Mapping Muhheakunnuk: GIS and the Living Landscapes of the Mohican Valley

by Charles Douglas Burgess

MAPPING MUHHEAKUNNUK:
GIS AND THE LIVING LANDSCAPES OF THE MOHICAN VALLEY

A Thesis

Presented to the Faculty of the Graduate School

of Cornell University

in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

by

Charles Douglas Burgess

August 2010

ABSTRACT

This thesis examines the landscapes of a portion of the middle and upper Mohican (Hudson) Valley in modern upstate New York, in relation to the relatively sparse Late Woodland period archaeological record. The subjects of the study are the Muhheakunnuk, the Mohican people, whose descendants now primarily comprise the Stockbridge-Munsee Band of Mohicans west of Lake Michigan within the boundaries of the State of Wisconsin. Muhheakunnuk signifies both the nation and the river which was their lifeblood, the waters that ebb and flow, constantly in motion. In that spirit, this thesis illuminates the lives of the people by understanding the ecosystems of the river that sustained them. At the same time, by understanding the Mohican people, a new appreciation of the abundance of their land is gained, with powerful implications for the modern inhabitants of the same lands.

Most studies of the archaeology of the Mohican tend to either be focused at the site level, or to bemoan the relative lack of settlement evidence. I contend, however, that there is an enormous amount of knowledge to be gained by studying the landscapes in which the Mohican lived, and the historically recorded practices by which they managed these landscapes. As such, a geographic information system (GIS) was built using ArcMap 9.3 combining soil, water and topographic data in order to tentatively reconstruct the landscapes of Muhheakunnuk. These landscapes are interpreted in relation to Mohican management practices and the Late Woodland period archaeological record, in order to provide a foundation for further inquiry.

BIOGRAPHICAL SKETCH

Charles Douglas Burgess is a life-long resident of the highlands overlooking the Mohican Valley in what is now Albany county, upstate New York. He holds an Associate's Degree in Wilderness Recreation Leadership from North Country Community College in Saranac Lake, New York, and a Bachelor's Degree in Anthropology, with a minor in Linguistics, from the State University of New York at Albany.

Charles' work emphasizes the importance of place in founding a person's- and a people's- identity. By seeking to understand ancient conceptions of and relationships to place, he strives to communicate the profound human need to invest themselves in the places they inhabit: to be stewards rather than owners, and neighbors rather than simply “others.” By applying the lessons of the past- the challenges faced and the solutions developed in overcoming them- to challenges of today: poverty, sovereignty, climate change, food security, and others; it is hoped that we may be better equipped to face these challenges, and to overcome them with even greater success than did our ancestors.

This research is dedicated to God, who created the heavens and the earth, that we might share in its fruitfulness.

Let this be a testimony of the abundance and fertility of the earth, and of the possibility of a way of living thereon that will feed the hungry and the poor, give rest to the weary and the needy, and will fulfill the commandment of the Son of God, who said, "This is my command: that you love one another."

May we be ever thankful.

ACKNOWLEDGEMENTS

A thousand thanks are due to more than can be added here. I mention only a few: to Professors Jordan, Gleach, Kassam and Parmenter, for not only their patience and understanding, but for their brilliance as academics and as the rest of who they are. The same should be said for everyone here mentioned: to Hetty Jo Brumbach, who asked, “Did you ever get into GIS?”; to Jim Bradley, who offered the archaeological reports, pre-sifted; to John Justeson, who never minds a midnight note to clarify whichever ancient phrase or thing has puzzled me sleepless; to Bob Daniels, for the fish; and to Andrea Lain, Ralph Rataul and Susan Winchell-Sweeney, who gave me an opportunity to see that yes, under every rock and tree, there is a site and a NYSM number.

Many thanks are also due to the Open Space Institute for all their work to protect the Mohican homeland from its modern inhabitants’ trammeling impulses, to Hudsonia for educating its modern inhabitants, to the Newbury Library for their work to protect its history, and to the Newbury’s Consortium in Native American Studies for offering to make that history available.

