acreage. In terms of timber classes, saw timber stands represent 46%; pole timber stands represent 30%; and seedling/sapling stands represent 24% of the total timberland acreage (MDNR, 2002). The Michigan Society of American Foresters reports that in 2007 the state of Michigan used 740 million cubic feet of timber resources, but harvests and diversions from Michigan timberland only reached 360 million cubic feet, indicating room for growth in this industry.

In addition to harboring unique ecological communities and recreational opportunities, the wood of each tree species has attributes that make it useful for general to specific use (see Table 5.1.1). The versatility of the wood also determines the market value board feet that will be attained and is subject to national trends. For example since the housing boom has halted in the United States, there is a smaller demand for this type of material, but pulp wood continues to be profitable.

Table 5.1.1

SPECIES	ECONOMIC USE	WILDLIFE USE	SUCCESSIONAL STAGE	VERY DESTRUCTIVE PESTS
(Hard) sugar maple (*Acer saccharum*)	Saw log, Veneer Furniture, flooring, firewood	Buds	Shade Tolerant	Asian longhorned beetle
(Soft) red maple (*Acer rubrum*)		Forage	Shade Tolerant Fire intolerant	
basswood (*Tilia americana*)	Soft wood Picture frames, toys, baskets, plywood and lumber	Smaller seeds food for birds and small rodents		Fall and Spring Cankerworm, Linden Looper
E. white pine (*Pinus strobus*)	Trim, furniture and lumber			
red pine (*Pinus resinosa*)	Poles, posts, lumber, paper		Fast growing Most planted	
Oak Species (*Quercus* spp.)	Architectural woodwork prized lumber spp.[1]	Mast for deer, turkeys, squirrels and woodpeckers		Oak wilt Gypsy moth Sudden oak death
Ash Species (*Fraxinus* sp.)	Industrial use, tool handles, baseball bats, pulp and firewood			Emerald ash borer
American beech (*Fagus grandifolia*)	Flooring and furniture	Mast	Shade tolerant	Beech bark
E. hemlock (*Tsuga canadensis*)	Lumber and railway ties	Winter shelter for deer	Shade tolerant	Hemlock Woolly Adelgid
white spruce (*Picea glauca*)	Pulp, paper, Christmas trees, dimensional lumber		Dry, fresh upland sites	
balsam fir (Abies balsamea)	Pulp, paper and lumber products		Shade tolerant	Balsam Woolly Adelgid
N. white cedar (*Thuja occidentalis*)	Shake/shingle Fence posts, lumber and boats	Winter food for deer	Slow growing, swampy tree in rocky upland sites	
Poplar (*Populus spp.*)	Pulp			
quaking aspen (*Populus tremuloides*)	Pulp, paper Composite board products			
yellow birch (*Betula alleghaniensis*)	Furniture, cabinet making, plywood, doors, firewood	Catkins and seeds eaten by wildlife		
paper birch *Betula papyrifera*	Veneer, pulp, hockey sticks, firewoods	Leaves, buds and seeds eaten by birds and wildlife		

Table information from: Cook, 2011; Hanson and Brand 2004; Reznicek et al., 2012; and Watkins, 2011.

5.2. Shifts in Land Ownership Within the Upper Peninsula

Statewide, families and individuals, totaling about 320,000 people, own nearly half of Michigan's forests. The remaining forest is owned by industrial and public sectors including federal, state and local governments (Cook, 2011). Since 2005, forestland ownership in the UP has shifted from Vertically Integrated Timber Product Companies (VITPC) to corporate investors. In the UP, Timber Investment Management Organizations (TIMOs) are the largest holder of private forestland, and Real Estate Investment Trusts (REITs) are the second largest landholders (Froese et al., 2007). Divestment of forestland by VITPCs is part of a larger trend that started in the 1980s such that by 2006, investors made up eight of the ten largest individual owners of private timberland (Clutter, 2007).

TIMOs do not own land, but serve as advisors to institutional investors in managing timberlands. They package and broker properties according to their clients' criteria and actively manage the timberlands. REITs are institutions that focus on the real estate aspect of land ownership rather than the production of timber products on forestland. REITs are required to distribute 90% of their taxable income to shareholders and have consequently high liquidity of assets (Fernholz, 2007).

Financial institutions dominate the landscape of those investing in forestlands. The Upper Peninsula land ownership underwent notable changes beginning in 2005 when over 1 million acres of corporate timberland changed hands short time span. See table 5.2.1 for a breakdown of land ownership in Alger, Delta, Dickinson, Marquette and Menominee Counties. Plum Creek Timber Company, Inc. is a company that converted from a conventional timber management company into the REIT structure in 1999. In 2005, they acquired 650,000 acres in the Upper Peninsula through a deal with Escanaba Timber LLC, formerly Mead Paper, MeadWest Vaco and NewPage Corporation. Plum Creek consequently became the largest private landowner in Michigan (Froese et al., 2007).

Table 5.2.1 breaks down ownership in the five counties of interest. Corporate owners will be the most likely source for Hannahville to acquire land of larger scale. Few TIMOs and REITs participate in forest certification programs that require management under accepted sustainable forestry management. The Forestland Group and Plum Creek Timber Co., Inc., major players in the Upper Peninsula, are amongst participants (Sustainable Forestry Initiative, 2012; Forest Stewardship Council, 2012).

The new corporate owners regard their acquisitions as real estate investments. They have divested themselves of mills, but hold log supply agreements with some of the previous owner's mills. International Paper agreed to a 10-year fiber supply to Verso Paper mill. There is much uncertainty what changes in ownership mean for the Upper Peninsula. Through extensive surveys and market analysis, Bliss et al., (2010), point out three trends in land-use changes and associated socioeconomic implications for rural communities and small landowners: intensive timber production, highest and best use, and conservation forestry.

Intensive timber production is the trajectory most similar to current land-use. In this management scenario the land is maintained for forestry. As noted above, few corporate land-owners subscribe to sustainable forestry methods and harvesting rotations are predicted to be more frequent. The rapid turnover of ownership has produced less interest in long-term forest management objectives and negligence of infrastructure like roads. While this type of management maintains a degree of job security in timber operations, it is a generally lower number per area. Forestry personnel are also less likely to interact with community organizations and invest in the capacity of rural communities (Bliss et al., 2010).

The conversion from timber production to that of 'highest and best use' is the trend that has the biggest implications for fragmentation as properties are sold for real estate (Bliss et al., 2010; Clutter et al., 2005). The low population density of the Upper Peninsula indicates that urban sprawl is not an immediate concern. However, the Michigan Environmental Council has expressed concern in the potential correlation

between urban sprawl and the increase in corporate ownership. The Michigan Environmental Council cites Plum Creek's legacy of fragmentation through housing and tourist development proposals in Maine and the western United States as reason for concern and the need for zoning implementations (Garmon, 2012). Fragmentation and parcelization have negative consequences for biodiversity (Hansen et al, 2005), and can facilitate ecologically and economically damaging exotic species invasions. Parcelization also has imminent implications for the demographics of local communities. The scenic and recreational value of the Upper Peninsula is projected to attract wealthy buyers who will convert former forests to vacation residential land cover. This anticipated trend could drive up the cost of living for current rural inhabitants and significantly change the demographics of the Upper Peninsula as it has done elsewhere (Bliss et al., 2010).

The third trend in the corporate ownership trajectory is increase in conservation tenures. Parcelization may increase access and sale of target conservation areas. Conservation type landowners may purchase areas of high integrity or the corporate entities could retain ownership and place areas into conservation easements (Bliss et al., 2010). For example, The Nature Conservancy recently acquired significant holdings of 6,275 acres on the Keweenaw Peninsula (Froese et al., 2009) and over 23,000 acres in Luce County. Corporate owners may be interested in the conservation easement option because of potential future markets such as carbon credits. This trend is not likely to increase economic opportunities or replace jobs lost from timber industries (Bliss et al., 2010).

Table 5.2.1 Ownership Category in acreage by county in this study's area of interest adapted from Froese et al., 2007.

County	Corporate (acres)	State (acres)	Federal (acres)	Leading Owner
Alger	169,159	99,485	158,599	The Forestland Group
Delta	62,627	71,564	244,397	Plum Creek
Dickinson	48,602	48,602	0	GMO Renewable Resources
Marquette	358,462	270,692	18,147	Plum Creek
Menominee	115,970	100,299	0	Plum Creek

Table 5.2.2 largest landholders, category of ownership and total acreage in the Upper Peninsula adapted from Froese et al., 2007.

Plum Creek Timber Company, Inc.	REIT (Real Estate Investment Trust)	633,900
The Forestland Group, LLC	TIMO (Timber Investment Management Organization)	518,050
GMO Renewable Resources, LLC	TIMO	419,930
Keweenaw Land Association, Ltd.	Land owner type	144,900
Longyear holdings	Land owner type	65,351
Nature Conservancy	Conservation owner type	23,076
Cleveland Cliffs Iron Company, Inc.	Mineral owner type	15,540
Vulcan Timberlands, Inc	VITPC (Vertically Integrated Timber Product Companies)	13,871

5.3. Timberland Investment and Ownership

Timberland as a financial investment mechanism is a relatively new idea. Its rise as an equity asset class has only gotten attention since the passage of the 1974 Employee Retirement Income Security Act (Mei and Clutter, 2010). This act required financial managers to shore up their retirement portfolios with more long-term low-risk investments, leading them to seek out untraditional assets such as timberland. The new market for timberland in turn partly led to a rise in prominence of TIMOs and REITs as timberland owners or managers, as opposed to the prior exclusivity of state and federal governments, NIPF owners, and VITPCs. Since then, the role of timberland as an asset class in investment portfolios has only increased (Cascio and Clutter, 2008).

The financial benefits of owning timberland come from the appreciation on the value of the land and its timber assets, the sale of timber, and from its capacity to accommodate multiple uses such as for NTFPs and recreation (Alexander and Gifford, 2003). The appreciation on timber derives from its natural growth and improvements in its quality, which proper management can encourage. Alexander and Gifford (2003) estimate an average 3.92% appreciation on forestland simply because that is the average rate of growth among hardwood and softwood species in the Northeast, if their volumes were evenly distributed. The appreciation on timberland comes from the increasing scarcity of undeveloped real estate.

Thankfully for our purposes, the recent attention on timberland as a financial asset has led to much recent research and documentation about its financial performance. Yet the newness of this research and the difficulties of generalizing timberland performance over so many variables – markets, management practices, forest variation, ownership classes, etc. – requires a measure of caution with regard to precise figures and predictions.

5.4. Timberland Investment: TIMO, REIT, and NIPF Proxy Returns

Returns data are difficult to find for Indian timber sales specifically. For an appraisal of timberland performance as a revenue generator, we will look first at returns data from other ownership classes that are available to get a sense of the market.

If Hannahville owned forestland primarily as an investment based on timber sales, it would operate similar to an institutional investor. The trend for institutional investors lately is to buy shares in TIMOs (Bliss and Kelly, 2008). Timberland in REITs operates with similar intentions, but the timberland may also be converted or developed into other classes of land and sold off in any portion. The rise of TIMOs and REITs alone may be evidence of the long-term profitability of timberland ownership, and their returns and risk could help illustrate how profitable or risky timberland ownership may be.

One method of evaluating timberland as an investment is its performance against alternative forms of investment. Investments are evaluated based on two main metrics: financial return and risk. Financial return is estimated by the gain in value of the assets and revenue from their sale, and risk is estimated by the volatility of the asset's market over time. The combination of risk and return of one asset class can be compared to the market as a whole, illustrating that asset's performance relative to a suite other investment choices.

The Capital Asset Pricing Model (CAPM) is one way to find this estimate (Casio and Clutter, 2008). Cascio and Clutter (2008) applied the CAPM method using the National Council of Real Estate Investment Fiduciaries (NCREIF) Timberland Index (TI) to investigate historical timberland performance in its reporting regions. The NCREIF TI compiles and aggregates quarterly returns by TIMOs and REITs and reports them by large regions, including the Northeast (though not Lake States individually). The returns are segregated into income and capital appreciation. The CAPM models forestland return on several assumptions and a model that roughly approximates a growth and extraction series

– called a synthetic timberland return model – but does not accurately reflect the dynamic response of uneven-aged forest to extraction. Caulfield (1998) still demonstrated a reliability of synthetic timberland performance models to mimic actual returns on timberland investment.

Comparing the aggregated returns on timberland to 10-year US Treasury bonds and concurrent S&P returns as the market proxies, Cascio and Clutter (2008) found timberland assets to be less risky than the market and to bring returns in excess of the rate hypothetically required offsetting its risk, at 5.92% averaged from 1994 through 2005.

Aronow, Binkley, and Washburn (2004) applied the NCREIF data to a timberland model that holds forest inventory and harvest static over time, showing evidence that timberland values are positively correlated with operating revenue in the US South and Pacific Northwest (R^2=0.73 and 0.64, respectively). Mei and Clutter (2010) collected the findings of many studies to reach the conclusions that timberland is relatively risk free compared to common financial assets and can be effectively timed to the market for higher returns on timber and property sale, but suffer some lag in market timing and has returns integrated with other non-timber markets and investments. Mei and Clutter's (2010) findings comparing performance of private- and public-equity timberland investment suggest that private timberland management provide higher returns – risk-adjusted 9.36% per annum nationally using CAPM – with low risk relative to similar investments in publically traded markets. Caulfield (1998) gives evidence that timberland exhibits "persistence" of returns over long period of time, indicating relatively stable and regular rates of return and appreciation.

The 2011 financial review of timberland as reported by the NCREIF for the Northeast show return rates that are mostly attributable to appreciation (6.63%) and much less so to net operating income (0.85%) (NCREIF, 2011).

We must be cautious with these data. Detailed records of timberland investment returns are difficult to come by since historical performance of timberland markets has not been well documented (Aronow, Binkley, and Washburn, 2004). The National Council of Real Estate Investment Fiduciaries (NCREIF) is the only real estate investment index that aggregates empirical data on timberland returns (Cascio and Clutter, 2008; Aronow, Binkley, and Washburn, 2004). While the NCREIF has kept quarterly reports on the Pacific Northwest and the US South since 1987, it has only done so for the Northeast since 1994. Many timberland valuation and model calibration studies thus neglect studying the Northeast in favor of the other areas with more extensive data. While the NCREIF numbers are regarded as the best available, the numbers are too coarse and broad to represent the returns of any single institution. Furthermore, land sales are also included in returns data, and so confound estimates of returns on timber sales alone. Historical returns do not always mirror future performance (Caulfield, 1998). Also, we do not know the applicability of forest models and markets created for a particular region to Michigan's Upper Peninsula. Many studies have recently focused on the South and Pacific Northwest, but those focusing on the Lake States appear scarce. Lastly, although timberland investment appears to bear low market risk, one should recognize that the risk and return estimates are aggregated from millions of acres. Market risk also does not predict or correspond faithfully to the catastrophic events that can occur to forests as a biological system open to damage. Thus, while the evidence is encouraging, there exist several problems in assessing timberland values and investment decisions based on others' data.

Investment returns derived from TIMOs and REITs also do not entirely represent the returns experienced by other ownership classes, such as NIPF, public domain, and Indian nations. These different ownership classes often express divergent methods of management to meet their individual needs and purposes.

Since Hannahville would not act as a remote investor in shared or traded land but as the sole forestland holder, it would resemble an individual private owner. These private owners – whether individual, family, or institution – usually own forestland for reasons other than timber sale, forest management, or real estate investments. NIPF owners make up a very large portion of timberland owners; in 2010, NIPF owners

make up a very large portion of timberland owners; in 2010, NIPF owners possessed the majority of forestland in the US (D'Amato et al., 2010). Because NIPFs, in contrast to VITPCs, TIMOs, and REITs, do not typically own and manage timberland as for-profit enterprises, they sell timber as an income supplement or to relieve the tax burden of land ownership. Since this sale that may occur only once is the owner's lifetime, NIPFs often invest little in forest management or professional counsel (Rosen and Kaiser, 2003).

Shivan and Potter-Witter (2011) estimated that NIPF provides the largest share of wood for Michigan's mills, around 40%. D'Amato et al. (2010) show that in the circumstance of development pressure, a combination of timber sale and the sale of conservation easements on the land was enough to offset the tax burden of NIPF, partially because of the reduced assessed property value; the study found however that timber sale alone did not provide a positive return.

5.5. Indian Forestry

Hannahville would show traits of both an NIPF and an institutional investor in its management of timberland. However, since Hannahville would prefer new land to enter trust status, we must consider how new timberland will perform in the context of Indian forestry.

Trust status possesses both benefits and difficulties. As exemplified by the divestiture of timberland by VITPCs, fee simple owners often choose to sell portions of their land to maximize their profits. In contrast to fee simple ownership, once Indian lands are in trust status, they are no longer a liquid asset and cannot be sold. The US government has fiduciary responsibility over Indian trust lands, so if Hannahville puts new lands into trust, it would not be able to transfer title without congressional approval. Recently, it has become a prevailing view that much of the value in timberland investments comes from the appreciation on the bare-earth real estate itself. The revenue generated from tribal timberland trusteeship thus must consider exclusively only its operating income from timber sale, use and recreation permits, and other products and services. When discounting the value of the land as appreciable real estate against its operating income, timberland is likely to provide much smaller returns than those described earlier for institutional investors.

However, fee simple forest owners pay property taxes on their land and bear a number of other costs. To ease this burden, many seek out government programs, conservation easements, tax credits, and other mechanisms to reduce their tax burden. Indian nations do not pay property taxes, and income generated from trust lands is not taxed.

The trust land also creates a relationship with the BIA, since it is technically their responsibility to ensure federal trust responsibilities are met regarding the management of Indian lands and forests. The federal government technically owns trust lands and tribes are considered the "beneficial owners" (Pevar, 2004). Indians are the primary beneficial users of the land conditional on arrangements coordinated with the BIA. This administrative arrangement presents challenges and complication. The BIA manages the land in a way consistent with Agency objectives and typically assigns its own forester to manage it. The BIA's management objectives and legal mandates may not agree with that of the tribe (Gordon, et al. 1997). Krepps and Caves (1994) present tentative evidence towards a hypothesis that BIA management of Indian lands for timber sale is less productive and profitable than that of self-management, citing perverse incentives on part of the BIA and red tape that impedes the goal of tribal wealth. The first Indian Forest Management Assessment Team (IFMAT) report of 1993 agrees that priorities differ between tribes and their BIA forest managers, but instead finds BIA foresters more likely to plan forestry around financial returns instead of tribes' preferences for complete resource protection (Gordon, et al., 1997). The priority of timber production may also appear in BIA code of practice despite shifts in federal forestry legislation towards multiple uses (Yazzie-Durglo, 1998) IFMAT I and II both documented severe underfunding of Indian forestry programs relative to the amount spent on other public forestlands (IFMAT II; Gordon et al., 1997). PL 638 offers varying degrees of

BIA involvement in forest management, from assigning responsibility for management solely to the BIA, or resigning management over to the tribe accompanied by funding. It appears that, accompanied by recommendations to shift to greater tribal involvement in forest management (e.g. IFMAT I and II), the relationship between federal agencies and tribes are becoming increasingly flexible and collaborative (Donaghue, Thomson, and Bliss, 2010).

Planning for trust land acquisition also differs from that for fee simple. The government confers trust land to a tribe pending approval of an application, wherein they must specify the land in question and justify why its acquisition adds to tribal wellbeing, in accordance with the trust responsibility. According to 25 CFR § 151.11 (b), "as the distance between the tribe's reservation and the land to be acquired increases, the Secretary shall give greater scrutiny to the tribe's justification of anticipated benefits from the acquisition." Put in other words, trust applications are more likely to be denied when they are for land noncontiguous and at a distance from current holdings (Smith, 2007). Trust applications also come under review slowly. Thus, tribes must weigh the decision to seek land more likely to enter trust status versus land that may be more attractive for forestry, development, or other goals. Given the relative permanence of tribal land holdings, for better or worse, tribes also face more pressure when securing land since it will become a fixture in their "home base" for generations to come.

Yet Indian forest in the UP may hold a strategic place in timber markets. While Indian timberland carries traits of both NIPFs and institutional investors, its unique ownership class may contain advantages over NIPF, institutional, and public sales. NIPFs often receive low stumpage prices because of their small tract sizes and lack of planned management. Institutional investments, while strategically managed, must share profits between the administrators and clients, and we do not know how long any tract is kept in timber management. Public sales are becoming scarcer and suffer from policies that restrict the quantity cut, when, and how, and with a non-profit mentality may often not command the prices they could receive.