And of course to Grandma, from whom I inherited my love of books and ancient things, and who ever emphasized the importance of *knowing who you are.*

To all my beloved family and friends, you know better than I can express here the gratitude I feel toward God for your presence in my life. What privilege! We should get together more often!

Día libh! Mó cheol sibh!

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

This thesis examines the landscapes of a portion of the middle and upper Mohican (Hudson) Valley in modern upstate New York, in relation to the relatively sparse Late Woodland period archaeological record. The subjects of the study are the Muhheakunnuk, the Mohican people, whose descendants now primarily comprise the Stockbridge-Munsee Band of Mohicans west of Lake Michigan within the boundaries of the State of Wisconsin. Muhheakunnuk signifies both the nation and the river which was their lifeblood: the waters that ebb and flow, constantly in motion. In that spirit, this thesis illuminates the lives of the people by understanding the ecosystems of the river that sustained them. At the same time, by understanding the Mohican people, a new appreciation of the abundance of their land is gained, with powerful implications for the modern inhabitants of the same lands.

The thesis documents and discusses a method of spatially interpreting empirical environmental data by mapping the characteristics of the landscape and exploring their relations to Muhheakunnuk ways of life. Just as approaching the archaeological record with a comfortable knowledge of the oral historical record illuminates the archaeological history (as will be shown in Chapters One and Two) so will approaching the history and archaeology with a firm grasp on the environmental challenges and Mohican solutions thereto illuminate Mohican life. This project is a step in that direction, but it is sadly only a small step: an enormous amount of data has been created that has inevitably raised many more questions than it has answered and due to the scope of this thesis, this cannot be the place to answer them all.

One of the great frustrations for people interested in learning about Mohican cultural prior to the arrival of their European neighbors has been an apparent lack of data. Unlike their Haudenosaunee (Iroquois) neighbors, prior to European contact,

Mohican people apparently did not live in fortified, nucleated settlements, which has resulted in a relatively sparse archaeological record. Archaeology has added very little to our understanding of Mohican settlement patterns, which leads to a great deal of difficulty in visualizing "what it was like." While we have a rich artifactual record, even this generally comes across as very convoluted and confusing. Many of the sites are heavily multi-component, with evidence of constant or intermittent occupation dating from the late Archaic straight through to the Historic period. As such, identifying a strict site sequence along the lines of those developed in Iroquoia is probably impossible.

With the exception of eyewitness accounts of the 17th century like that of Adriaen Von der Donck (1965[1655]), relied upon heavily in this thesis, accounts of Mohican life often appear to be largely speculative, with little basis in history or archaeology. The entry for "Mahican" in the *Handbook of North American Indians* is as an example of both the speculative tendency of discussions of pre-contact Mohican culture, and the corresponding inclination of scholars to bemoan the lack of evidence relating thereto. Following a brief but detailed discussion of Mohican culture, rich in tantalizing specifics (including village site preferences, number of longhouses per site, number of fires per longhouse, seasonal ceremonies, and more) but completely lacking citations, Brasser emphatically states that "A detailed reconstruction of other aspects of early Mahican culture is out of the question"[1] (1978:200). This thesis challenges that notion, with the hope of moving towards anchoring apparent speculations in the living landscape.

Elizabeth Chilton (2005) has noted that the non-Iroquoian portions of the Northeast (including the Hudson Valley) are generally considered a "cultural

[1] I would like to note here that Brasser then goes on to a detailed and well-documented examination of Mohican life and events in the post-contact era.

backwater" by archaeologists, apparently due largely to a lack of concern with fortification and nucleation. This is of course absurd and ethnocentric, and Kurt Jordan (2008) has demonstrated the advantages of non-nucleated settlements in times of peace in Seneca country in the 18th century. The implication is that even Haudenosaunee people may largely have preferred dispersal to nucleation if political relations would have permitted it.

Perhaps it is the tendency of scholars of the Northeast Woodlands to primarily study the Haudenosaunee, with interests occasionally spilling over into and beyond Mohican country, which has led to another dissatisfying tendency in archaeological approaches to the Mohican and their other Algonquian neighbors. That is the tendency to emphasize site-level analysis, with only a limited degree of occasional intersite comparison. The obvious problem here is that lives and relationships were not lived out within the confines of the three by three meter squares of excavation grids: they ranged across landscapes, up and down rivers, over mountains, through forests, along ridgetops and back down into valleys again. Sites- the locations where archaeologists have happened to dig, often based upon the whims of modern development- have no necessary emic relationship to the people whose material is excavated. In Haudenosaunee country this problem is minimized because nucleated settlements enable complete excavation of what truly was an emically essential space, the fortified village. In Mohican country this is not the case, and so another approach is necessary. I advocate for a landscape based approach and this thesis demonstrates one way of going about it.

The landscapes in which lives run their courses are both the context and the product of these lives' interactions with and within the world. Like a river whose course is cradled and steered by mountains, yet whose own meanderings carve out bends and broaden valleys, we are shaped by our environment even as we shape it. So

as these landscapes are considered in a series of deceptively static maps, we must constantly be mindful of the contingency and permeability of mapped boundaries, of the blinding power of analytical scale and categorization, and perhaps most of all of the *aliveness* of the actual landscape these maps seek to portray. These waters run *right now*, these valleys breathe wind between the boughs of trees *right now*, and *now* these stones soak in and sweat out air and water. The dramas and subtleties of season and weather are ever present in their ways; these streams flood in spring, slow in summer, speed in autumn, freeze in winter. So as well with people, plants and animals, each reacting to these changes in their ways, as individuals and members of communities, tied in endless ways each to the others as Muhheakunnuk, the waters that ebb and flow, constantly in motion, swells and settles in.

The broad underlying assumption of this research has been that though the landscape has changed- though different systems of land management have, over time, changed it- much remains the same. The same bedrock underlies the same soil, the same streams carve through them. The same vistas overlook the same valleys, and though some swamps and lakes have shifted with the breaking and building of dams and though some have appeared where none before existed, some-to-many remain the same, and all bear study, as ecosystems similar in many ways to those sought out and studied by generations of Muhhekunneyuk, Mohican people.

The bedrock, waterways and natural lakes represent the most stable elements of the landscape. Though waterways cutting through alluvial flats may shift and ox-bow, the ecosystems created thereby will remain similar even over many centuries. Likewise plateaus and ravines may be eroded, but these processes may take thousands or even millions of years. In this paper I contend that soil is another largely stable element of the landscape, in terms of texture and chemical composition. This is my contention largely because of my observations of the soil surveys in my own study

area. While one may expect that modern environmental factors like acid rain, and modern cultural practices like plow agriculture, would have largely degraded soils, leading to more acidic, less productive soils, as the forthcoming maps will show, the study area still has enormous areas of highly productive and highly calcareous (non-acidic) soils. While it is possible that decline has occurred, this would simply imply that there were greater areas of high productivity and highly calcareous soils in the past, a scenario not particularly damaging to the model.

Aside from the already mentioned potentially unstable elements of the landscape, like wetlands, beaver ponds and man-made lakes, other elements we can safely assume have drastically changed include forest cover, and some plant and animal life. Widespread deforestation in the eighteenth and especially nineteenth century drastically changed the face of the landscape. As modern forests have reclaimed fallow farmland, their compositions may be very different from that which was here prior to European colonization. Reconstruction of these forests is one of the major concerns of this thesis. Certain wildlife, like the now-extinct passenger pigeons, which were once a focal point in the Mohican and Haudenosaunee seasonal rounds, will be underrepresented in discussions of predicted habitats from a modern ecological perspective. The same is true of the now (allegedly) extirpated mountain lions that once inhabited the study area. Many non native plant species also now inhabit the study area; in my interpretations and discussions of the maps, I have tried to be mindful of considering only native species.

As with all of the assumptions that underlie our disciplines we must be constantly cautions, asking of every mapped place, “Would this place have been this way?” and “How can we see what was here?” These questions are implied in every discussion of the plotted data, whether or not a satisfactory answer is suggested.