Indian forests can have inherently fewer of these drawbacks. A large parcel of well-managed timber has an advantage over NIPF-style ownership in the stumpage price commanded and the desirability of cutting its timber. Since the land is kept in permanently managed forest, it can improve in both timber quantity, stand composition, and class over a time frame not experienced on land traded for investment and conversion. Finally, Indian forestry in particular has an advantage in the institutional support of both funds and expertise through federal grants and agencies. Where there are grants for infrastructure or forest improvement and professional expertise available to Indian tribes, other classes of forest owner-operators would have to bear those costs alone. Keeping forests forested and under single ownership for a long period of time can contribute to the economic stability of an area, since the idea of perpetual timber production indicates sustained job production as well as a relief from the uncertainties of changing land tenure.

Forestry on Indian trust lands is regulated by 25 CFR § 163 "General Forestry Regulations." The contents of this code reveal several of the issues and choices with regards to timber management. While written in part to ensure that the development of Indian forest land and associated value-added industry by Indians and Indian tribes to promote self-sustaining communities, so that Indians may received from their Indian forest land not only stumpage value, but also the benefit of all the labor and profit that such [land] is capable of yielding (§ 163.3 (b)(4)) the code nonetheless imposes legal processes that limit Tribal autonomy in decisions and management. The Secretary of the Interior undertakes forest management directly through BIA assigned foresters, or may contract with Indian tribes under PL 93-638, the Indian Self-Determination and Education Assistance Act. Hannahville does not have an active forestry program or the professional expertise to contract forestry operations itself. It would therefore be beneficial to weigh heavily the choice of management organization, and what degree of management should be delegated to the BIA, subcontractors, or to incorporate forestry professionals into Hannahville's administration.

25 CFR § 163 also lays out particular requirements of forestry activities, including management plans, timber sales, contracts, and the minimum acceptable stumpage, among other forestry business, and the Secretary must sign off on these particular operational details. This raises concerns that, whether or not forestry is contracted to a tribe, the bureaucratic nature of the process and administrative difficulties of coordinating with off-site, federal forest managers may dissuade timber purchasers from buying and impede what is a simpler business transaction for fee simple owners.

5.6 . Estimating Timberland Asset Value: LEV and Sales Comparison

Timber without the possibility of real estate sale provides a problem for the investor, since "historically, two-thirds of total returns from timberland properties have been in the form of appreciation" (Aronow, 2004). Timber on the stump is real property combined with the value of the bare land, and is not easy to assess as felled logs, which is simple personal property (Mayo and Straka, 2005).

Land expectation value (LEV) is a discounted cash flow (DCF) analysis used to appraise the value of land in (typically even-aged) timber production. It is described as the net present value (NPV) of the expected harvest when growing timber on the land in perpetuity. It may also be seen as the maximum price that can be paid for a tract of timberland if a rate of return equal to the discount rate used to calculate the LEV is specified (Straka, 2007; Straka and Bullard, 1996).

LEV may be combined with the calculations of current stumpage (or stand age subtracted from harvest rotation) to get the total value of land in present timber production or with pre-merchantable timber on it. Uneven-aged stands do not have a bare-earth value, but LEV can still be used to calculate land value by the ratio of the expected annual returns to the interest rate (Straka, 2007). Or, the original LEV calculation can be used with the cutting cycle substituting for the rotation. One time period from planting to harvesting is a rotation. Uneven-aged stands as a whole do not see rotations, but rather cutting cycles that "rotate" individual trees.

Because immature or pre-merchantable timber stands do not exhibit a present use value, they are often thus appraised by conservative appraisers at less than their DCF of future expected revenue streams (Mayo and Straka, 2005).

Another method of assessing the value of timberland is through a sales comparison approach, which takes this relative stability as an assumption that comparable lands have comparable market-determined values. Yet valuing timberland by comparability of similar timberland sale is often difficult because the data or timber stands truly comparable in size and composition are hard to find (Mayo and Straka, 2005; Healy and Bergquist, 1994). Sale prices tend to follow seven main variables: timber age, volume, forest species composition, sale motivation, time spent on the market, timber quality, and site features (Healy and Bergquist, 1994), all of which may vary between superficially similar areas.

Of these variables, forest species composition and site features are likely to be spatially correlated, and timber age, volume, and quality vary within a limited range. Importantly, timber age, volume, and quality are features that appreciate over time, and so the price paid today and compared to another similar forest sale may not reflect the value obtained over the next decades.

It has been accepted that "there is no standardized appraisal and valuation practice in forestry" (Mei and Clutter, 2010). Evaluating the value of a parcel of timberland will in the end require hiring a timber cruiser or other forestry professional to assist in documenting the assets and providing council of a fair assessment (Healy and Bergquist, 1994).

5.7 Timber and Timberland Market Projections

Recent softwood lumber and panel market reports indicate that mills struggle to match sales with production. Prices are heavily

influenced by current affairs. Market reports cite weather patterns as well as seasonal changes to causes of weekly sales fluctuations. Weekly reports can be found on Global Wood's website under Industry News and Markets (Global Wood, 2012). Annual timber growth in Michigan has exceeded the volume of timber extracted from the forests for over 30 years, representing a surplus of wood. Michigan's surplus is one of the largest in the country (USDA, 2002), and, if considered from a timber products perspective, represents an opportunity for increased output of products and an increase in economic benefits (MDNR, 2003). Certainly, the market is not constrained by processing infrastructure. It might be restated, however, that the market for Michigan timber is not constrained by supply but by the demand for its products. The surplus of Michigan wood should mean that until people begin to purchase more wood products, prices will stay low and volumes of extraction will stay high. In fact, demand for wood products and high production volumes may be followed by reforestation and afforestation rather than over-extraction. For instance, while aspen forest cover declined in area from 4.2 million to 2.7 million acres between 1966 and 1993, continued demand for aspen pulp and for management of wildlife species that prefer aspen have slowed this decline. Overall the growing stock has increased by roughly 35%; this raised the growing stock to 27 billion cubic feet since 1980 (MDNR, 2003).

Despite projected increases in demand in China, Korea, Japan, and Mexico among other countries in the next two decades, the US is not projected to increase its market share of exports in any category in the same time (Turner, et al., 2005). Haynes (2003) predicts "over the next 50 years, prices of most major classes of forest products will continue along their recent historical trends. [Pulp and strand commodities] consumption will grow most rapidly [but] will realize the smallest price growth rates. Lumber, in contrast, will experience slower rates of consumption growth but more rapid price growth." Alig and Wear (1992) and Haynes (2003) predict substantial investment into softwood plantations in the South over the next several decades. This suspected increase in Southern softwood implies that the Northeast and Lake States may respond by specialization in hardwoods.

While total forestland nationally has declined only marginally in the past decades, the amount of forest per person has declined by half in the US in the last half-century (Kline, Alig, and Garber-Yants, 2004). Rosen and Kaiser (2003) describe that, in the 1990s, timber sourced from public lands in the US decreased 62% while timber sourced from private land increased 17%. As harvests on public land continue a decreasing trend and conversion from forest to development continues, demand for timber from private sources is expected to continue into the foreseeable future (Alig, et al. 1999). Alig et al. (1999) identified changing timber markets and policy decisions that affect public cuts as drivers for an increase in NIPF management intensification and sale. Still, most NIPFs practice "hands-off management" and treat their woodlands as "quality of life amenities," rarely bringing timber to market (Erikson, Ryan, and De Young, 2002). Similarly, the recent trend of selling off institutional lands and their parcelization appears to have resulted in decreases in contiguous forest and increases in change from institutional forestry, since fragmentation makes timber sale operationally less feasible (Miller et al., 2007; D'Amato et al., 2010). TIMOs and industrial private forestland owners can own forests on the scale of tens of thousands of hectares (Arano and Munn, 2006). Compared to TIMOs and industrial forestland owners, NIPFs invest significantly less in intensive forest management (Arano and Munn, 2006). This implies a premium on large, contiguous tracts of single-owner forestland.

5.7.1. Timber Sale and Management: Factors Affecting Bid Values

Stumpage prices

Stumpage is the value of a log after accounting for the estimated operational costs of felling and selling (Wagner and Sendak, 2005) and

for a tract represents the value of trees that are immediately ready for harvest (liquidation value). Stumpage prices have "historically tended to be highly volatile because of global and domestic factors affecting demand" and so do not reflect the relative stability of timberland values (Healy and Bergquist, 1994). Wagner and Sendak (2005) found hardwood sawlog prices in the US regional Northeast (which excludes Michigan) increasing by 4.6% annually on average between 1961-2002, and softwood sawtimber and pulp by 0.7% and 0.6%, respectively. These increasing rates had been nonetheless declining for the few years leading up to 2002. Hard maple receives the highest price, around $440 per MBF of sawtimber in 2009 (Shivan and Potter-Witter, 2011). Pulpwood prices averaged $54 per hardwood cord and $74 per non-pine softwood cord; boltwood receives between $115-150/cord (Shivan and Potter-Witter, 2011). Yin and Newman (1996) demonstrate a relative stability of stumpage prices en mass, while pointing out that this stability may partially be due to lags in the market and that individual local markets can differ significantly from regional averages. Absent a subscription to price reporting firms, MDNR produces quarterly price reports that can inform Hannahville of expected returns on sales.

Location

Timber markets are confined to their proximate area, and also unlike financial assets, timber assets are less liquid and require more effort to buy and sell (Yin and Newman, 1996). A large majority of mills receive their wood from within 90mi transportation distance (Shivan and Potter-Witter, 2011). Estimates by Puttock, Scott, and Mielke (1990) found a 7.3% decline in stumpage price for every 50km hauling distance and a 0.94% increase for every 1% total increase in tree volume harvested.

Furthermore, in some regions there may exist only one buyer – the closest mill – and so exclude competitive bidding (Dahal and Mehmood, 2005, quoting Nicholson 1998 and Carlton 1983). The net number of Michigan mills has declined severely in the past several years, providing a further challenge. If there is no mill within an economical distance, there is no destination for Hannahville timber. At the current rate of mill closures, this may prove a serious problem in the future even though remaining mills may search farther for its timber.

Ownership type, area, infrastructure, and management intensity

Public sales often represent lower bid prices per comparable acre than commercial private sales because of the cost of regulation compliance borne by the buyer (Dahal and Mehmood, 2005). Dahal and Mehmood (2005) found for mixed pine forest in Arkansas significant factors to increase bid prices are the percent MBF sawtimber, allowance of wet-weather harvesting, number of bidders, and preexistence of logging roads. Stier, Kim, and Marcoullier (1999) found that ownership class, and the attendant presumptions of management intensity, matters little to forest productivity in the Lake States. That is, while ownership and management can produce better quality and more timber, the paramount determinant of an area's productivity is its biological and geographic conditions, which are unalterable through management. In the Lake States, the history of land tenure almost by accident put the most productive land in government ownership, and industrial land subsequently tended to be inherently less productive and on par with the potential productivity of forest in other ownership classes.

While there are more forest owners than ever, the average forest ownership area is significantly smaller than in the past (Rickenbach and Steele, 2006). An economics of scale applies to forest businesses, and small-scale forests "do not fit smoothly into the commodity chain" (Bliss and Kelly, 2008). Richenbach and Steele (2006) profiled logging operations of the UP and parts of Wisconsin in 2004, finding roughly 30% of logging operations occur on harvest areas covering between 21-40 acres and roughly another 30% over 40-80 acres. Firms not dependent on NIPF were more likely to log on areas of 80 acres or more (Richenbach and Steele, 2006). Average harvest of NIPFs was 680 cords per sale, and

non-NIPF dependent operations 1960 cords per sale (Richenbach and Steele, 2006).

Theoretically, forest tracts incur increased average costs of operation per unit area as area decreases (Cubbage, 1983). In a review of the literature, Cubbage (1983) found that most studies corroborated the reasoning that large tracts of forest were less costly to operate, attributable to better optimization of scales of management, better returns on the fixed costs of logging, profitable sales of thinned material, and other proportional reductions in unit costs. Ranges of "optimal" tract sizes in various models were anywhere from 50-1000 acres, above which lay diminishing returns but returns nonetheless (Cubbage, 1983).

Yet a point worth considering is the diversity of uses that can occur on a limited area of forest, aided by the more personal attention the landowner may pay and the ability to manage the whole ecosystem. Traditional large scale timber-oriented businesses often employ broadcast treatment over areas, which may be good for en mass timber sales and quick turnaround but insensitive to other purposes a tract of land can employ, such as recreational benefits and other niche markets (Bliss and Kelly, 2008). Broadcast treatment also often disregards quality for volume, and while there is no lack of timber volume in the Upper Peninsula there may be supposed a lack of high-quality logs for high-value products. This may be otherwise produced with intensive attention to a manageably scaled tract of forest.

Business and marketing

Many large mills in Michigan find long-term timber supply contracts as attractive arrangements (Shivan and Potter-Witter, 2011), which may prove a business arrangement worth pursuing; yet, because there are several mills in the surrounding area of Hannahville, competitive bidding on an individual-sale basis may have positives as well. Some large mills evidently feel that restrictions on timber sale in federal and state forests are stifling their necessary supply of timber (Shivan and Potter-Witter, 2011). This may be an opportunity for Hannahville to enter the market with a large tract of forestland to good reception.

Studies suggest that attention to price and market reports, such as that provided by Timber Mart-North for private sales and MDNR for public sales, significantly better prepares NIPFs to engage in strategic timber sales and management (Rosen and Kaiser, 2003). Wagner and Sendak (2005) describe that contrary to the importance of stumpage prices to TIMOs in determining financial viability, NIPFs rarely study them for decision-making. Also, timber sales can theoretically be timed with the market (Alexander and Gifford, 2003); the buyers are offering and sellers selling depending on trends in demand and price, and standing timber is a product with a shelf life of years.

5.8. Catastrophic Natural Risk

Theoretically, the disturbance created by carefully managed logging is reversible. However, the forest characteristics of Michigan significantly differ from that of a century and a half ago, such as the conversion of former white pine stands of the Upper Peninsula to hardwood dominance, largely due to intensive logging.

Timberland investment, aside from market risk, bears risk from ecological events, such as the fire and windstorms (blowdowns) that sometimes visit hardwood forests of the UP (Frelich and Lorimer, 1991). Natural disturbances like these determine some of the heterogeneity of timber stands and successional characteristics of forests across landscapes (Frelich and Lorimer, 1991), with wind playing the largest role (Woods, 2004).

Frelich and Lorimer's (1991) study of natural disturbance in the Porcupine Mountains estimate a regime of moderately heavy canopy removal, 30-49% (e.g. windthrow of mature trees), over three to four centuries. Windthrown trees are recoverable through salvage logging,

however, and sometimes to great profit. Fire is less economically beneficial, but much more rare, especially so in the age of fire suppression. Frelich and Lorimer (1991) estimate historical canopy-killing fires had occurred in the UP once every ~1,200-4,500 years, and around a half millennium for contained surface fires. It may appear that the risks more fearsome to the forester in this scenario are the persistent and subtle – regeneration failure, pests, and disease – rather than the immediate and superficially catastrophic.

5.9. Forest Management Principles

5.9.1. Management of Northern hardwoods: harvesting

Ecological forestry is the deliberate maintenance of natural patterns of heterogeneity across temporal and spatial scales (Schwartz, Nagel, and Webster, 2005). Harvest selection procedures that create larger gaps do so in favor of mid-tolerant species, such as yellow birch (Schwartz, Nagel, and Webster, 2005). Group selection, rather than single-tree selection, produces gaps more favorable to mid-tolerant species. Schwartz, Nagel, and Webster (2005) found that among ecological management regimes, heterogeneity inherent to the site, such as soil types and past management have little short-term effect on species composition in stands dominated by sugar maple. Ecological forestry is one management method to achieve the goals of Sustainable Forest Management (SFM), which aims to "preserve environmental, economic, and social or cultural value of the forest base while simultaneously meeting the growing demand for fiber-based products" (Hart, Arnold, and Day, 2000). Hart, Arnold, and Day (2000) suggest that as more timber producers move to SFM models worldwide in response to given global trends of deforestation and subsequent public reaction, that proactively employing SFM in business models may help with strategic competitive positioning.

While there are sound scientific and business rationale for implementing ecological forestry, there are several other methods for managing and harvesting timber from uneven-aged forests such as Northern hardwoods. High-grading is a timber harvest practice where the highest quality trees in a forest management unit are selectively harvested for sale. The trees are typically tall, straight, and knotless sawlogs. Cutting the highest quality trees allows the buyer to get the best product and the seller a profitable one-time sale. However, this practice is not healthy for sustaining the quality of the forest stand as a whole because it removes the trees that are genetically best fit for producing quality timber products, leaving genetically inferior seed trees as the regeneration stock (i.e., seed producers) after the cut (Finley et al., 2007; Barton, 2011).

Diameter-limit cutting applies a cut to all merchantable trees above or below a threshold diameter at breast height (DBH) and is a revenue-oriented harvest rather than a silvicultural procedure (Wagner, Nowak, and Casalmir, 2003). While many studies that have shown financial returns to be greatest through diameter-limit cuts within a half-century time period or less over other harvest prescriptions, evidence shows that the return is highly variable depending on the stand characteristics and does not provide consistent financial returns into the future (Wagner, Nowak, and Casalmir 2003). This practice is questioned as worthwhile by many foresters (Egan, 1999).

Of these, single-tree selection is the management method preferred for maintaining forest conditions favorable to shade-tolerant species such as sugar maple (Schwartz, Nagel, and Webster, 2005), which are among the more valuable of timber species in the Northeast. Industrial Northern hardwood timberland is typically managed by single-tree selection and stand improvement techniques, such as thinning, limbing, fertilization, gap creation, and crop tree maintenance. Thinning has been effective in improving stand composition for commercially valuable trees, but at the expense of some marginal complexity (Gronewold et al., 2010; Caspersen, 2006). Single-tree and group selection mimics natural

disturbance patterns of second-growth hardwood forests (Schwartz, Nagel, and Webster, 2005). Broadcast cuts (i.e., clearcuts) are often used in softwood management because they maximize harvest volumes and do so at the expense of structural complexity, creating even-aged stands. Selective cutting maintains a hardwood forest of uneven ages and of a constant stocking level – the concentration of trees of different species, often expressed as volume or basal area/land area – at the expense of large single harvest volumes (Gronewold et al., 2010). Instead, the stand may see smaller harvests repeated over relatively short cycles, which has its own problems. The more often a forest sees harvest, the faster it will accumulate damage incurred from harvest-related activities, as studies estimate that 15-35% of residual trees suffer damage during the course of adjacent logging (Caspersen, 2006).

Precise selection methods depend on the species composition desired for the resulting stand. A combination of selective cutting of a variety of trees and stand improvement appears to be the most attractive management method in the long term. Harvesting a diversity of timber products – sawlogs, pulp, and bolts – allows the stand composition to stay relatively constant, while stand improvement techniques can improve of the quality and merchantability of timber.

5.9.2. Management of Northern hardwoods: Timber growth and site health

While single trees may receive individual attention, typically the tree stand is the smallest unit of forest to which management prescriptions are applied. A stand is defined as a contiguous area that displays a relatively uniform community of standing timber in both species composition and age structure. The immediate worth of a stand is defined by its stumpage, which is the value of the merchantable timber currently standing on the property. The ideal calculation of stumpage would include, by species, the exact total volume of wood, for every tree, allocated to and priced for its most valuable use. This calculation would provide the highest monetary figure of the forest stand's worth. Such a number, however, would not represent with absolute precision the worth of the stand for a timber sale, and a timber cruise typically suffices. A timber cruise is "a sampling procedure generally used to determine stocking densities and volumes" (Healy and Bergquist, 1994). The stocking figures may then be combined with stumpage prices to estimate worth.

In sustainable forest management, only selected trees or portions of a stand are ever cut so as to ensure some future growth, sale, and ecological value. Logging can also be a destructive process that damages the landscape through roads for equipment, soil compaction and incidental damage to the trunks and root systems of living trees. The observable volume of a tree is also not always indicative of the volume or quality of its wood. Some trees that look perfect from the outside may be hollow on the inside, or suffer deformities that devalue the wood. A buyer of timber knows the imperfections of forests and accounts for that in bid prices. So a seller of timber should know the actual value of the timber available for sale. Together, the buyer and seller in their independent calculations of the actual merchantable value of the stand or selected trees agree on a fair price and a contract that specifically agrees the conditions of the sale.

Improving the quality of the trees in a stand often requires silvicultural management. Among the methods for improving stand quality in naturally regenerating hardwoods is the maintenance of crop trees. Crop trees are trees that show characteristics of high-quality sawtimber – good health, straight, and with few deformities – maintained as a seed source and cared for in a way that promotes a full crown. As an estimate, many commercially operable hardwood stands have only about 20-50 good timber crop trees per acre, and younger stands tend to have more crop trees per acre than older stands (Perkey, Wilkins and Smith, n.d.). Management of crops trees requires selective cutting and pruning of surrounding trees. To "release" the crown, trees immediately surrounding the crop tree are cut to relieve competitive pressure and to grant the crop tree space and light (Perkey, Wilkins and Smith, n.d.). In the crown-touching release method, the trees that make contact with the crown of

the crop tree are cut or limbed. Releasing crop trees creates gaps in the overstory, which allow light and water through to the understory and the seed bank to reach seedlings on the forest floor in duff (the leaf-litter, decay, and other surface debris).

Selection harvesting, removal of merchantable timber, and thinning also create gaps that promote regeneration of early successional species such as aspen, whose establishment and gap closures then favor later successional species like maple. Early successional species require large amounts of light compared to mid or late successional species for generation. Seedling establishment is based on the conditions of the seedbed in the forest understory: moisture, light, soil chemistry and competition, among other factors. Gap openings of various sizes create different light regimes and microclimates that suit different tree species. Wide gap openings inhibit the growth of valuable shade-tolerant trees such as sugar maple until primary growth is established to provide that shade (Yamamoto, 2000). Strategic control of overstory gaps and regeneration conditions may influence future stand composition and health of its trees.

Deer browsing on regenerative growth can also lead to the failure of sapling establishment (Tatenzap, Kirby, and Goldberg, 2011). When browsing leaves large patches of unpalatable herbaceous species in the undergrowth, seedling establishment itself is inhibited in those areas as light does not reach the ground and seedlings are outcompeted by current cover for nutrients (Tatenzap, et al., 2011). Deer density in the UP is often found highest in the south, below the snowline, because lower snow depths allow more access to forage for longer portions of the year. Areas of pulpwood harvest also appear to promote high deer concentrations, as they provide high concentrations of sprouting regeneration (Matonis, Walters and Millington, 2011). High deer populations may mean more regenerative failure of seeds and damage to saplings, and is a concern in this area. Tatenzap and colleagues (2011) demonstrated impaired tree stand composition for many years following deer culling, implying that even significant intervention for deer heard pest management may not see recovery to prior levels of timber production for years. However, work by Reo and Karl (2010) has shown successful regeneration of oak under management that maintains low deer population density.

5.10. Conclusions

The Upper Peninsula is still an area with great potential for forestry, and the Lake States come in second to the Pacific Northwest for timber output from Indian forests (IFMAT II, 2003). The area close to Hannahville may support another entry in commercial timberland ownership, and it appears that the Tribe could find a welcoming market for Northern hardwoods should it acquire the appropriate forestland.

Together, CAPM, LEV, and sales comparison can inform decisions about investments into the purchase of forestland. Several studies using CAPM demonstrate that timberland is a safe investment relative to other investment choices, and that timber sales alone have the potential to provide a return on the purchase of forestland. On another scale, LEV can be employed to estimate an expected return on a specific parcel of land and calibrated to one's required rates of return.

However, we see that the productivity of an individual stand of forest can be significantly affected by the management applied to it. Generally, stand improvement and careful harvesting contribute to the value of the forest and the sustainability of the forest's future for continuous production of timber products. While worthwhile in the long run, intensive management requires additional investment in time and money to prepare and implement appropriate management regimes.

While we may generalize about the usefulness of this information in guiding one's timberland investment decisions, the most useful information is a direct on-site cruise of a potential timberland property and consultation with professionals knowledgeable of the area. The characteristics of timberland – stand composition, age, physical features, wood volume – may vary widely among sites, and so will the degree of the return and the extent of improvements necessary to maximize the site's productivity.

6. Biomass Production

6.1. Biomass

Michigan's Upper Peninsula is an ideal location for biomass energy production. Biomass offers a sustainable source for energy production; when managed properly it can meet current needs without diminishing resources or a forest's capacity to re-grow.

There are a variety of ways to convert biomass into biopower:

• Direct combustion is the oldest and most common way of converting biomass to electricity; it is the process of burning biomass to create steam, which moves a turbine to produce electricity.

• Co-firing is a combination of biomass and coal burning.

• Biomass gasification is the process of heating biomass in the presence of oxygen under pressure, which is then converted into a mixture of hydrogen and carbon monoxide called Syngas. Syngas can then be run directly through a gas turbine or burned and run through a steam turbine.

There are several methods that can be used to create biomass energy. Because there are several methods, each proposal must be handled on a case-by-case basis. After a full evaluation of resources in a given location a development plan can be implemented.

6.1.1. Native American communities and biomass energy

From 2002 to 2008 the Department of Energy's Tribal Energy Program funded 93 tribal energy projects totaling $16.5 million. Federal funds leveraged by $6.4 million in cost sharing the tribes (DOE).

Many Indian tribes have realized the opportunity of producing biomass power. Athabascan, Mississippi band of Choctaw, Port Graham, Red Lake Band of Chippewa Indians, and Keweenaw Bay Indian Community are all tribes that have biomass projects. All of these tribes worked through the tribal energy program and received assistance in development.

6.1.2. Current biomass production

According to the United States Department of Energy the existing biopower sector, nearly 1000 plants, is mainly comprised of direct combustion plants, with an additional small amount of co-firing. Plant size averages 20 megawatts electric, and the biomass to electricity conversion efficiency is about 20%. More than 75% of this power is generated in the forest products industries' combined heat and power applications for process heat. Wood-fired systems account for close to 95% of this capacity. Recent studies estimate that on a life-cycle basis, existing biopower plants represent an annual net carbon sink of 4 MMTCe. (DOE) To get a better understanding of the biomass market in Michigan here is a list of current and proposed/pending biomass facilities in the state.

Biomass facilities in Michigan

• Cadillac, MI- Cadillac Renewable Energy 36MW
• Detroit, MI- Covanta Energy 65MW
• Escanaba, MI- Escanaba paper 100MW
• Flint, MI- Genesee Power Station 36MW
• Grand Rapids, MI- Covanta Energy 18MW

• Grayling, MI- Grayling Generating Station 36MW
• Hillman, MI- Hillman Power Company 18MW
• L'anse, MI- J.H. Warden 20MW
• Lincoln, MI- Viking Energy 18MW
• Mt. Pleasant, MI- Central Michigan University 1MW

Pending/Proposed Facilities

• Alpena, MI- American Process
• Escanaba, MI- New page (Swedish) Black liquor to ethanol 13 million gallons per year
• Frankfort, MI
• Kinross, MI
• Mancelona, MI- 36mw
• Marquette, MI- Northern Michigan University

These facilities are examples of biomass energy production in Michigan. They can also help one to determine the feasibility of starting a new biomass energy company and what availability of resources would be, given the competition. Also, this list of facilities could offer potential customers who would require consistent shipments of biomass materials.

6.1.3. Feedstock

Having enough feedstock to power a biomass facility is critical to its operation. There are many different options when looking for feedstock, but being able to collect it on your own land versus having it shipped in can have important implications on costs. The feedstock's that are used for biomass include:

• Animal residues- Animal manure from farms can be converted into methane using anaerobic digestion.
• Agricultural residue- Stalks, leaves, corncobs.
• Forestry- Operations create a substantial amount of residue that can be collected for direct firing.
• Crops- Sorghum, oats, barley, wheat, cotton, rice, are all possible feedstock.
• Trees and grasses- Switch grass, hybrid poplar, and willow are quick growing and are great sources for a biomass power plant.

Understanding the feedstock for the biomass facility is crucial and should be the first step in determining the potential for operations. There are a variety of feedstocks, and each will be different in cost. In the case of crop-based feedstocks, there are production costs including labor, seed, soil amendments, machinery, and transportation. Contact with regional suppliers of feedstock is essential prior to operating to get a realistic idea of how quantity and consistency of supply. For a 1 megawatt facility, the feedstock required would be 13,000 green tons of wood or 8000 bone dry tons a year.

Another potential use of acquired land can be to become a feedstock yard. A feedstock yard is simply composed of woody biomass that is collected and sometimes processed and can be sold to biomass facilities. This option provides an alternative revenue stream that would not require a large initial investment. The same process used to collect woody biomass for one's energy production can be done including managing forestland as well as planting fast rotation hybrid poplar and other crops. The Biomass Research and Development Board compiled

five steps in assessing if a feedstock yard is a feasible business model:

1. A survey of the quantities of potential biomass resources across the landscape and ownerships within a 25-50 mile radius of the proposed facility.
2. A survey of the actual availability and accessibility of these resources (e.g. what types and amounts of biomass were actually harvested and made available over a designated period, say the last three or five years); Some of this data could be gathered from the USFS forest inventory and analysis timber product output program which provides county-level data on logging residues and forest product removals.
3. An estimate of the costs of obtaining available biomass resources including the cost of the raw material itself, logging and transportation costs, assessment of biomass quality and quantity of the biomass sources, as well as administrative costs.
4. A ranking of the biomass resources from cheapest to most expensive delivered to the proposed feedstock location
5. Creation of a supply curve to determine the price of a biomass resource at a given quantity of demand. As part of this assessment make any adjustments for the seasonal and or traditional woodshed for each of the biomass users in the area to identify where or when competition may drive up prices (National Association of State Foresters)

If Hannahville were interested in creating and maintaining a feedstock yard, they would have to assess all of these points to decide if it is an economically viable option. Given that Hannahville already owns over 5,000 acres, this may be an option without the procurement of new land. In addition to owning property, Hannahville has a community of 700 people that could contribute to biomass collection in other forms, from yard work to farming. The key to this business option would be obtaining purchase agreements with biomass facilities in the area. In addition, being able to secure more woody biomass from nearby communities could have important implications based on what Hannahville would be able to recover on its own.

6.1.4. Costs associated with biomass energy

Prices generally range from 8 cents kWh to 12 cents (EERE, 2011). The cost of electricity from wood-fired power plants ranges from $.06 to more than $.22 per KWH (USDA, 2004). There are a variety of feedstocks that can be used causing costs to vary. Co-firing using coal will cost $50-$250/KW and the electricity cost may be competitive ($20/MWh) if local feedstock is available. With wood fired plants the efficiency ranges from 18% to 24% and they are competitive when they receive feedstock at a very low price or are located in an area of high electricity costs (USDA, 2004)

For example if Hannahville choose to build a 1 megawatt facility using co-firing the initial investment would cost between $1,100,000-$1,300,000. A 1-megawatt facility would power around 1,000 homes and the efficiency of a co-firing facility ranges from 35%-40%(IEA, 2007). Therefore the facility would produce 350-400 kilowatts per hour with a cost of .05 $/kWh (IEA, 2007) 375-kilowatt hours would cost $18.75. In 2012 in the Detroit area electricity per KWH ranged from .11-.14 (BLS, 2012) meaning average price per KWH was .125 cents. This means that taking the average efficiency of the co-firing facility at 375 kilowatts per hour with the average electricity price of .125 cents per kWh the value of the electricity produced would be $46.87. This means that the potential profit would be $28.12 dollars and hour.

One of the most important factors in biomass energy production is the feedstock. Ideal species for feedstock include hybrid poplar, Willow, switchgrass, and Miscanthus (Cook, 2010). Once planted these plantations can last decades before needing reestablishment. A fiber

production rule-of-thumb for northern latitudes is about 3-4 dry tons per acre per year (Miller, 2008). Total plantation establishment costs can range from $600-$900 per acre (Miller, 2008). Willow may have harvests every 3-4 years while hybrid poplar might have 8-10 year rotations (Cook, 2010). Jason Cross a research coordinator for the university of Washington's Olympic natural resources center said that a 1-megawatt facility would consume 8,000 bone-dry tons of wood a year. This means that a 1-megawatt facility would require the planting of 2,285 acres and at an average cost of $750 acre it would require and investment of $1,713,750. A bone dry ton is valued at $72.98 (Goldmark, 2010). This means that 2,285 acres could produce $583,840 dollars a harvest. Therefore if Hannahville were to plant 2,285 acres with hybrid poplar with a 9-year rotation the initial investment of $1,713,750 million would require 3 rotations to recoup which comes to around 27 years.

To accurately determine a return on investment of a biomass energy facility it would require more information. The size of the facility, the initial investment range, and the location are all critical factors to assessing the assessment. Because there can be large variations on cost depending on which method is used it is difficult to deliver an accurate assessment.

6.2. Conclusions

There are concerns over the impact of biomass energy on the environment. If biomass is not collected in a sustainable fashion then it can have a negative impact on the environment. Burning of biomass produces emissions that negatively impact air quality such as: carbon monoxide, nitrogen oxides, and soot and ash. While emissions of biomass energy facilities are generally similar to emissions of coal facilities, biomass facilities produce very little sulfur dioxide. These negative externalities should be addressed when looking to build a new bio-mass facility and the latest technology that improves emissions should be used to reduce these concerns.

There are many different potential uses for biomass energy. In Hannahville, one option for the use of biomass energy would be in the casino. Rather than developing a one megawatt facility, Hannahville could do an analysis on the casino's energy consumption and develop an on- site facility that could substantially reduce energy costs. Another option for the energy production would be to power the 700 plus community members' homes. A third option could be to partner with an existing utility company in the area. Utility companies have important renewable energy standards to meet and may be willing to collaborate in a renewable energy program. This relationship can allow the local utility company to manage the facility or utility simply purchase the energy produced. A relationship with the local utility company should be developed prior to any development and is crucial to the operation.

The tribe should evaluate current grants or development assistance that the Department of Energy is offering. The grants have benefits but the development assistance can also be invaluable. Having experienced teams developing a facility can help expedite the process. It is crucial for this project to work with the Department of Energy in developing a biomass facility. Prior to contacting the Department of Energy it would be beneficial to contact tribes that have already developed biomass energy and worked with this agency. An open dialogue with these tribes will help to determine the challenges and benefits or renewable energy development. This would be one of the first steps in determining if biomass energy production is right for Hannahville.

The level of commitment Hannahville is willing to make towards biomass energy production is necessary to make an accurate recommendation. The initial steps include: obtaining potential grants, communicating with other tribes, and determining the local utility company's role in the project. This will be a long-term investment with a future pay-off. A smaller facility could help to lessen the initial investment and make it more feasible for the tribe.

Given the investment costs and Hannahville's goals, the feedstock yard would be a viable option. Based on current market data in

Michigan, there are several biomass facilities and several near Hannahville. The acquisition of new land could include a plan for biomass collection and management. The current land that Hannahville owns can be managed to contribute to the feedstock yard. The acquired land could have a management plan to produce biomass by planting hybrid poplar that has short rotations and can easily be cultivated. This option may be the most viable for Hannahville as it provides a revenue stream from the newly acquired property and would not require much additional capital investment. This plan would allow Hannahville to recoup the initial investment on the new land faster and could provide jobs to the community. Hannahville should go through the five-step process recommended by the biomass development board to ensure that it would be a feasible business option.

7. Recreation, Hunting, and Fishing

Fishing, hunting, and camping are very popular activities in Michigan. Hannahville has recognized the importance of catering to part of this clientele through creating a R.V. park. There are more opportunities that would present themselves with the purchase of new land. There are several different approaches to these types of businesses activities some of which will be explored further in this document.

7.1. Recreation as Business

Recreational activities on land holdings may be a good way to diversify revenue streams. The United States Fish and Wildlife service conducted a national survey in 2006 that documents hunting and fishing activities. This survey found that 87.5 million US residents 16 years and older participated in wildlife-related recreation (USFWS, 2006). In 2006, 30 million people fished, 12.5 million hunted, and 71.1 million participated in at least one type of wildlife-watching activity such as observing, feeding or photographing wildlife in the United States (USFWS, 2006). This study helps to explain the recreational actives in the United States, and suggests that these types of activities are very popular and may present opportunities for new business ventures.

With over 87 million U.S. residents participating in recreational activities, the economic impact is vast. Wildlife recreation accounted for $122.3 billion of spending in 2006, of which $37.4 billion was trip-related, $64 billion for equipment, and $20.7 billion on other items such as licenses and land leasing land (USFW, 2006). When broken down by activity, the report shows that $42 billion was spent on fishing and $22 billion on hunting. Interestingly, wildlife watchers spent $47.7 billion on their activities (USFW, 2006).

During 2006 in Michigan, there were 1.3 million anglers resulting in $1,671,114,000 in total expenditures and 753,000 hunters, which resulted in $915,884,000 in total expenditures. Finally, there were 3,227,000 wildlife-watching participants in Michigan with $1,622,521,000 in total expenditures (USFW, 2006).

With the acquisition of a large parcel of land, ideally the property would be able to accommodate fishing, hunting and wildlife watchers. While evaluating different business opportunities on large tracks of land in Michigan's Upper Peninsula, recreational activities should rank high on the list of priorities. The popularity of these activities nationwide and in Michigan demonstrates that there is a strong cliental for these activities. Another positive aspect of a business that catered to recreational activities is that it would not require a large initial investment after the land is purchased. If the Hannahville community were to purchase a large tract of land that could accommodate these activities and created a business that offered hunting, fishing, and wildlife viewing, it would be mutually beneficial to the hotel and casino. For example, these activities could be advertised in the hotel and casino; people that visit to gamble could also be informed of these recreation activities and may choose to partake in them, which would extend their stay. Conversely, individuals who came to Hannahville for the recreational activities would stay in the hotel and most likely dine in casino restaurants and possibly gamble as well. Unlike logging and biomass projects, this activity looks to extend customers' stay and also bring new customers to the region.

While evaluating specific parcels of land, the Hannahville community should make it a priority – although not a deciding factor – to find a parcel that contains a body of water. Fishing is one of the most popular leisure activities and Hannahville could capitalize on its popularity.

When setting up fishing related businesses, decisions are determined by the size and location of the body of water. Given Hannahville's

location, the body of water may be stocked, if there are not fish already present. Pike, walleye, bass, trout, and hybrid bluegill are all feasible options for stocking a body of water in this region. Second, the type of equipment would need to be determined. On a small body of water, it would be most sensible to have rowing boats or boats powered by small trolling motors. On a larger body of water it would be worth investing in some smaller 15ft-30ft fishing boats. The third piece of equipment needed would be fishing poles, hooks, bait, and so on. Most avid fisherman have their own supplies, but a small shop containing these products would be important to have for guests who are not fisherman or have not planned ahead. One opportunity that Hannahville should explore is hiring tribal members as fishing guides. They can also explore models such as the Lac du Flambeau tribe and get a percentage of the revenue from the state fishing licenses that are used on their property. This would be a good opportunity to offer new jobs to community members that are familiar with fishing in this region. With this type of business it would be recommended to work closely with tribes such as the Lac du Flambeau for guidance and direction. Also, being able to find alternative ways to create revenue will be beneficial such as creating a relationship with the state that allows the tribe to capitalize on selling state fishing licenses.

To know what kind of revenue can be generated from fishing activities, Hannahville can look to other local companies to see what current rates are for fishing. Scott's Superior Inn and Cabins offer fully equipped 18ft smoker craft boats for $175 dollars a person and $150 a person for two; for reference a used 18 ft smoker craft can cost around $10,000. Evaluating the boats needed is highly dependent on the body of water, which means the costs can vary greatly. Uncle Ducky Charters offers inland lake fishing packages for 1-2 fishermen $300 or 3-4 fisherman for $350 dollars. Uncle Ducky also offers canoe rentals ranging from $40-$50 a day. Hannahville could be creative with their pricing offering package deals with the hotel, hotel restaurants, and golf course to be more enticing to potential customers. It would also be very simple for the hotel and casino to promote fishing trips and even offer to cook your catch at the casino restaurants. The addition of fishing could attract new customers to Hannahville that may have not visited before. Another benefit of creating a fishing location could be to provide the casino restaurants with its fish supply, which could reduce costs and provide fresh fish daily to customers.