These maps were produced by layering the various characteristics of the

landscape such that their composite images imply the different habitats of Muhheakunnuk. Characteristics considered include soil texture, reaction (pH), drainage, and exposure. These are mapped in relation to farmland, wetland, ponds, lakes and waterways. At the fringes of these are found edge areas, unique and abundant habitats in their own right. By understanding the habitat needs of the plants and animals of Muhheakunnuk, and by interpreting the environmental data in relation to Mohican land management practices, I hope to contribute a broad backdrop upon which to discuss the intricacies of Mohican life from senses of duty to senses of place. This discussion could not possibly be carried out fully here, and so this thesis will foremost hold to its primary purpose, the explanation of a tool- its creation and application, followed by a discussion of the resulting maps.

As I understand it, this is the first study of its kind to be undertaken in the Hudson Valley, or anywhere else, as far as I know. As such it will gain much by scrutiny from a variety of experts. In addition to archaeologists and historians, ecologists, wildlife biologists, soil scientists and many other specialists could make valuable contributions to refining the model. Even as it stands now, though, it presents a valuable opportunity for archaeologists and historians to examine the sites and events of their interest in the context of their broader landscapes. It has great potential as a predictive model to guide excavation and to aid our understanding of village layout even among the heretofore confounding dispersed settlements of the Mohican. At the same time, it will inevitably be frustrating, because in order to concretely put these predictions to the test, further excavation may be necessary.

The Archaeological Database

In order to prepare for this analysis site reports for forty-five archaeological sites[2] within the study area were scoured for all of their reported material remains. All

[2] Many thanks to Jim Bradley for providing his site files to me for this project. Because of his

forty-five sites have at least one Late Woodland component, generally indicated by triangular "Levanna" type points (Ritchie 1997) or by some sort of incised pottery. Stone and pottery materials were originally intended to be included in this writeup, but were ultimately put aside for a later date in order to give due attention to floral and faunal remains. Twenty-one of the forty-five sites had no floral or faunal remains reported, leaving a database of twenty-four sites with botanical and/or faunal remains. These twenty-four sites are listed in Table 1, along with their periods of occupation and the sources from which floral and faunal data were gleaned. Only at six of these sites was the recovery of botanical remains reported; most of these come from Goldkrest. Floral and faunal remains are shown in Tables 2 and 3, respectively, below. Where differentiated in the site reports I have listed whether remains were charred or uncharred, and what part of the plant or animal was recovered.

Predictive Mapping and Habitat Specificity

This research is founded on the principle of habitat specificity: that certain plants and animals require specific habitats to survive (Kiviat and Stevens 2005). The analysis of environmental characteristics discussed herein will focus primarily on plotting plant habitats; the implication of these plant distributions for the animals that rely on them will also be considered, but not methodically analyzed. Such an analysis will be another step in the project. Mohican land management practices will also be discussed in interpreting the maps. More comprehensive application of our knowledge of Mohican land management could also be applied in future analyses: for example wildfire models could be used to understand the logistics of the famous Mohican land burns that helped to shape and maintain the high, clear forests of Muhheakunnuk. There are many other possibilities, and it is my hope that this first step, the vegetation reconstruction, will provide a jumping-off point to explore them.

---

generosity, much of the work of sorting through the archaeological record was already done.

Table 1: Sites with floral/faunal remains

Site	Occupation Periods[3]	Source
Black Duck	MW,LW+	Weinman and Weinman 1974
Castleton	LW	Bradley n.d.
Claverack Rockshelter	A,EW,MW,LW	Funk 1976
DEC Headquarters	A,EW,MW,LW+	Hartgen 2002
Dennis	A,EW,MW,LW	Funk 1976
Fort Orange	MW,LW+	Huey 1988
Four Mile Point	A,MW,LW+	Bradley n.d.
Goes/Vanderzee	A,EW,MW,LW+	Brewer 2001
Goldkrest	MW,LW+	Largy et al 1999
Hamburg	LW+	Weinman and Weinman 1977
Lansingburgh	LW+	Bradley n.d.
Little Nutten hook	A,MW,LW	Funk 1976
Lotus Point	A,EW,MW,LW	Ritchie 1958
Luykas Van Alen House	A,MW,LW+	Kirk 2005
Mechanicville Road	A,EW,MW,LW+	Hartgen 1983
Menands Bridge	A,EW,MW,LW	Funk 1976
Rip Van Winkle	MW,LW+	Weinman and Weinman 1971
Riverside	A,EW,MW,LW+	Huey et al. 1977
Roger's Island	LW	Bradley n.d.
Staats House	A, LW+	Huey and McEvoy 1977
Van Orden	MW?,LW+	Ritchie 1944
Van Shaick Island	A,EW,MW,LW[4]	Huey 2002
Waterford	MW,LW	Hartgen 1996