Another potential recreational activity would be hunting. Hunting camps are rising in popularity and given the right situation could offer a new source of revenue. As shown previously, hunters spend a substantial amount nationwide and in Michigan. Hannahville could create a hunting camp on a newly acquired piece of land, this would offer guests even more variety in activities and could easily be promoted through the casino.

To better understand the hunting business we looked at similar operations in Michigan:

- Scott's Superior Inn and Cabins
- Deer hunt $125 a day plus lodging
- Bear hunt $1500 includes lodging and meals
- Cherry Creek Farm- 500 acre facility
- Cull Hunt (Whitetail Does Only) $400.00
- Whitetail Doe Hunt Guided hunt with one night's lodging and meals $400/$700
- Whitetail Deer Management Hunt Bucks $1,500 to $2,500
- Whitetail Trophy Hunt Bucks range in price from $2,500 to $9,500
- Half day pheasant include guide, dog and refreshments 5 pheasants per gun $130 additional pheasants $15 each
- Turkey hunt $350

• Legends Ranch
•One hunter one guide- 5 days $5,400
•Two hunters one guide-5 days $3,400 each
•Three days $3400
•Turkey 3 days $1600
• Michigan Elk Hunting
• 3 nights accommodations transportation to and from airport meals prepared

Class	Hunt Price
5 X 5 Bulls	$2,900
300 to 340	$4,200
350 to 370	$5,200
370 to 400	$6,800
400 to 420	$7,200
430 to 440	$12,900
450 to 470	$16,800
480 to 495	$22,800
500+	Price upon request

These are some of the larger and more popular hunting camps in Michigan. While many of these camps offer cabins for housing, Hannahville can offer their hotel and create similar packages. Also, hunting camps do not need to be placed on large pieces of land. We see that Cherry Creek operates on 500 acres. Therefore, if Hannahville is unable to purchase a large tract of land and has to look to smaller parcels it would not rule out this activity.

While it is possible to create a contained hunting camp it is very costly. Instead Hannahville may want to look to uncontained game management. The tribe could hire experts to manage their forests in ways that promote the development of larger, mature deer in the herd. This again will present Hannhaville with opportunities to generate revenue from selling hunting licenses. Once word gets out about the trophy bucks that are being hunted in Hannahville forests it will quickly grow in popularity among sportsmen and draw new customers to the casino.

Another important factor in these activities is the fact that they are social activities. When planning hunting or fishing trips it is rare that there is only one individual on the trip. These are also popular family activities in Michigan so for each trip booked it is highly likely that there will be 2-4 guests. Because it is a social activity that means there are positive economic implications for the hotel, restaurants, gambling, and possibly golfing as well.

As we have seen previously, there is a tremendous amount of money spent on observing nature. This can take on a number of forms from camping to hiking. Hannahville has seen the importance of catering to this population as they have build a small R.V. area. On a new parcel of land this may be the most inexpensive way to create popularity in the Hannahville area. Expanding camping areas and creating walking trails throughout the property would allow for people to navigate the property and observe nature. If planning around hiking and

camping activities there should be a body of water or a river on the chosen parcel of land. These attributes are more astatically pleasing to campers and would promote other activities such as fishing or kayaking.

Another option to catering to recreation customers is to create R.V. ready campgrounds. Business models are being developed in camping where the camping area is already set up with air stream trailers or R.V.'s and customers simply rent out the units. This is a market niche that caters to the customers that are interested in camping but do not have the supplies. This offers them the camping experience without having to buy a camper and haul it all around to campgrounds. Hannahville could operate this type of business out of their hotel and simply treat the campground as an extension of the hotel.

These recreational activities also can have positive social impact on the Hannahville people. These activities can have positive impact in many ways first; diversifying the type of business Hannahville operates will make them less vulnerable to shifts in consumer behavior. This will allow for the tribe to be more economically stable in the long term. Secondly, the social impact on tribal members could be very positive. Being able to provide new job opportunities within the community is very important. Job opportunities can come in a variety of ways from hunting and fishing guides to trail guides. It would also be interesting to try to offer packages where the guide is also a teacher and teaches about the history of Hannahville. Guides could teach about traditional ways in which Native Americans hunt fish and manage the land. This would appeal to customers, as it would offer them recreational activities along with educational opportunities. This type of package would draw new and diverse clientele to the Hannahville Indian Community. Being able to provide a job or career for tribal members that would not have been interested in working in a casino would have a positive affect on the community.

7.2. Conclusions

When Hannahville is evaluating new business options on current or acquired land, recreation activities should rank high on the list of priorities. The priority of the recreational activities should rank from nature observing to fishing and finally hunting based on the amount of money spent for each. The degree of difficulty in setting up a business framework also progresses with the chosen activities.

First we recommend that Hannahville plan to extend the camping facilities on current land or develop a new camp ground on acquired land. Along with increasing camping facilities Hannahville should look to increase walking and hiking trails throughout the property in the most scenic areas.

The second recommended activity is inland lake fishing on newly acquired land. With small fishing crafts or guides Hannahville can create a new business that would not require a high capital investment. As previously stated fishing is very popular in Michigan and fisherman are willing to spend to enjoy their leisure activity.

Third, Hannahville should look to create a hunting camp. In a contained parcel of land Hannahville can offer pheasant, deer, and even elk hunting if desired. This operation would require land and animal management plans to ensure the sustainability of the business. With the popularity of hunting camps in Michigan Hannahville could look to a broad customer base to offer hunting trips and lodging.

These recreational activities would be ideal to add to Hannahville's business operations. Given the marketing team and efforts that Hannahville puts into its hotel and casino incorporating hunting, fishing, and camping trips to the campaign will be effective. Hannahville can offer creative packages with hunting and lodging and even meals. They could also offer packages with fishing trips and promote cook your catch options at the casino restaurants. The main focus of these business activities would be to draw in new customers to Hannahville, extend customers stays, and to create impulse actions from customers currently at the hotel.

8. Non-Timber Forest Products

The term non-timber forest products (NTFP) describes resources extracted from trees, non-woody plants and mushrooms that are not timber. Nuts and berries, essential oils, dyes, fibers, and biofuels are among the products derived from these raw materials. NTFPs can be processed to increase their commercial value, but often little processing is required of these products (Chamberlien, 1998). The Ministry of Natural Resources in Ontario, Canada, identified about 50 NTFP products in its boundaries (Mohammed, 1999) and Emery (1998) identified 138 species in the Upper Peninsula. NTFPs can be for individual consumption or sold for small profits.

Community members can harvest NTFPs for traditional use and personal consumption. Sweetgrass and wild rice are two plants used historically by Great Lakes tribes and Hannahville Indian Community. Sweetgrass is dried and used in basket weaving. Northern wild rice is an annual grass that grows in shallow wetlands. It is an important traditional food and harvested from both cultivated and wild populations.

Surplus harvest can be sold for small income generation to specialty markets. The White Earth Nation, an Ojibwe Nation in Northern Wisconsin, sell wild-rice grain and flour for nine dollars a pound (White Earth Nation, 2012). There are numerous edible wild mushrooms that are found throughout the region. They can be harvested for consumption or sold fresh or dried. A one-pound bag of dried mushrooms is priced at $42.00 in a specialty store of Ann Arbor in 2012 (personal observation).

NTFPs can also serve as an activity for ecotourism. The transfer of local knowledge and the opportunity to collect NTFPs can be incorporated into guided tours. Northern Michigan provides an ideal climate for wild blueberries and huckleberries. In addition to their usage by tribal members, harvesting of berries can be incorporated into ecotourism activities (Vasquez and Buttolph, 2010). Berries can be further marketed by preservation such as drying or freezing.

As with all extractive processes, sustainable harvesting techniques should be employed to assure a future yields and maintain habitat values of NTFPs. The identification and proper harvesting techniques requires the guidance of a trained naturalist, especially for specimens sold commercially. Because they occur in diverse habitats, an ideal parcel of land for NTFPs will contain more than one forest cover. Both sweetgrass and wildrice grow in wetland habitats, while blueberries grow in upland, acidic soils (Reznicek et al., 2012). The more diverse the landholding, the greater the potential there will be to harvest non-timber forest products.

Selecting Parcels for Land Acquisition

PART III

The forest-based business opportunities we identified perform best in land with characteristics most appropriate to each separately. Quality timberland is different in features than the best land for biomass, and the most productive land for biomass differs in the features best suited for recreation. To be proactive in land acquisition requires a way to identify these features in a parcel of land and to judge their suitability for supporting these business options or their combination. Given a criteria of acceptible land qualities and in light of the business options proposed, the following section demonstrates an example of a methodology for remotely identifying parcels of forestland worthy of attention for land acquisition and judging the parcels' suitabilities.

9. Selecting parcels for land acquisition: Recommendations and methodology as it pertains to the Hannahville Indian Community

9. Selecting parcels for land acquisition: Recommendations and methodology as it pertains to the Hannahville Indian Community

9.1. Criteria of Land Ownership

We developed a methodology to select areas based on the criteria of land ownership and area, forest composition, and proximity, in order to direct Hannahville towards evaluation of potential land purchases.

•Land Ownership and Area: Large landowners are more capable of selling large properties that would satisfy acreage requirements to obtain returns from forestry or tourism-based business.

•Forest Composition: Appropriate parcels were selected based on reclassified land cover type. The tribal council is more interested in Northern hardwood forest classification (over 50% sugar maple), which is the most prevalent forest cover type in northern Michigan (Cook, 2012).

•Proximity to Recreation Features, Mills and Hannahville: Although these criteria are important to the Tribe, they will depend on the business plan that the tribe selects. Proximity to mills is important for forestry operations to minimize transportation cost, which is passed on in realized sale values. A parcel that is not adjacent to reservation properties may be more difficult to obtain in trust status (Smith, 2007), but the tribe stipulated an ideal parcel might be justifiable. We used a 100 mile radius to maintain relative proximity to current land-holdings.

The following analysis focused on landcover for forestry operations, diversity, and water features.

9.2. Geospatial Data Collection

We obtained information from several different sources.

Through purchase we obtained:

- A geo-referenced map of parcels data from 1996 for Menominee County from Rockford Maps
- Digitized parcels for Marquette County from 2008 through a private firm, CoreLogic with a one-year use contract

We obtained various other files through Internet databases such as the Michigan Center for Geographic Information:

- Federal Land Cover
- State Lands
- Road and hydrological features network
- Township and County Boundaries
- Cities and towns

We used three datasets in the analyses of forest covers in our study area:

- Forest Inventory Analysis (FIA): U.S. Department of Agriculture Forest Service (USDA-USFS)
- Landscape Fire and Resource Management Planning Tools (LANDFIRE): Interagency collaboration between U.S. Department of

Agriculture Forest Service and U.S. Department of the Interior (DOI) wildand fire management program.

• Michigan Department of Natural Resources' Integrated Forest Monitoring, Assessment, and Prescription (IFMAP) Forest Inventory Analysis:

The United States Forest Service Forest Inventory and Analysis (FIA) program was originally developed in the 1930s to assess standing stocks of timber volume in federally owned forests. In 1999, the program expanded to include all U.S. forestlands of any ownership and incorporated inventories outside of timber assessment such as groundcover (Bechtold and Patterson, 2005). Forest Inventory Analysis classifies trees as anything greater than 12.70cm in diameter and saplings 2.54cm to 12.7cm. Since 2000, as part of the enhanced FIA, four permanent fixed-area 7.32m-radius circular plots are positioned in a triangular array across 0.61 ha of the forest (McRoberts et al. 2005). Forest health is also assessed in the enhanced program. Due to privacy issues, the exact location of FIA plots is not possible to obtain. The information is obscured, but rests within a 5-mile radius of a plot's true location in order to maintain forest cover accuracy. This coarse-scale data is useful in drawing general conclusions regarding dominant species and forest cover in our assessment.

Broader forest types are delineated in the inventory based on species composition. Within Michigan, significant forest types include maple-birch, aspen-birch, elm-ash-red maple, oak-hickory, red and Eastern white pine, Northern white cedar, jack pine, black spruce, balsam fir-white spruce, tamarack and Eastern red cedar. Within these types is a low estimate of 72 tree species. Maple-birch is understood to be synonymous with Northern hardwood. A further breakdown of Northeastern forests found in Michigan as described by the USFS follows. This is not an exhaustive list of land or forest cover in Michigan; the forest types were selected due to their pertinence in the study area.

Table 9.2.1 Forest Inventory Analysis Forest cover types in Michigan with dominant tree species, asso
Net volume and area are for the state of Michigan in 2004.

FOREST	DOMINANT (trees singly or in a combination make up the majority of mature trees)	ASSOCIATES	NET VOLUME (thousand cubic feet)	AREA (thousand acres)
white/red pine	Eastern white pine red pine Eastern hemlock	red maple oak sugar maple aspen	3,318,729	1,946.6
spruce/fir	red spruce white spruce black spruce Norway spruce balsam fir Northern white-cedar tamarack or planted larch	Eastern white pine red maple yellow birch aspen	3,377,535	2,471.4
hard pine	red cedar pitch pine	white pine paper birch sugar maple basswood		
oak/pine	hickory upland oaks	pines and red cedar (50-25%)	614,046	516
oak/hickory	upland oaks hickory yellow-poplar black locust sweet gum red maple	pines and red cedar (<25%)	3,802,291	2,570.5
elm/ash/red maple	elm willow cottonwood red maple	white ash sugar maple aspen oak	1,877,612	1,446.6
Northern hardwoods	sugar maple American beech yellow birch black cherry red maple	white ash Eastern hemlock basswood aspen red oak	10, 732,724	6,303.5
aspen birch	aspen paper birch gray birch	red maple white pine red oaks white ash	3,277,040	3,097.8

Species information from Eyre, 1980. Area and board feet information from Hansen and Brand, 2004.

9.2.1. Landfire

Landscape Fire and Resource Management Planning Tools (LANDFIRE) is an interagency mapping tool that provides information on vegetation, fuel and fire characteristics; cover type definitions are available at natureserv.org. Our primary data analysis concentrates on timber producing forestlands and utilizes FIA and LANDFIRE data.

This dataset was created by the National Cohesive Wildland Fire Management Strategy through collaboration between the U.S. Forest Service and the Department of the Interior's wildland fire management. It was originally designed to help agencies respond to wildland fires, reduce fuels, and plan firefighting strategies. There are currently a number of private and public collaborators involved in the synthesis of this dataset. LANDFIRE uses LANDSAT sensors to compile data that is available in WGS 1984, USA Contiguous Albers Equal Area Conic with a 30m resolution (USGS, 2012).

We used several different vegetation layers in raster format to complete our analyses with LANDFIRE. Existing Vegetation Types provides complexes of plant communities and Existing Vegetation Cover provides the information on the live canopy for a specific area. Existing Vegetation Height gives an average height of vegetation, which can be applied to interpretation of forest age, forestry and wildlife value. Existing Vegetation Cover is mapped in LANDFIRE using a combination of field data, LANDSAT imagery, digital elevation models, biophysical gradients and a decision tree (USGS, 2010). LANDFIRE uses ecological system classifiers as defined by NatureServe, a private partner. Existing Vegetation Cover clusters landcovers according to plant associations, substrate and abiotic factors and consists of nearly 600 classes. It also incorporates successional information and is more informative than FIA for assessing diversity of landcovers and potential land-uses (Comer et al., 2003).

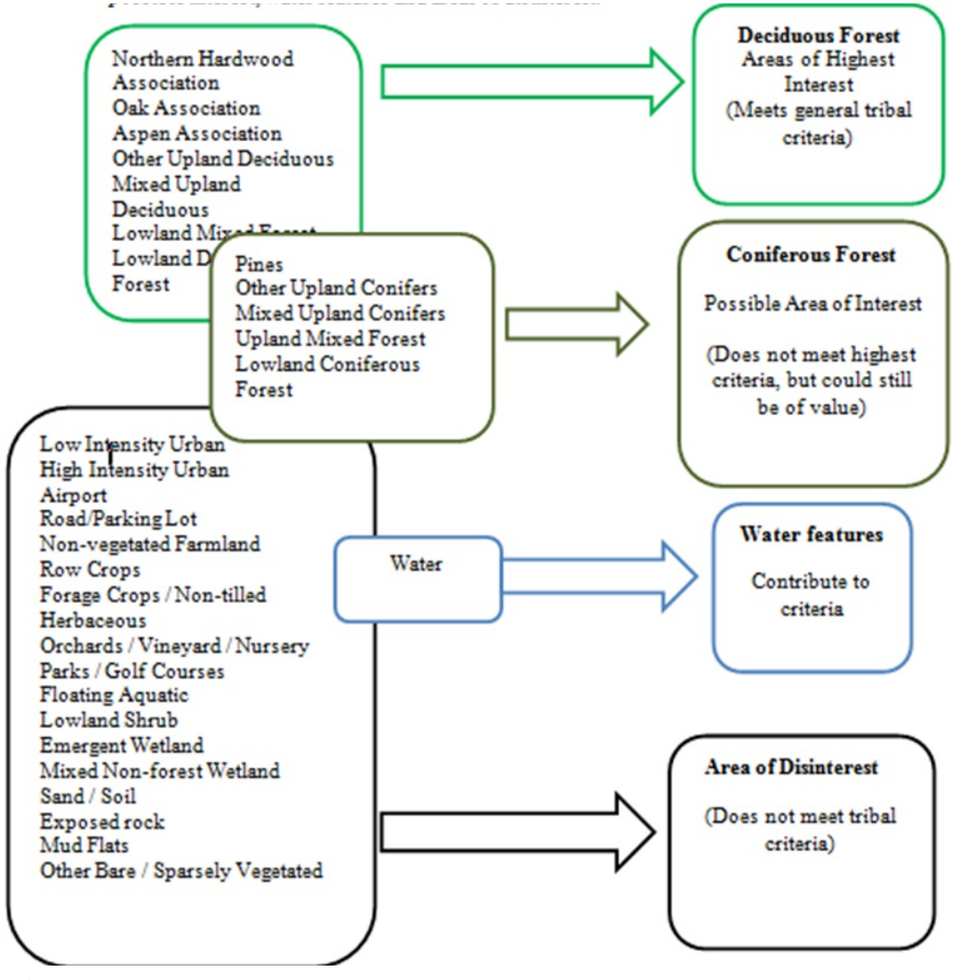
The purpose of the LANDFIRE's classification is to identify upland and wetland terrestrial environments. The resultant landcovers are coarse descriptions (25-250 acres) projected to be stable over the next 10-100 years. The Upper Peninsula falls within the larger Laurentian and Acadian Ecological Division.

9.2.2. IFMAP

The IFMAP is a coarse resolution map that can be used with statewide inventories of forest resources for management planning at an ecosystem level and in assessment of forest resources. The data for the Michigan's Upper Peninsula was obtained from Landsat Thematic Mapper images from 1997-2001.

IFMAP is projected with Michigan Georef coordinate system and Oblique Mercator map projection, using North American Datum of 1983. The resulting raster has a cell size of 30m2 and 8 bits per pixel. The IFMAP provides 33 Cover Type Descriptions. The following is a complete list of the cover types. For our analyses, we reclassified the cover types into: deciduous forest, coniferous forest, and the remaining values into area of disinterest (Figure 9.2.1).

Figure 9.2.1 Reclassification of IFMAP categories into four areas: Those of high interest, possible interest, water features and areas of disinterest.



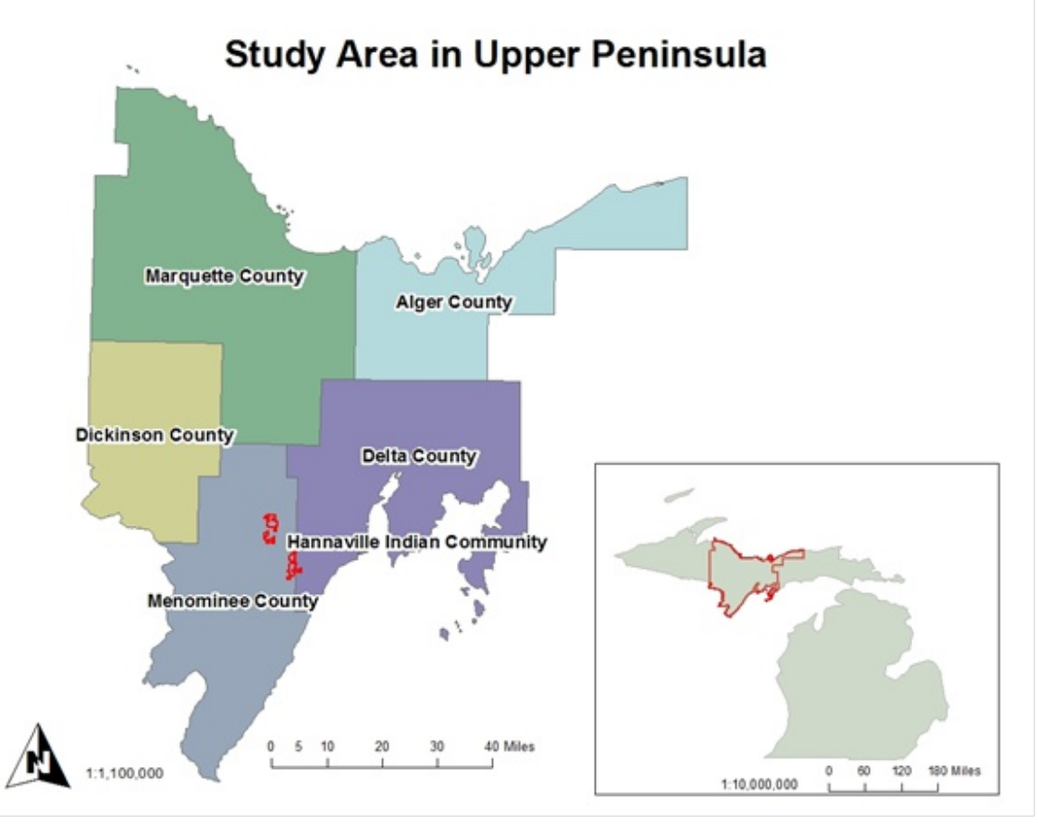
9.3. Methodology for Area Selection

We selected the five closest counties to Hannahville because they fall within the maximum distance of 100 miles as indicated by tribal criteria above– Alger, Delta, Dickinson, Menominee, and Marquette (Figure 9.3.1). Large portions of Alger and Delta counties are excluded because they include federal land in the Hiawatha National Forest that will not be for sale in the foreseeable future. However, the proximity of land to national forest may increase its potential for forest based business and these counties should not be entirely eliminated. We reclassified the IFMAP into four categories: covers of disinterest, deciduous forest, coniferous forest, and water. The groupings do not account for any attributes such as basal area, age, or condition of the forest.

Our initial query focused on Menominee and Marquette Counties because the parcel information was the most recent and accessible

for these two counties. As the information for these areas is available in different formats, we used separate methodologies to explore the areas and select parcels.

Figure 9.3.1 Five counties around Hannahville Indian Community that were included in the study area.



9.3.1. Menominee County

We digitized large parcels owned by landowners, such as the paper companies and forest industries, out of approximately 20,000 parcels drawn in the plat map in Menominee County. Then we used Tabulate Area in ArcGIS Arc Toolbox, Spatial Analyst Toolbar to calculate the digitized parcels' areas combined this with Zonal Statistics to obtain acreage of Northern hardwood forest from an intersection with the IFMAP . We eliminated parcels with less than 300 acres of desirable land-cover owned by private entities (9.3.2.2).

9.3.2. Marquette County

First, we selected parcels classified as "Vacant lands" and dissolved by ownership to reveal the dominant landowners in the county. As with Menominee County, we calculated area and acres of deciduous cover using Zonal Statistics in Spatial Analyst Toolbar of Arc Toolbox, ArcGIS 10. Marquette County has a greater amount of desirable land-cover and we eliminated all parcels with fewer than 500 acres of desirable land-cover (9.3.2.1).

Once we selected choice parcels according to landownership and desirable land-cover, we used the Network Analyst tool in Arc Toolbox to estimate distances to Hannahville and to the closest mill on existing Michigan roads. The Network Analyst is a tool in Arc Toolbox that requires the input of a transportation network such as roads, and destination and origin location in points. Using Hannahville as our origin we were able to eliminate parcels over 100 miles on the road network from further consideration. Our final product gave us 24 possible parcels in Marquette County and 56 in Menominee County. All large parcels in Menominee County are within 100 miles of Hannahville, but eleven parcels were eliminated from consideration in Marquette County. The following two maps show the parcels from each county that remained after the analysis and their distance to Wilson (9.3.2.1 and 9.3.2.2).

Figure 9.3.2.1 Menominee County and parcels identified to meet tribal criteria following our first methodology.

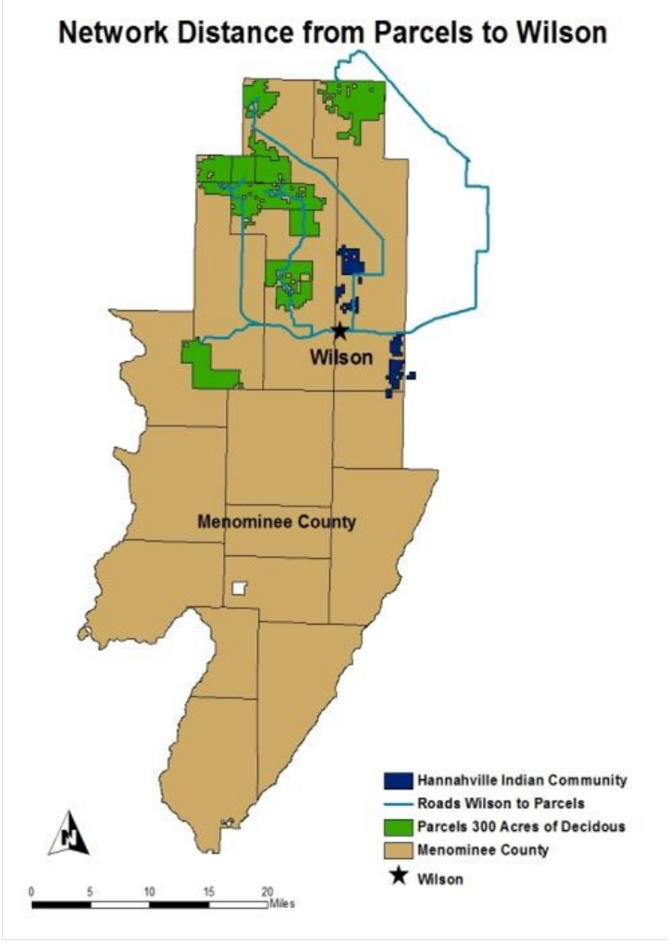
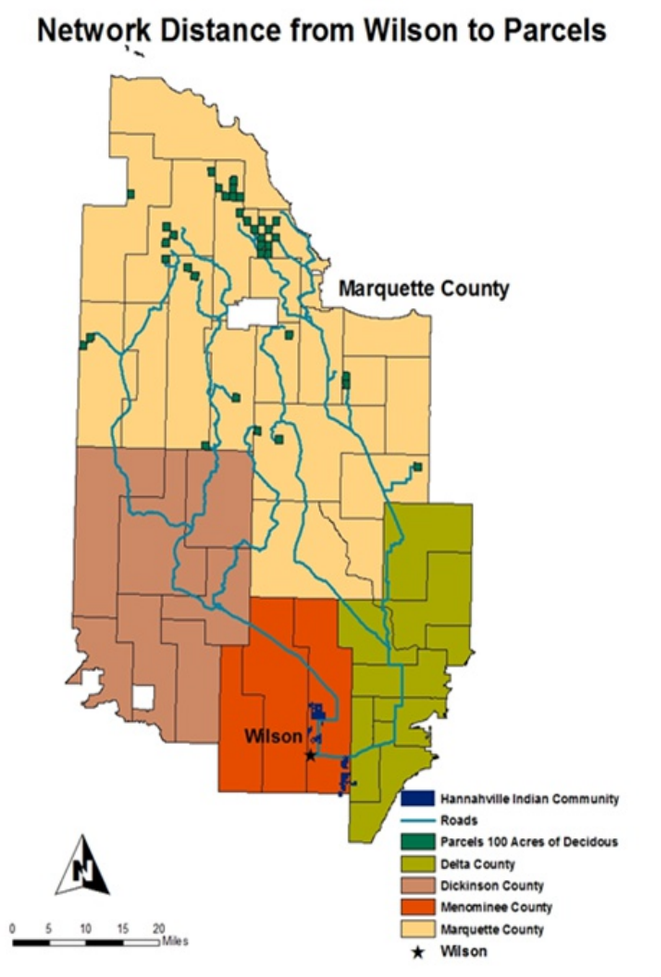


Figure 9.3.2.2 Marquette County and parcels identified for acquisition following our first methodology.



9.4. Further Refinement on Identifying, Narrowing, and Qualifying Areas (trees, diversity and water)

9.4.1 Analysis Method #2

An alternative method to assessing the study area for viability of land acquisition is to creating a suitability ranking based on tribal criteria and available data. Current ownership information was not easily obtained outside of Marquette County. The following analysis applies tribal criteria to the entire study area and ranks the study area according to abundance of Northern hardwood forests, water features, diversity and distance from Wilson, Michigan.

To facilitate a finer resolution analysis of the area, we created a vector fishnet of 800ft2 cells in Spatial Analyst Toolbar of ArcGIS 10. We clipped the fishnet to our study area using the Geoprocessing Tool in ArcGIS and tabulated zonal statistics for the four criteria (Figures 9.4.2.1, 9.4.4.). The criteria maps were converted to rasters and reclassified into categories 0-5. Ratings of 5 indicating the highest match and lower numbers exceedingly lower correspondences. The maps were then added to produce a suitability map (9.4.4.1) of the study area to identify potential "hot spots." Hotspots are areas the Tribe will want to focus on for proactive land acquisition and as part of process of evaluating land acquisition opportunities as parcels come up for sale. Our analysis is based on LANDFIRE Vegetation layers, and a road network and hydrology layer from Michigan Geospatial Library. If tribal criteria shifts, or one criterion is ranked as superior, the additive model should be adjusted accordingly.

9.4.2 Northern Hardwoods

Northern hardwoods were indicated in the tribal criteria as the priority forest type for a sustainable forestry operation. This is due to the high prevalence of sugar maple in this forest type (Table 9.2.1) and the high value of this species (Cook, 2012). Figure 9.4.2.1 is a representation of this forest type in the 800ft2 fishnet of the study area reclassified into a 30m2 grid for ease of overlay. It does not indicate successional stage or forest health within the Northern hardwood category.

9.4.3. Successional Stage

LANDFIRE provides information on the successional stage and height of forest cover. Within the study area, LANDFIRE divided forest height into four classes (0-5 meters, 5-10 meters, 10-25 meters, 25-50 meters). Figure 9.4.3.1 represents the distribution of the four classes across the study area. Since 94% of the forest falls within 10-25 meters, it is difficult to use this information to assess forest age and estimate basal area. Forest Inventory Analysis data provides information on basal area and species distribution within its ground plots. Further interpolation can be made to estimate these attributes between plots, but current aerial photographs and ground checking will provide the most accurate assessment of successional stage and forest composition.

Figure 9.4.3.1 - Distribution of Forest Height in Study Area. The majority of forests fall within the 10-25 meter class.

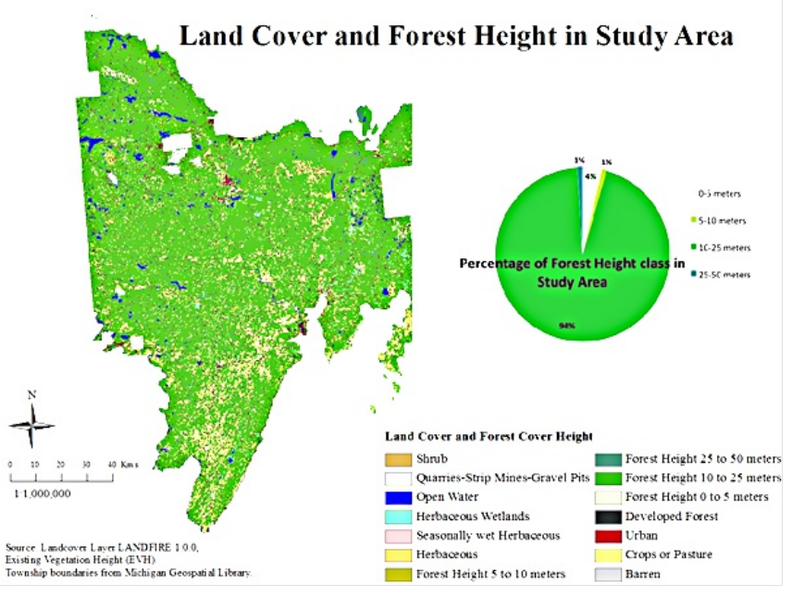
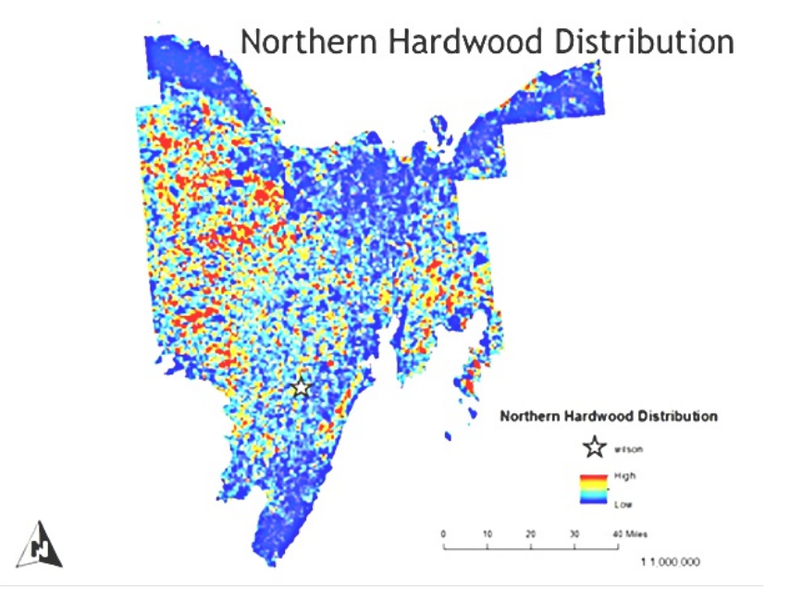


Figure 9.4.2.11 Northern Hardwood distribution across study area. Calculations were done using LANDFIRE Vegetation Coverage data and applied using ArcGIS 10.



9.4.4. Water Features

Water features are important criteria for evaluation of future land purchases. The tribe specified that they are not interested in obtaining property along any Great Lakes shoreline. The water feature analysis was therefore limited to inland water features, such as kettle lakes and rivers and streams. The following maps show the distribution of inland shoreline and rivers and streams for the study area. Areas with higher amounts of shoreline or river are in dark blue; areas with less are in lighter shades of blue. Townships with no water features are white. Map 9.4.4.2 is a representation of water features reported in LANDFIRE data applied to the 800ft^2 fishnet of the study area.

9.4.5. Diversity

Beyond timber, possessing a piece of land with a diversity of cover types may provide a variety of recreational and economic possibilities. Diversity is advantageous in a piece of land from both and ecological and economic perspective. Ecologically diversity protects ecosystems against stressors such as pest outbreaks or climatic variation (Elton, 1958). This buffer against catastrophe is increasingly important as climate change impacts are full of uncertainties for the Upper Peninsula. In selecting a business model, high diversity will provide the tribe with more options and

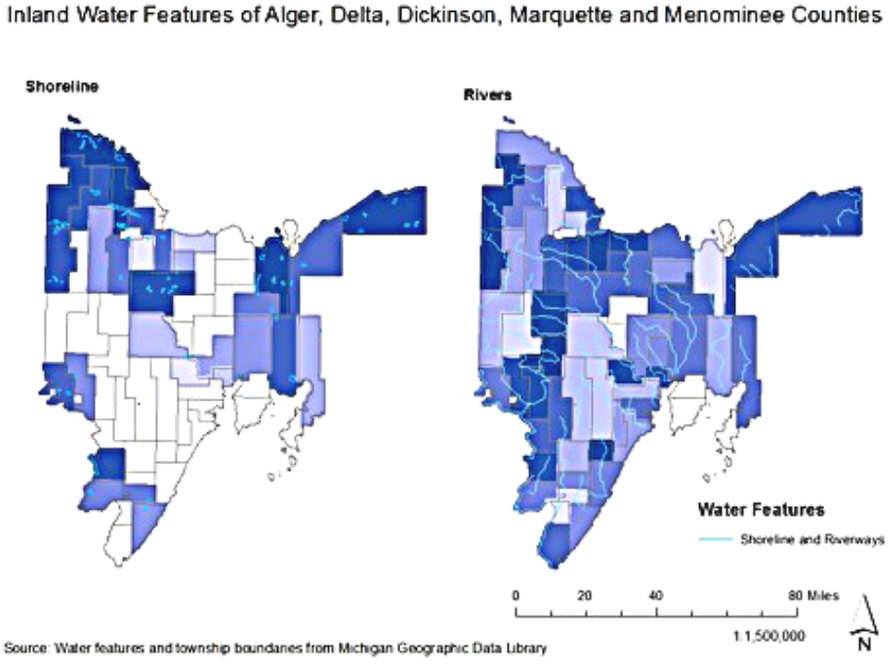


Figure 9.4.4.1 - Shoreline and River distribution in the study area by township. Darker shades of blue indicate higher amounts of shoreline or river. White areas indicate no water features within the datasets we utilized. Northern townships have higher proportions of shoreline in inland lakes, leading to the darker blue. Rivers are distributed throughout the areas.

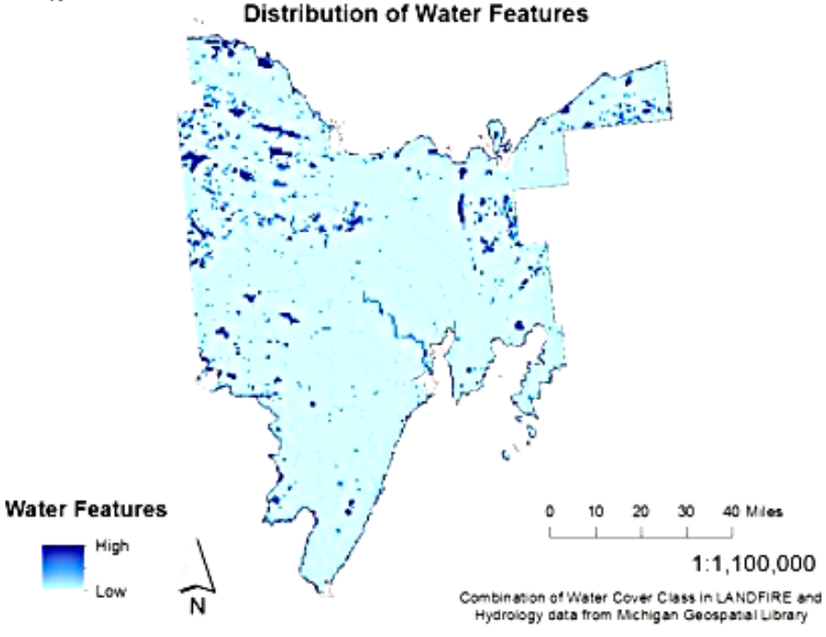


Figure 9.4.4.2 Distribution of water features across study area. Calculations were done using LANDFIRE Vegetation Coverage data and applied using ArcGIS 10.

We used LANDFIRE to assess diversity because it has the finest resolution in cover types amongst our available datasets. We reclassified the landcovers and eliminated developed, urban, and road-networks from the analyses. All agricultural practices were grouped into one cover because these areas continue to serve wildlife as habitat and have potential value for hunting and additional recreational activities. Recently logged or burned areas were clustered into one landcover. Grasses and berries that flourish following disturbances provide food for wildlife and these areas are important in the landscape mosaic (Vitz and Rodewald, 2005).

Landcover diversity was assessed using two different measures for the study area. A simple count was taken to give the variety of landcovers per township (Fig 9.4.5.1). This is the simplest measure of diversity; however, it does not account for evenness of covers. The maximum number of landcovers for a township within the study area was 27, and the minimum was 16. Internal areas appear to have the lowest variety of landcover per township, while coastal areas have higher values.