[3] A = Archaic; EW = Early Woodland; MW = Middle Woodland; LW = Late Woodland; + = Historic

[4] Though no evidence of Archaic or Middle Woodland occupation was reported on Van Schaick Island, evidence of occupation during these periods was reported on the directly adjacent Peebles Island. No floral or faunal remains were reported for Peebles Island, but because of their close geographic proximity, on this table I include these occupations in the Van Shaick Island entry.

Table 2: Botanical Remains

Resource	Site
Flora	
Grains	
Beans (possible)	Dennis (charred)
Grass (millet)	Goldkrest (charred)
Grass (undifferentiated)	Goldkrest (uncharred)
Maize	Goldkrest (charred), Dennis (charred)
Chenopodium	Goldkrest (charred & uncharred); Mechanicville Road
Sedge/buckwheat	Goldkrest (charred)
Vegetables	
Amaranth (green)	Goldkrest (uncharred)
Buttercup	Goldkrest (charred)
Chickweed	Goldkrest (uncharred)
Clover	Waterford
Daisy	Goldkrest (uncharred)
Wild Pink	Goldkrest (uncharred)
Purslane	Goldkrest (charred & uncharred)
Wood-sorrel	Goldkrest (uncharred)
Fruits	
Blackberry	Mechanicville Road
Elderberry	Goldkrest (charred)
Grape	Goldkrest (charred); Waterford (seed)
Raspberry	Goldkrest (charred); Waterford
Nuts	
Black Walnut	Black Duck (shell)
Hickory (butternut)	Goldkrest
Hickory (undifferentiated)	Mechanicville Road
Undifferentiated nutshells	Goes/Van Derzee

Table 3: Faunal Remains

Resources	**Site**
Fauna	
Mammals	
Bear (black)	Claverack Rockshelter; Lotus Point
Bear (undifferentiated)	Castleton (½ mandible, 2 canines)
Beaver	Lotus Point; Rip Van Winkle (tooth); Riverside (incisor)
Boar/pig	Fort Orange (tooth)
Deer	Black Duck; Castleton; Claverack Rockshelter; Dennis; Fort Orange; Goes/Van Derzee; Hamburg (bone awl, other); Lansingburg; Little Nutten Hook; Lotus Point; Luykas Van Alen House; Menands Bridge (bone awl, other); Rip Van Winkle (antler flaker, bone awl, other); Riverside; Roger's Island; Staats House (mandible); Zimmerman Rockshelter (antler tines)
Elk	Lansingburg (tooth pendants)
Raccoon	Claverack Rockshelter
Wolf/dog	Claverack Rockshelter; Hamburg (canine)
Woodchuck	Claverack Rockshelter; Zimmerman Rockshelter
Undifferentiated small mammal	Riverside
Amphibians	
Turtle (box)	Rip Van Winkle
Turtle (map)	Little Nutten Hook
Turtle (snapping)	Castleton
Turtle (undifferentiated)	Claverack Rockshelter; Dennis; Zimmerman Rockshelter

Table 3: Faunal Remains (continued)