We also calculated Shannon's diversity index (SHDI), using LANDFIRE landcovers (Equation 1). Shannon's diversity index provides amore detailed description of landcover diversity across the study area. A higher SHDI is interpreted as a more proportional distribution of landcover types within the area. The resulting map displays greater heterogeneity in this evaluation of landcover diversity within townships (9.4.5.1). We applied Shannon's diversity index to the 800ft^2 fishnet and converted it to a 30m^2 grid to obtain a finer scale distribution for our additive model (Fig. 9.4.5.2).

Equation 1

$$SHDI = -\sum_{i=1}^{m} (Pi * \ln Pi)$$

m=number of landcover types; Pi=proportion of area covered by landcover type (#pixels of one landcover/#pixels of all landcovers).

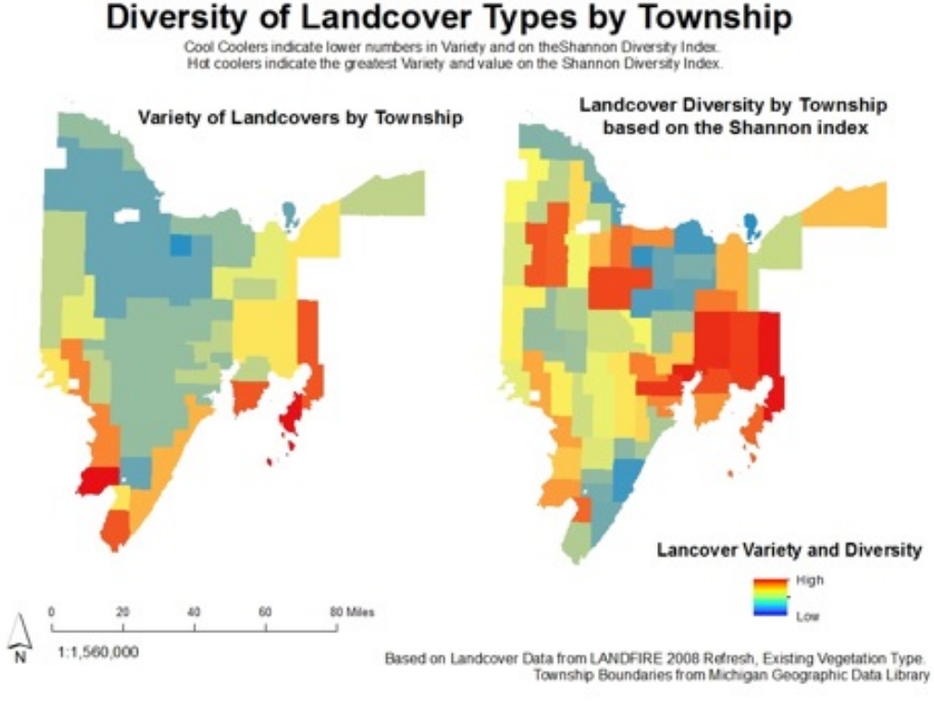
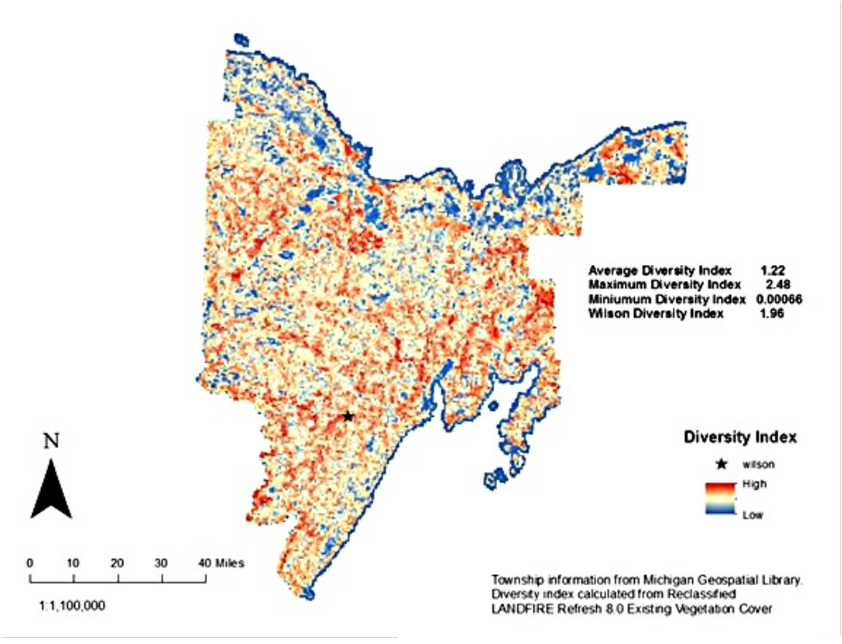


Figure 9.4.5.1 - The two maps display two measures of diversity: Variety is a simple count of LANDFIRE landcovers per township and Shannon's diversity index is a ratio that incorporates evenness into the diversity score. The map on the right displays greater heterogeneity between townships.

Figure 9.4.5.2 Shannon's diversity Index applied to study area. Index calculated using LANDFIRE Vegetation Coverage data.



9.4.6 Distance from Wilson

Distance from the reservation was cited as an important tribal criterion. It is easier to put land in trust status that is close to existing lands. The opportunity to collaborate with casino facilities for day hunting or recreational trips also requires the land be close enough for round-trip commutes in one day. Figure 9.4.3.1 is a partial network map for the study areas. Longer lengths are indicated by cooler colors and close areas are exceedingly hotter colors. The appropriate piece of land may have attributes that outweigh the limitations of distance, which is why we did not favor the immediate area around Wilson.

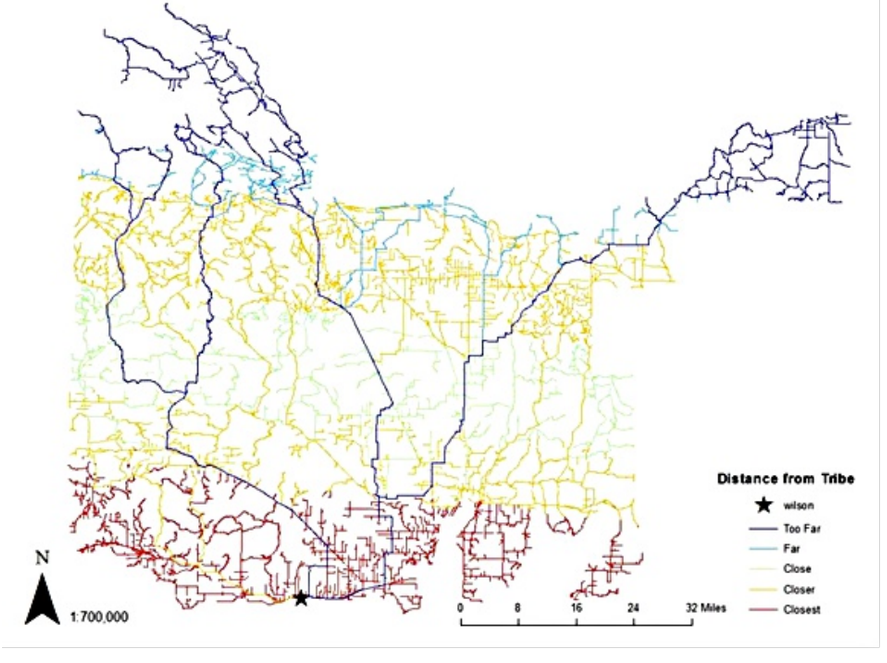


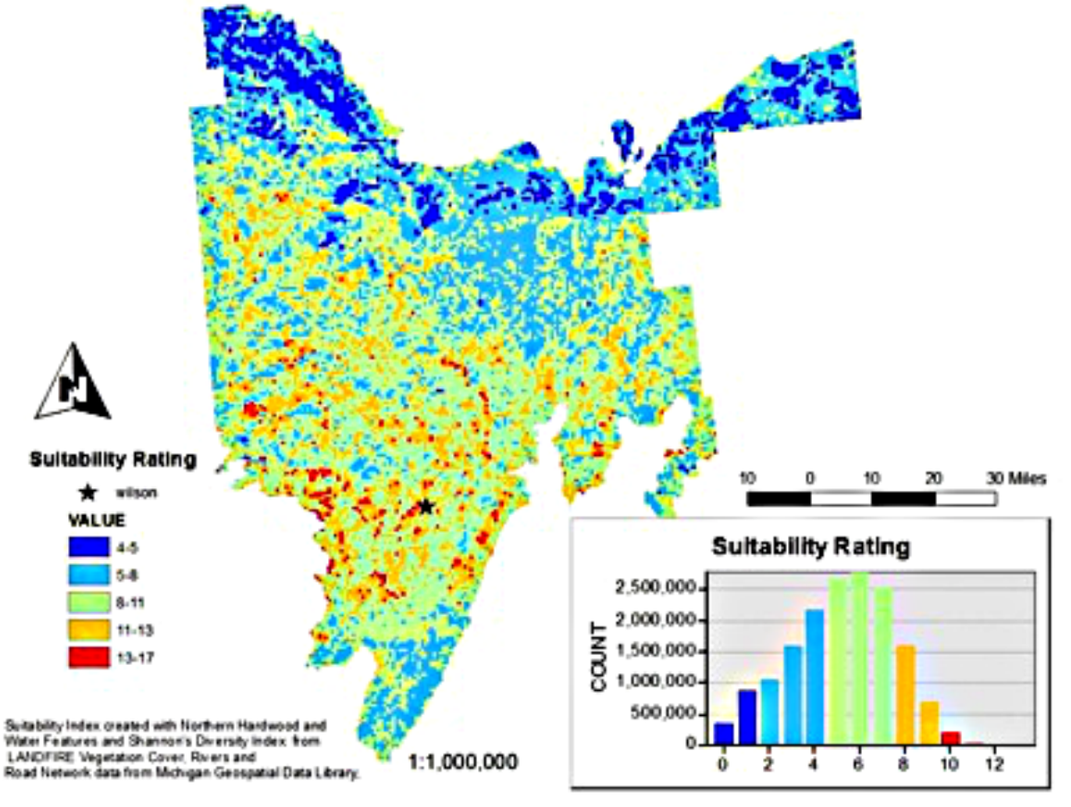
Figure 9.4.6.1 Road Network from Wilson. Cool colors represent high distance and exceedingly cooler coolers indicate larger distances.

9.4.7. Additive Model

By combining maps of Northern hardwood distribution, open water, distance from Wilson and the diversity index we created an additive model. We did not incorporate successional stage because the available data do not demonstrate enough heterogeneity to influence the additive model (9.4.7.1). The additive model is a useful tool for deriving visual conclusions about land acquisition. This is an unweighted model, but weight could be given to a criterion if it was determined to be more important to the acquisition.

The additive map was created by reclassifying each criterion on a 1-5 scale; one being the lowest rating and five the highest. Therefore an area with a high percentage of Northern hardwood cover will have a rating of 5 and an area farther than 100 miles from Wilson received a 1. The resulting map shows very few areas above 15. This indicates that is unlikely that area will be found to meet all criteria perfectly. The availability of land and its characteristics will guide the business model that Hannahville pursues.

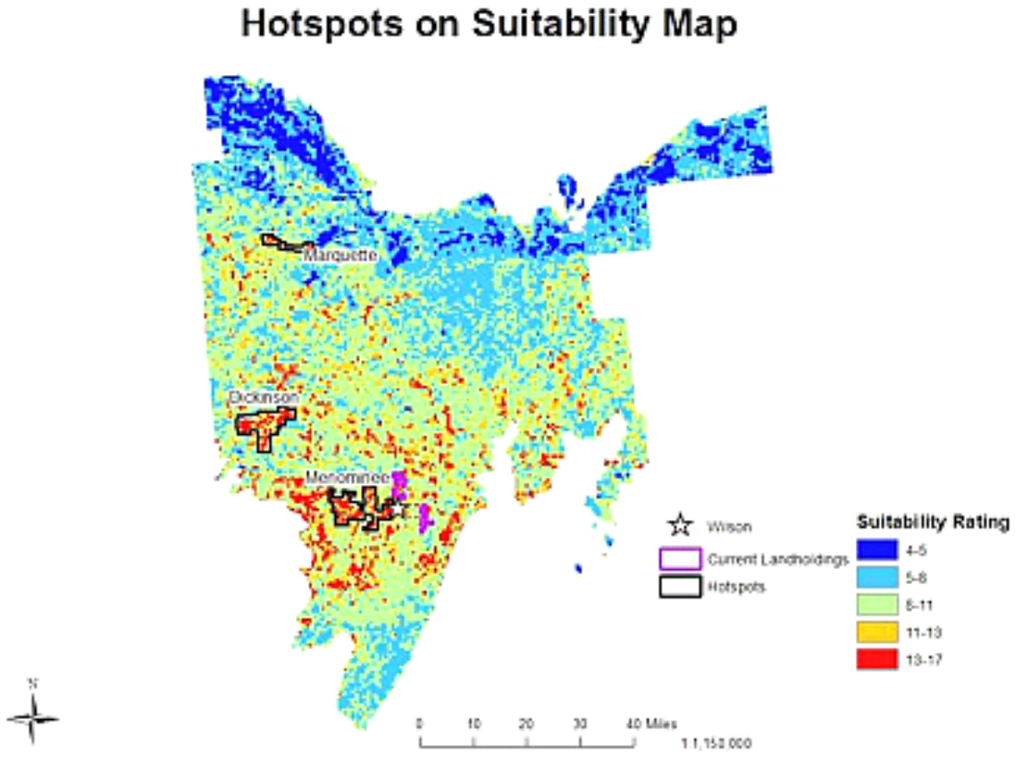
Figure 9.4.7.1 Suitability map of tribal criteria applied to study area. Northern hardwoods, water features and diversity index were calculated using LANDFIRE Vegetation Cover. Distance was calculated on current road network data obtained from Michigan geospatial library.



9.5.1 Using the model for Hotspot analysis

After creating a suitability map for the area, "hot spots" were identified as those areas more greatly meeting the tribal criteria across the study area. In order to identify the accuracy and drivers of the hotspots, we digitized three areas with the editor toolbar in ArcGIS 10. Following digitization we tabulated area within the "hot spots" (Fig. 9.5.1.1). We also performed zonal states using distribution of Northern hardwoods, water features, Shannon's diversity index, and distance from Wilson. The hot spots are in Menominee, Dickinson and Marquette Counties Figures 9.5.1.2 displays the average of the overall suitability rating, and each criterion for the three hot spots. A break-down of these four criterions is provided in Figure 9.5.1.3, this allows further insight into the factors driving a higher suitability score. We added parcel information to the Menominee parcel from Rockford Maps 1996 (Fig. 9.5.2.1) and to the Marquette hot spot from CoreLogic 2008 (Fig. 9.5.2.2). In Dickinson County, we overlaid the hot spot on a topographic map because we did not have access to parcel information for this area (9.5.2.3).

9.5.1.1 Suitability Map with three hot spots in the study area based on high scores of additive tribal criteria.



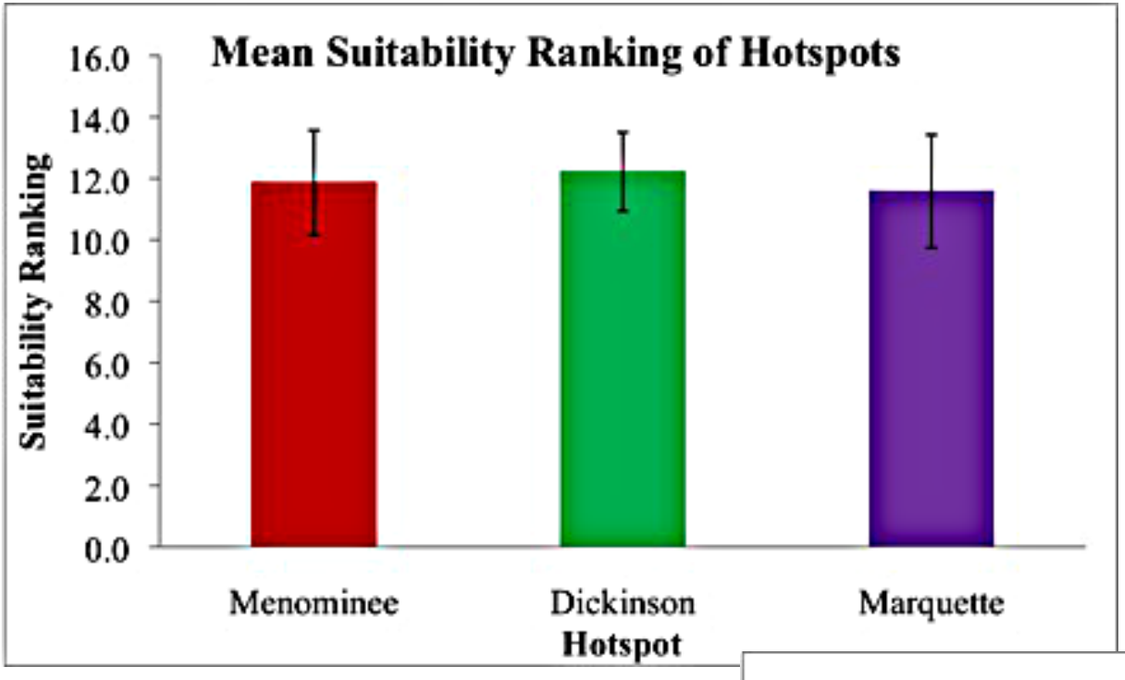


Figure 9.5.1.2 Average Suitability Score on a scale of 4-20 of the three hotspots in figure 9.5.1. Error bars represent standard deviation from average within the digitized hotspot.

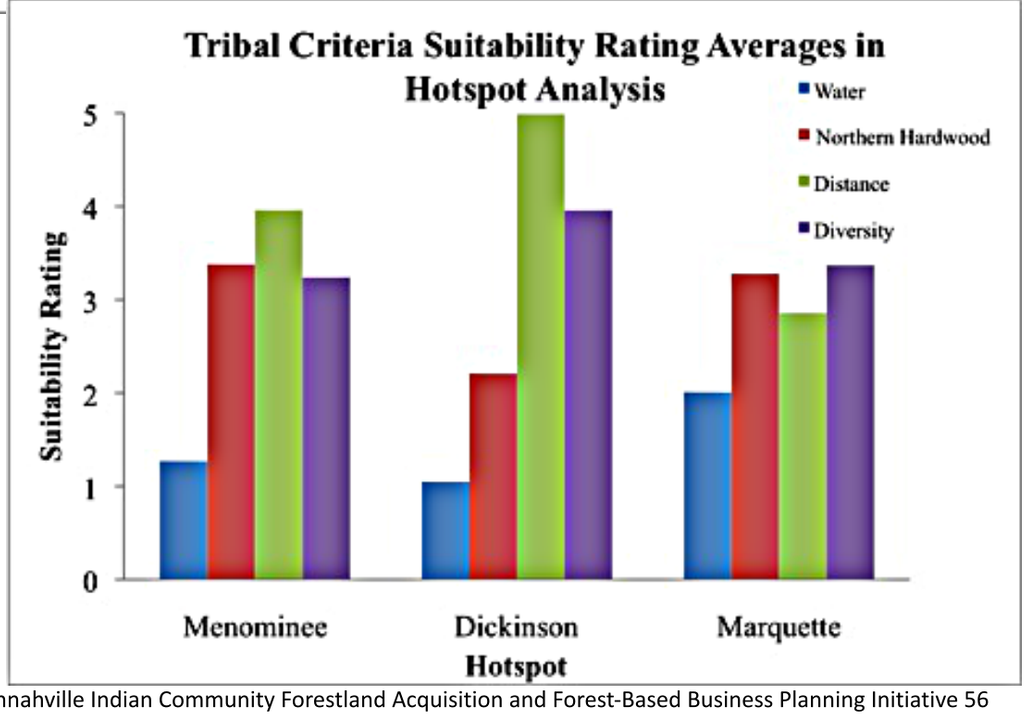


Figure 9.5.1.3 A break-down of the average criterion scores in the suitability map of the three hot spots. This graph allows greater insight into factors driving the high suitability rating.

9.5.2 Parcel Ownership and Topographic Information Applied to the Hot Spots

Application of parcel information, when available can help eliminate false hotspots or those that will not be viable for land acquisition because they violate essential tribal criteria. If geocorrected information is not available, tribal authorities could reference the most recent plat maps to assess ownership information.

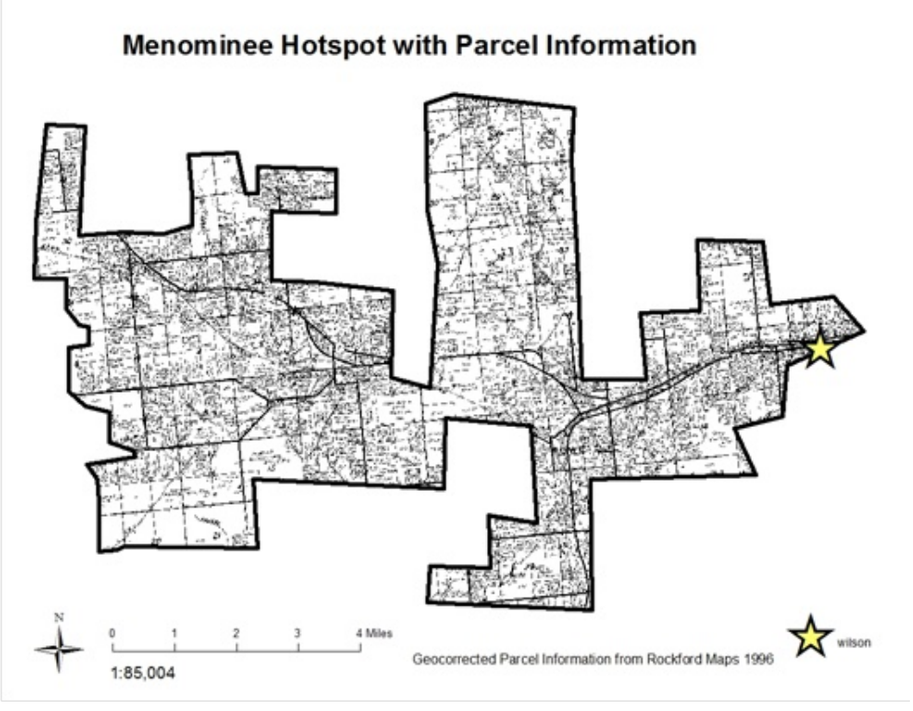


Figure 9.5.2.1 Menominee Hotspot with Parcel Information from Rockford Maps, 1996 and Wilson, Michigan.

The Menominee Hotspot parcel information reveals an area along major roads. The area is broken up into many owners and appears residential. This category of ownership and heavy development in the area negate this hotspot as an area in which the Tribe should pursue acquisitions. Figure 9.5.1.3 indicates that the driving factor in the hotspot is its close proximity to Wilson. The diversity index was also relatively high, but could be corrected if landcovers were ranked according to their wildlife and habitat value. The current diversity index ranks all landcovers as the same, and though developed areas were not included in this analysis they should be included as a negative aspect of an area. Appropriate rankings would improve this criterion's contribution to the suitability assessment.

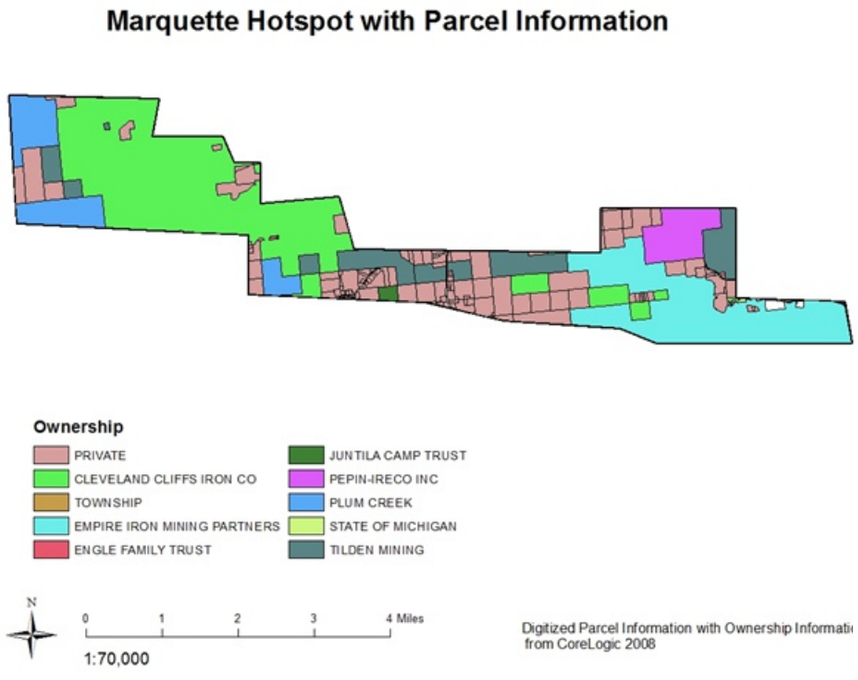
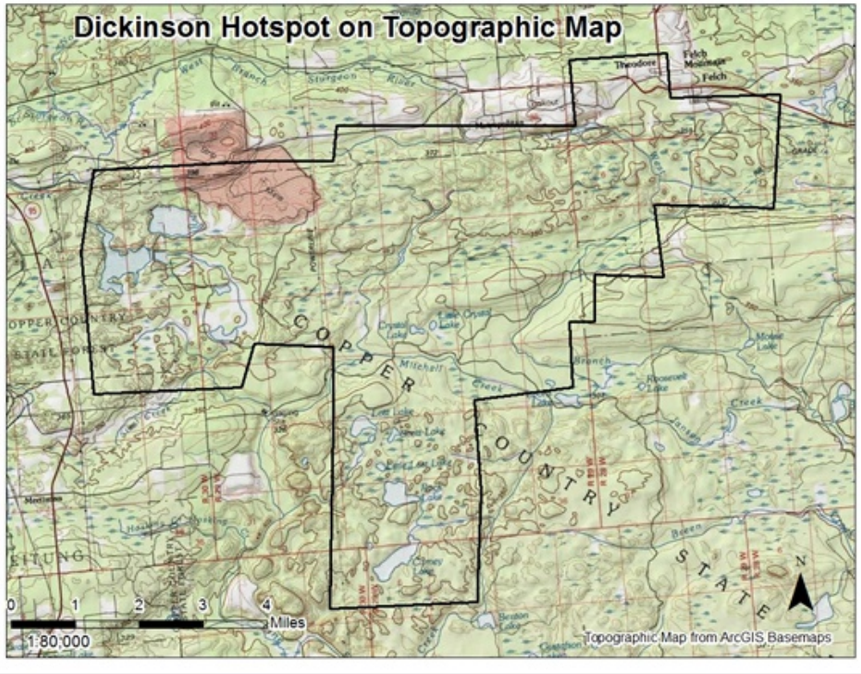


Figure 9.5.2.2 Marquette Hot spot with Parcel information from CoreLogic, 2008

Figure 9.5.1.3 shows that this is an area in which the tribal criterion is more evenly driving the higher score, rather than a single high ranking criterion. Figure 9.5.2.2 reveals that the Marquette hot spot also has high private citizen ownership and there is visible parcelization. However, there are several large landowners such as Plum Creek and the mining operations. The size of these larger areas would meet Hannahville's criterion and allow them to purchase a large acreage of land. Previous land use can also dictate the quality and potential of the land. Mining operations may render land less useful due to contamination or extractive procedures. The transfer of mining rights in this area should also be considered so that Hannahville can have full control of their acquisition.

Figure 9.5.2.3. Dickinson County hot spot overlaid on topographic map



We did not have access to parcel ownership information for Dickinson County. Figure 9.5.2.3 show the Dickinson County hot spot overlaid on a topographic map. Though it is lacking information on parcel size and ownership category, this method provides a view of the biophysical features in the area along with major roads. Though the suitability map reports this area as having a low rating on the water features criterion, the topographic overlay display several water features. A large percentage of the area also appears to be covered wetlands and there is a strip mine in the upper left corner. The parcel intersects the Copper Country State Forest, which the state manages for forestry, indicating the potential of this business opportunity in the area.

A closer look at the hot spots of the suitability map will allow the tribe to make strategic decisions in how to focus their attention. The first hot spot in Menominee County can easily be eliminated from consideration due to its location and parcelized ownership status. Acquisition in the second hot spot could proceed if the Tribe was able to verify lack of contamination and transfer of mineral rights access with the land. The Dickinson County hot spot is the most promising of the three that we selected from the suitability map. Though the ratings are very similar to the other two hot spots, the overlay of this area on a topographic map (Fig. 9.5.2.3) demonstrates a diverse landscape with water features and an established legacy of forestry. If the tribe recreates a suitability index to reflect shifting criteria, they can perform a similar hot spot analysis that will allow them to quickly assess the viability of an area.

9.6 Recommendations for Hannahville for Choosing a Specific Parcel

9.6.1 Examples of Parcel Level Analysis

A challenge of performing analysis on potential land-acquisitions is the unavailability of current ownership map and the lack of advertisement of large land sales. The following section applies our analysis to parcels listed for sale by online realtors in the study area. Thecurrent status of these sales is unknown and all of them are under the acreage desired by the Tribe. However, this analysis can be applied to future sales and assist Tribal officials in making decisions on the viability of future potential land purchases.

Using GForest, a tool for FIA data query and analysis, we compared ground data to the additive model in evaluation of four large pieces of land listed for sale through on-line realtors. The FIA data is not entirely resampled annually; therefore some information in the tables will not be accurate. It is a method to estimate forest lands remotely, but is no substitute for ground assessment. For each of the potential parcel acquisitions, we used the smallest radius possible, 6 miles to query FIA plots for forest features.

We filtered by forest lands and obtained live trees per acre by forest type (Figure 9.6.1.1). We also filtered live trees per acre by species for a report on the dominant tree species within the radius (Fig. 9.6.1.2). Finally, we obtained reports on the volume of species by diameter at breast height (DBH) and our graphs depict the top four or five species per site (Fig. 9.6.1.3).

We will not include the specific sale information in the academic report, though example graphs from the GForest query follow. Though they are examples of parcels currently listed for sale; Hannahville has made no indication of interest in these areas. Their inclusion in this report could lead to misinterpretation that we will avoid by excluding detailed parcel level analysis.

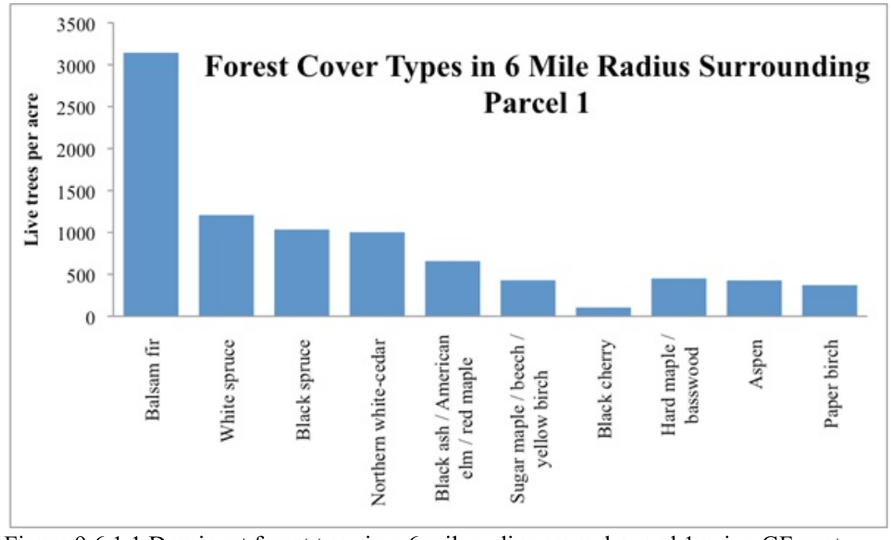


Figure 9.6.1.1 Dominant forest type in a 6 mile radius around parcel 1 using GForest, a FIA query tool

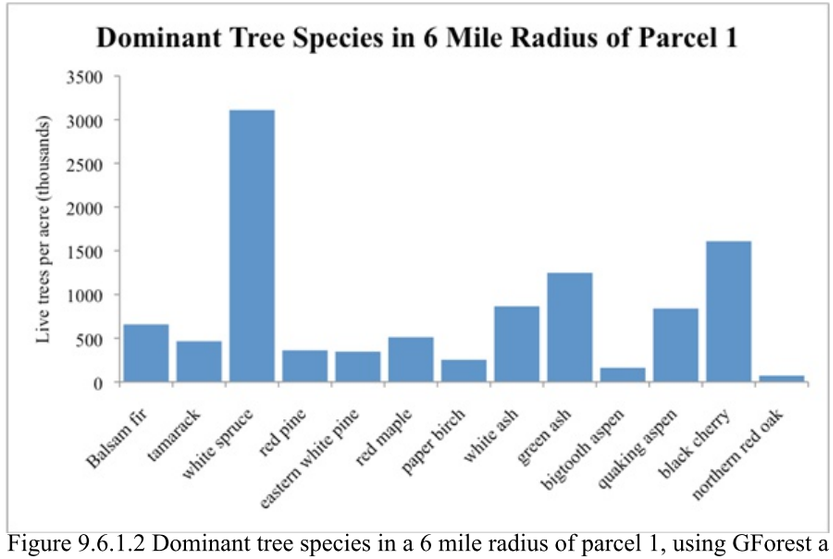


Figure 9.6.1.2 Dominant tree species in a 6 mile radius of parcel 1, using GForest a FIA query tool

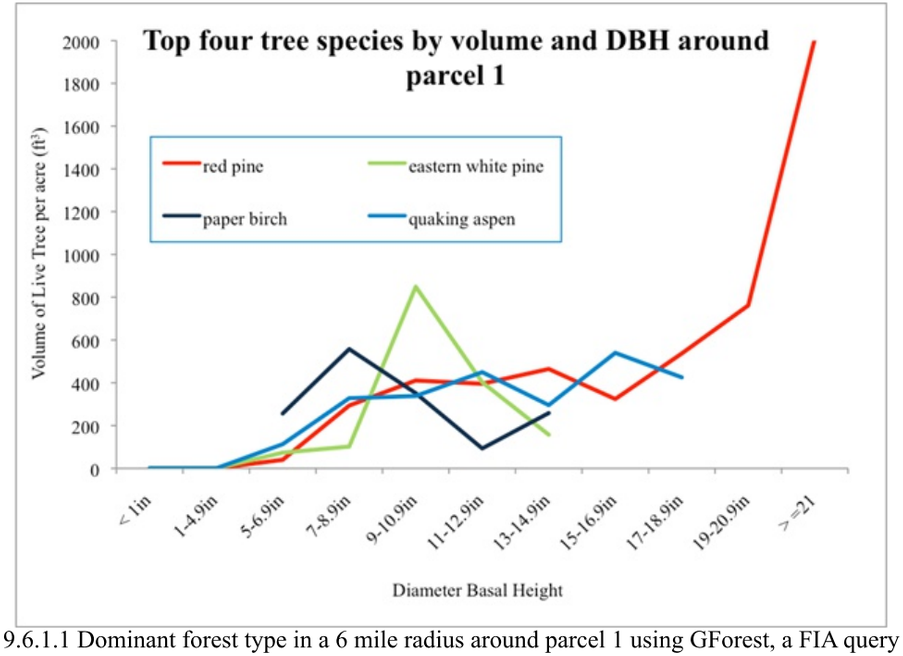


Figure 9.6.1.1 Dominant forest type in a 6 mile radius around parcel 1 using GForest, a FIA query tool

Tribal Criteria	Parcel 1	Rating
Northern Hardwood	12%	1
Forestry Potential	Softwoods	3
Water Features	XXX on the XXX River	5
Distance	40 miles	4
Diversity	1.5 out of 2.5	3
Ownership	Large Landowner	5
Price	Not listed	0
Acreage	Less than 1,000	3
Suitability Rating	8 out of 20	2
Overall Score		28/45

Table 9.6.2.1 Tribal criteria are rated for parcel one in order to score the property on a relative scale. Criteria included in the suitability map of Section 9.4 are in red. Rating is based on scale of 0-5; 0 indicates it does not meet criteria and 5 indicating it meet the criteria very well.

9.6.2 Rating and Interpreting a Parcel

If the Tribe obtains information through Internet sources or social networks about large land sales, they will be able to apply the above analysis to assess the area and determine its strength against their criteria. We recommend that the tribe develop a way to rank parcels using their criteria. Table 9.6.2.1 is an example of a rating system that we devised to assess parcel 1 for which the figures 9.6.1.1-9.6.1.3 also apply.

Table 9.6.2.1 Tribal criteria are rated for parcel one in order to score the property on a relative scale. Criteria included in the suitability map of Section 9.4 are in red. Rating is based on scale of 0-5; 0 indicates it does not meet criteria and 5 indicating it meet the criteria very well.

The left column is list of tribal criteria. This list may not be exhaustive, but is an adequate representation of our understanding of the tribe's preferences. The second column provides more specific information on the criteria and the last column is the ranking, some of this information is omitted from the report in order to avoid linking Hannahville to a current land sale. The rankings are given on a scale of 0-5; 0 indicating that the criterion is not met and 5 that it is met very well. Again this is an unweighted assessment and all criteria contribute equally to the ranking. Criteria that were included in the suitability map are indicated in red. There are nine categories, which we rank in order to obtain a score that can range from 0-45. Parcel 1 received a 28 out of 45, but this score could change depending on shifting criteria.

This parcel does not meet the qualification of high Northern hardwood features. Figure 9.6.1.3 also indicates that many species fall below a diameter at breast height for immediate timber harvest. There is a high amount of red pine in the area, indicating softwood forestry may be the potential land use. The site falls well within the distance requirement to the tribe (40 miles) and is close enough to arrange day trips to bus from the casino for day trips. Based on its water features, fishing and river trips have high potential. The diversity index will make it a good investment for recreational activities. Road and river access is high, so the Tribe will not have to develop preliminary infrastructure for lower impact outdoor recreation.

9.7 Conclusions and Recommendations of Remote Identification

As the tribe investigates land acquisition and business opportunities further; they will likely revise the relevance and importance of their criteria. Both the suitability map of section 9.4 and the ranking table of section 9.6 provide tools in which the tribe can assess the available information and rate their own criteria. The rankings of the suitability map (9.4.7.1) and the table (9.6.2.1) should also be modified to reflect the Tribe's preferences and abilities. Similarly, more refined criteria may be added to the assessment or exchanged with those in the Table 9.6.2.1.

The suitability map can either be used to identify hotspots in which to actively seek land-acquisition or to evaluate parcels as they come up for sale. The analysis of section 9.6 is from sales listed online, and an example of how the Tribe can evaluate opportunities as they come up for sale in the market. The lack of publically advertised large land sales indicates that the tribe will have to be proactive in pursuit of a large acquisition. This will require institutional investment and relationship building with regional players in the Upper Peninsula's current land ventures.

This analysis provides several options from which the Tribe can remotely speculate the characteristics of a piece of land. However, this must be coupled with ground information such as the forest composition information in section 9.6 and even more current estimations by qualified investigators. Our analysis provides a method in which the Tribe can narrow its focus and evaluate acquisitions through the application of easily shifted criteria. We encourage similar methods be employed to identified hot spots or parcels as they come up for sale.

Effects of and Responses to Climate Change

PART IV

Planning for acquisition and investment in forestland requires long-term perspectives on future benefits, costs, and risks of ownership. The LEV, CAPM, and business profiles described earlier suggest an economic timeframe of years or decades on returns. While this accommodates human expectations of returns within one's lifetime, substantial change in the growth of trees and the biology of forests require decades or centuries – the span of human generations – to realize.

10. Climate Change Adaptation in Michigan Forestry

Among the earth processes that affect forests on such a timeframe is climate change. Long-term vision is required to acknowledge climate change in present land-acquisition plans, as climate change could substantially affect the character of the land passed down to future generations, Many scientists actually predict that the evidence and effects of climate change of forests may be clearly demonstrated as soon as within the next few decades. Climate change, typically referred to as the increase in global average temperatures caused by anthropogenic increases in CO2 concentration and its effects on weather and seasonal patterns, exhibits a range of consequences relevant to forestry, some positive and some negative. In the following sections, we will discuss the increase in CO2 concentration,

10. Climate Change Adaptation in Michigan Forestry

10.1. Changing Forest Markets

The Michigan Society of American Foresters estimates that Michigan's forests provide approximately 200,000 jobs and over $12 billion to the economy per year (Karetnikov et al., 2008). Hardwood forests make up 75 percent of the timberland area in Michigan (USDA, 2006). A changing climate may change the ranges where many of Michigan Hardwood forests currently reside.

Climate change impact on forest markets provides a challenge to estimate since strategies are dependent on individual tree species (Karetnikov et al., 2008). Forest growth and development, ecological functions and biodiversity are all strongly influenced by climate. The forests found in Michigan's Upper Peninsula are adapted to the local climate and under current projections, warmer temperatures will shift the suitable habitat for certain forest species northward and some southern species will transition into the U.P. (Karetnikov et al., 2008).

In some regions, increasing atmospheric CO_2 levels will cause an increase in forest productivity due to the fertilizing effect of CO_2 (USCGRP, 2009). Yet these increases will depend on local conditions of moisture stress and nutrient availability (USCGRP, 2009). For instance, due to increased climate variability, the Southeast and Northwest could experience drought-induced losses of carbon. Thus, formulating adaptation and mitigation strategies will have to be individualized to very local regions, that is, to the specific areas of interest to the Hannahville Tribe.

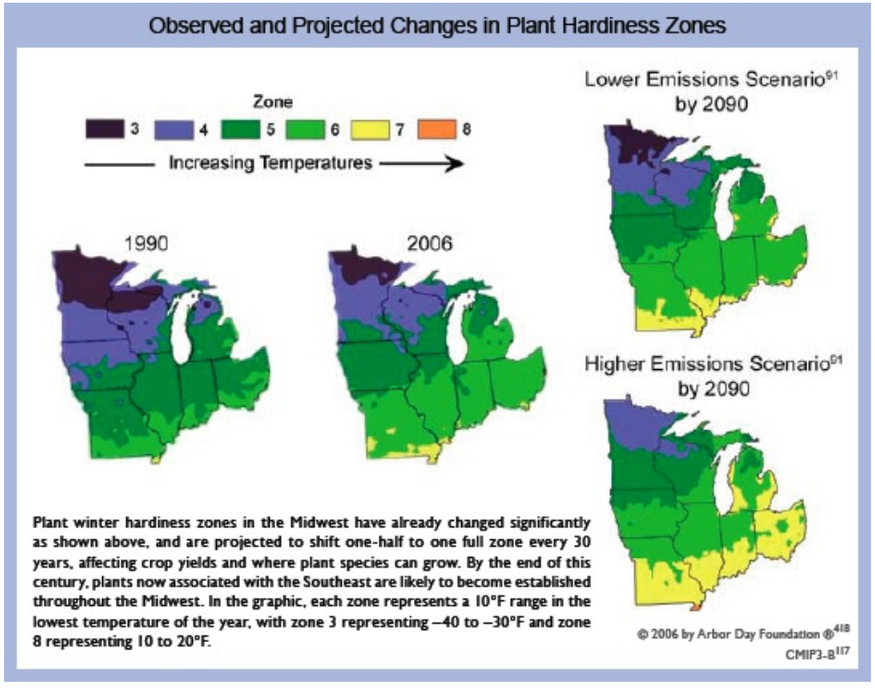


Figure 10.2.1 Observed and Projected Changes in Plant Hardiness Zones

10.2. Studies and Uncertainties of Predictions for Northern Michigan / Vulnerabilities

As mentioned in earlier sections, formulating adaptation and mitigation strategies will have to be individualized to very local regions. The Hadley Scenario and Canadian Scenarios provide detail on the Eastern United States as to the changes in dominant forest types. However, for the purpose of this project, the aim is to make predictions for a smaller scale. Figure 10.2.1 details the shift in winter hardiness zones from 1990 to 2006 and predicts further changes under high and low emissions in the Midwest. Figure 10.3.1 shows the projected changes in temperature and precipitation in Michigan and Illinois under high and low emission's scenarios.

10.3 Adaptation to climate change in forest management

The Intergovernmental Panel on Climate Change reports that by the end of the 21st century, the mean annual temperature

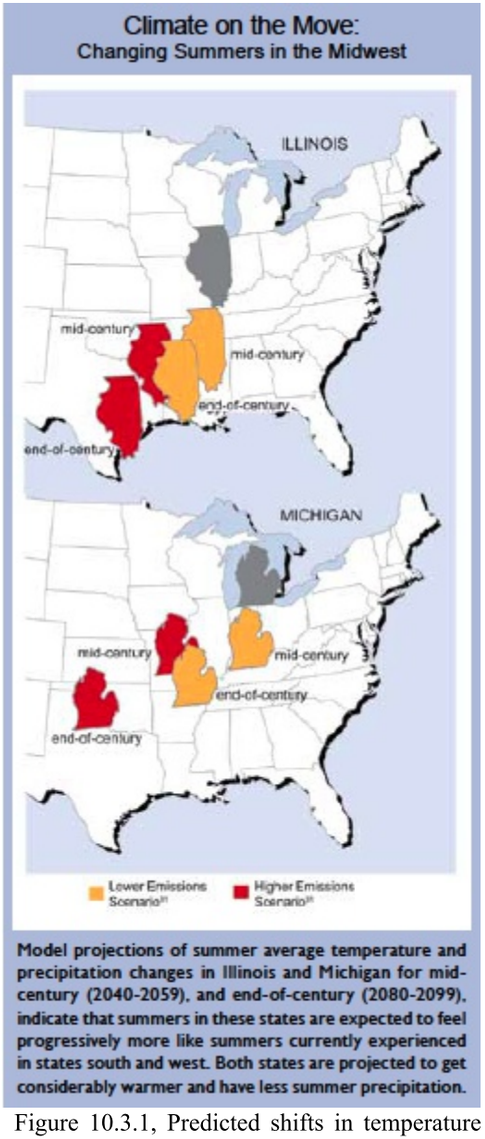


Figure 10.3.1, Predicted shifts in temperature and precipitation for two states based on high and low emissivities.

The main objective of planning for climate change is to "encourage the forestry community to evaluate the long-term impacts of climate change and determine what the community might do now and in the future to respond to this threat (Spittlehouse and Stewart, 2003)." Holling (2001) notes that an adaptive capability is a necessary component of sustainability, and preparation and being adaptive are very important when planning for long-term sustainable operations. The life cycles of forests range from decades to centuries. Spittlehouse and Stewart (2003) suggest that decisions made today are based on the assumption that the climate will remain relatively stable throughout a forest's life, but climate change can change this assumption. There are gaps in knowledge as far as the vulnerability of ecosystems along with poor spatial and temporal resolution of the future climate but even with this uncertainty it is possible to create an adaptation plan.

Adaptation to climate changes is defined as adjustments in ecological, social, and economic systems in response to the effects of changes in climate (Smit et al., 2000; Smit and Pilifosova, 2001). Realizing that adaptation measures may be socially unpopular and even viewed as more of a risk than doing nothing, it is valuable to note some important steps or methods necessary to plan adaptation:

- Establish objectives for the future forest under climate change.
- Increase awareness and education within the forestry community about adaptation to climate change.
- Determine the vulnerability of forest ecosystems, forest communities, and society.
- Develop present and future cost-effective adaptive actions.
- Manage the forest to reduce vulnerability and enhance recovery.
- Monitor to determine the state of forest and identify when critical thresholds are reached.
- Manage to reduce the impact when it occurs, recover, and reduce vulnerability to further climate change.

Spittlehouse and Stewart (2003) created a framework of four steps forest managers can take to plan for adaptation. The first step is to define the issue. Second, is to assess the vulnerability of the forest, forest communities and society. Third, is the development of adaptive actions to be taken immediately, and the fourth plan calls for future adaptation plans.

A summary of adaptive actions that can be taken in forestry may include gene management, forest protection, forest regeneration, silvicultural management, forest operations, non-timber resources, and park and wilderness area management. To further expand on these adaptation measures we can take a closer look at the gene management option. The article offers that seed transfer zones are based on the assumption of optimum climatic limits to species and provenances. A

changing climate means that the geographic extent of these zones will change. In general, ranges are expected to move upward in elevation and northward in latitude in the Northern Hemisphere and new assemblages of species will occur in space and time (Kirschbaum 2000; Hansen et al. 2001). From this Spittlehouse and Stewart (2003) create a list of actives comprised from multiple authors on what is required for adapting to these changes to maintain genetic diversity and resilience in the commercial forest:

• Determining the responses of species and genotypes to climate and the limits of their transferability, and developing climate-bases seed zones that will change over time.
• Breeding for pest resistance and for a wider tolerance to a range of limited stresses and extremes in specific genotypes.
• Re-evaluation of seed orchard locations.
• Planting a mixture of provenances at a site.
• Re-evaluation, conservation and recovery programs.

These measures give forestry operations a set of goals and objectives that need to be addressed when planning for long-term forestry operations. The summaries go on to give several points to address adaptation in the other topics mentioned above.
Forest managers must accept that climate change is probable and that forests and forest communities face significant impacts, and that planned adaptation will reduce vulnerability for commercial tree species at selected sites.

10.4 . Conclusions

The forest composition of Upper Peninsula timberlands may shift to a higher proportion of hardwood and lower proportion of softwood species as softwood ranges retreat north. The diversity of forest cover in the UP may suffer as a result. This is consistent with projected shifts of the Upper Peninsula into more temperate plant hardiness zones and a general shift northward of species ranges in the northern hemisphere.

This result has important ramifications for foresters. Hardwoods, such as maples and beech, are more desirable for durable products and are typically priced higher. Furthermore, they are typically harvested from naturally regenerated forests; softwoods like the pines are instead often grown profitably as pole timber on plantations.

Most projections agree that regardless of species composition, the biomass held by forestland is anticipated to increase with higher concentrations of CO_2 and temperatures. (Again, many speculate that this could drive prices down worldwide, which may have diverse reactions, such as the devaluation of forestland for timber and more for development. Still, many others expect the reduced costs of finding, harvesting, and processing of quality timber would benefit producers too.) CO_2 fertilization has been shown to encourage speedy growth of some species of young trees (Norby, 2008). For silviculture, this may be utilized for more rapid turnover of the forest stock as trees reach size earlier, reducing the length of harvest cycles. The effect appears to be limited, however, as older trees appear to respond less sensitively to CO_2 effects on growth, and instead cycle the carbon through pathways other than the creation of woody biomass, such as into leafy matter or other compounds (Korner, 2005). In general, this result would suggest quicker establishment of young trees and shorter harvest cycles, an implication of special importance for plantation silviculture.

Regeneration failure is a significant concern since the regeneration of many tree species is very sensitive to and dependent on environmental factors. The effects may show at scales from stand-wide dynamic to single-species levels. For instance, climate change may

the times and successes of pollination and the production of seeds. Mast production in beech, birch, and oak has been significantly affected by the temperatures of the previous year. Fires are also important for forest regeneration. They might be anticipated to increase slightly should climate change exacerbate drought conditions, which is a good thing for many softwood trees like the jack pine whose seeds depend on fire for successful dispersal and establishment (Price, 2001). Human disturbance incurred through activities like logging can also contribute positively to vegetative reproduction, especially of hardwoods. Many deciduous trees, such as aspen, maple, and black locust sprout prolifically upon damage to the main stem. Cut one tree down, several others pop up from the subsurface roots radiating from it. In short, there are many factors that contribute to regeneration success, and even in the changed environment of the future, forest managers are not without some control over the security of future timber production.

Whatever the conditions of the forest of the future, it is agreed that treating timber and forests sustainably requires attention to the system and the context to the larger resource system in which forestry operations occur (Crow, 2008). Under climate change scenarios an investment into site management of forest stands – practices such as coppicing, selective removal of weak trees to relieve horizontal competition, and uneven-age stand management – could produce significant returns on production of quality timber (Yang and Kant, 2008). Under today's scenarios, one study even reported the potential for a 10% increase in the profitable productivity of a timbered forest stand (Siry et al, 2004).

Yet coupling a biophysical system whose effects may likely take decades or centuries to a system that responds, evidently, in a matter of years to market drivers unrelated to those biophysical systems is very difficult. It appears easier to predict effects of climate change on trees than it is to predict the direction of the forestry industry and the economy that drives it. Some have tried to model it, and the results are too divergent to allow us a reliable prediction and subsequent broad recommendations beyond that of encouraging best practices.

10.5 Mitigating and adapting to climate change as Forest Managers

There are low-cost, low-technology, relatively easy forest management strategies that the Hannahville Indian Community could incorporate into their management plan in order to mitigate and adapt to climate change. Section 10.4 provided several adaptation strategies for forest managers. In this section, we provide recommendations specific to the Hannahville Indian Community. Forest management for carbon sequestration and storage demonstrates one of many ways to reduce greenhouse gas concentrations, and it represents a simple and cost effective option to help mitigate climate change right now while additional long-term solutions are developed (Charnley et al., 2010). Carbon-oriented management of forests can offer the Hannahville Indian Community environmental benefits such as enhancing wildlife habitat for gaming and recreation, improving soil quality, increasing water storage and filtration, and conserving biodiversity (Charnley et al., 2010). The following table provides management practices the Hannahville Indian Community could employ to increase carbon stocks in both future and current forests.

Table 10.5.1 Management practices that can be applied for climate change mitigation and adaptation and their effects on carbon sequestrian.

Management Practice	Effects on Carbon Sequestration
Extend Harvest Rotation Intervals	Lengthening rotation intervals allows forests to continue growing and accumulate biomass and carbon for longer periods of time. When harvested trees are process into wood products, 40-60% of the carbon they contain is lost (Murray et al., 2005)
Partial Harvest	Using partial harvest techniques involves removing part of a stand instead of all of it through partial cutting and decreases the amount of carbon lost through harvesting (Harmon et al., 2009)
Reducing Dead Biomass Removal	Carbon held in dead biomass persists in the forest for long periods. By reducing or eliminating management practices that remove dead biomass, Hannahville could make gains in forest carbon storage (Janisch and Harmon, 2002)
Wildfire Mitigation—Prescribed Burning	Prescribed fire can be a quick and effective way to remove harvest residues and woody debris that increase the risk of wildfire, which causes an intense, rapid loss of carbon (Hurteau and North 2009)

Discussion and Recommendations

PART IV

The Hannahville Indian Community wishes to evaluate forestland acquisition as a way to increase its land base and promote economic development. This project aims to assist the tribal government by providing information on the biological and physical resources of potentially available forestland within a 100-mile radius of the Community. Because of ever-changing real estate markets, we are providing Hannahville with a framework that they can use independently in the future to identify tracts of land that will meet their evolving community needs. To accomplish this overarching goal we researched historical challenges facing tribal land acquisition, explored a number of forest-based business ideas, and provided a decision-making framework on how to locate parcels of land that meet tribal criteria for acquisition.

11. Discussion and Recommendations

11. Discussion and Recommendations

We developed the following goals and objectives in order to facilitate this work:

Goal 1: Help Hannahville proceed with its land acquisition planning with a focus on ecological and economic sustainability
Objectives:

1A.Create a decision-making framework to identify appropriate parcels of land and avenues of income generation to support land purchases

1B. Provide necessary information for decision-making in land acquisition activities undertaken beyond the life of this project or its immediate recommendations

1C. Examine region-specific climate change effects and implications for adaptive forestland management

Goal 2: Assess feasibility of potential forest-based business ventures
Objectives:

2A. Research business opportunities possible with identified real estate parcels and their features

2B. Examine the challenges and benefits of pursuing those business opportunities

2C. Research and identify "best practices" of sustainable forest-based businesses

Our recommendations are best broken down by thematic area, beginning with lessons learned from tribal land acquisition around the country. First, we have found that for long-term economic stability and development, the common business model that places a casino alone at the center of tribal economies is risky (Meister et al., 2009). Second, to move from gaming-dominated tribal economies toward more diverse economies, it is crucial that any new economic initiatives are supported by a given tribe's elected leaders and by their tribal members. Without this support, we believe chances of success could diminish. Third, proactive planning for the land acquisition process is paramount. Land acquisition requires significant financial capital or credit, and the fee-to-trust process requires a thoroughly justifiable argument of economic or social benefit before an act of Congress places land in trust. Acquisition of land outside reservation boundaries presupposes that economic and social benefits are guaranteed. Because of the expense of buying and managing land and the financial and political risk of doing so, land acquisition initiatives require significant planning and deliberate community discussion of whether and how to move forward. Our team recommends that, after careful analyses of the potential risks, Hannahville make an institutional commitment to direct a portion of casino revenues to a land acquisition program. Making this sort of commitment will signify that the Tribe is committed to increasing its land base and alleviate the debt required to buy land. This recommendation is based on four types of forest-based businesses that we identified as being feasible on new tribal land: timber production, biomass energy production, recreation and ecotourism, and non-timber forest-based products (NTFP).

Regarding forestry operations, we came to three conclusions. First, valuing timber parcels and efficient forestry operation requires a

skill set and knowledge base that can apply economics and market timing to managing the biophysical characteristics of forests. While timber sales often occur in the absence of management or professional appraisal, professional counsel helps to preserve the continued health of the forest and ensure profitable returns on sales. This is a type of expertise that Hannahville does not currently have. We recommend Hannahville acquire this type of expertise before engaging in forestry, either through the BIA, an in-house forestry program, or through contracted foresters. Second, forestry and timber investment occurs on a time horizon that is much longer than most other financial endeavors. Managing land for timber is a multi-generational investment, which means that Hannahville must have prolonged institutional commitment and must adjust expectations about short-term profits when trying to recover costs. Finally, we found that investing in timberland and managing for timber sale could provide economic as well as social and environmental benefits. Evidence exists to support the idea that adequately managed timberland, even of relatively small acreage, can provide positive returns with little financial risk compared to other investments. Additionally, were Hannahville to have a significant area of productive timberland in trust, it may have institutional and market advantages over other timber sellers in the UP due to the absence of taxes, collaborative support of the BIA, and dedication to commercial production, which together can reduce operation costs of professional forestry while providing a desirable "wood basket" for timber buyers.

In addition to forestry, we explored the possibility of investing in forestland for biomass energy production, recreational use, and non-timber forest products (NTFP). Regarding biomass, we recommend the creation of a feedstock yard to supply local biomass facilities instead of building a biomass energy plant. Despite potential profitability, the high capital investment required for a biomass facility and difficulty of operation leads us to this conclusion.

Profits from recreational use of the land may vary widely depending on the type of land acquired, since different features support different forms of recreation. However, we found that Hannahville could successfully operate recreational opportunities in the area. Specifically, we recommend that Hannahville phase in the development of recreational opportunities to minimize risk. Begin with developing campsites and trails, and then move towards the provision of professional hunting and fishing services. Finally, we have found that NTFPs, such as wild rice, may only provide marginal income. However, NTFPs can be important assets to other business options, like ecotourism, and can contribute to the Tribe's own cultural activities.

In summary, the business opportunities available to Hannahville are diverse and all come with their own trade-offs in capital costs, returns, and operational effort. We recommend pursuing a strategic combination of forest management for both timber and biomass and recreational opportunities, as we believe that a diversified income stream is the best way to ensure financial success of land acquisition. An example of this is selling recreational permits in the cutting offseason. None of these business opportunities inherently precludes another, but planning to accommodate multiple uses may provide financial returns in excess of any one business practiced alone.

Designing a framework for identifying parcels of land that would be ideal for acquisition is a crucial component of our project. We suggest parcels for land acquisition based on the above maps. These maps locate "hotspots" of parcels that contain the forest features, nearby infrastructure, or characteristics best suited to the economic uses we have mentioned. Areas with a variety of land cover types will support greater biodiversity to a similarly sized area with few types of land cover. By investing in land with higher biodiversity, the Tribe will have an easier time operating multiple business ventures. High biodiversity will also help protect the Tribe's investment by increasing a property's resilience to pest and disease outbreaks.

The final aspect of our project was to look at the effects of climate change on the forests of Michigan's Upper Peninsula and identify

ways that Hannahville could adapt to future conditions. We recommend that Hannahville look for pieces of property that contain a diversity of land cover to reduce the impacts of climate change. Second, we again recommend that Hannahville pursue multiple forms of income generation on their land so that they can more easily adapt their business strategies and be insulated from negative effects of climate change such as impacts on an individual tree species. Finally, if Hannahville decides to pursue timber management, we highly recommend incorporating a parcel-specific analysis of future impacts of climate change into its forest management plans.

In conclusion, we believe that Hannahville should pursue land acquisition. With the right planning and mindset, we believe that additional forestland land will be socially, economically and environmentally beneficial to the Hannahville Community as a whole.

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