Resource	Site
Fauna	
Fowl	
Duck	Hamburg
Goose	Black Duck (wing bone; Claverack Rockshelter (humerus)
Passenger pigeon	Zimmerman Rockshelter
Turkey	Castleton; Hamburg (wing)
Undifferentiated bird	Fort Orange
Undifferentiated large bird	Little Nutten Hook (claw)
Fish	
Sturgeon (rock)	Lotus Point (plates)
Sturgeon (undifferentiated)	Black Duck (plates); Dennis (plates); Goes/Van Derzee; Goldkrest (plates); Hamburg (plates); Little Nutten Hook (plates); Menands Bridge (plates); Roger's Island; Van Shaick island (plates)
Undifferentiated fish	Goldkrest (bones); Menands Bridge (bones); Riverside (bones & spines); Van Orden
Mollusks	
Fresh water clam	Hamburg (shell); Little Nutten Hook (shell); Menands Bridge (shell); Rip Van Winkle (shell); Riverside (shell); Zimmerman Rockshelter (shell)
Fresh water mussel	Claverack Rockshelter; Dennis; Fort Orange (shell); Goldkrest (shell); Lotus Point (shell); Riverside (shell); Van Shaick Island (shell)
Oyster	Claverack Rockshelter; Goes/Van Derzee (shell); Luykas Van Alen House (shell)
Snail	Claverack Rockshelter
Undifferentiated marine shell	Four Mile Point (wampum); Lansingburg (crescent bead)
Undifferentiated shell	DEC Headquarters (“cut shell indicating wampum manufacture”); Lotus Point (midden); Van Orden (midden)

The notion of habitat specificity, while familiar enough in my implicit knowledge of the ecosystems around me, was first explicitly introduced to me at a Biodiversity Assessment Training Course (BATC) offered by Hudsonia, Ltd. a non-profit environmental education organization specializing in Hudson Valley ecology (Kiviat and Stevens 2005). In the training course, local planners, officials and concerned citizens (I fell into the latter category) were introduced to a method of predictive habitat mapping. Information gleaned from topographic maps, soil surveys, maps of bedrock- and surface- geology and stereo- and ortho- aerial photographs was compiled and the potential locations of significant habitats were mapped onto a base map. These predictive maps were then field-checked for accuracy. During field-checking, records were made of observed flora and fauna, with special attention to certain "indicator" species to confirm habitat predictions. These indicators may be as obvious as the chestnuts, oaks and maples of the hardwood forests or the hemlock, spruce and pine of their coniferous counterparts, or as subtle as one of the various calcicoles (like maidenhair spleenwort) that may indicate, for example, a calcareous cool ravine.

Though field checks were used to confirm our predictions and clarify ambiguous (unpredictable) places, field checking all predictions was logistically impossible. In the case of this study, the same is true: the study area is far too vast to field check these predictions sufficiently, and four hundred years of drastically different land use practices will greatly complicate field checking, if and when it is undertaken. Though I will speak from broad experience in the study area, including dozens of field visits to numerous sites, no effort was made to methodically field check predictions. In a sense, in this case, the archaeological and historic records provide the evidence of the accuracy of prediction. That these materials are found in the material and written records confirms their presence and importance, and this type

of spatial analysis will help to bring us beyond vague generalizations as to source, demonstrating the specific locations from which these important materials may be derived.

In order to give readers an understanding of who the Mohican people are, and how they fit into the archaeological and historical traditions of the Northeast, I first review the Mohican and Lenne Lenape traditions of their origin and their relations to the other people of the Northeast in chapter one. The archaeological record in the study area will then be broadly discussed in chapter two. From there, a brief discussion of how the data for this project was acquired and analyzed forms chapter three, followed by consideration of important plant resources in chapter four, and a discussion of the habitats represented in the maps in chapter five. In the conclusion, some of the implications of the research are discussed and more suggestions for further research are put forth.

Before continuing, a note on place names: the place names used in this thesis, unless otherwise indicated, come from the land transactions listed in the appendices of Shirley Dunn's *The Mohicans and Their Land* (1994) and *The Mohican World* (2000). Place names mentioned in the land transactions have been tentatively mapped as accurately as possible, consulting only the information included in the land transfer entry in the aforementioned appendices. Generally, when all else failed, named places were mapped as watersheds of the creeks to which they apparently referred. This aspect of the project will be fully written up for publication in the near future.

Chapter One:

Origins

(*Our forefathers asserted...*)

The Mohican family of relations reaches far beyond the many trails of Muhheakunnuk, and through the reaches of any living memory. In ancient times they came to this Muhheakunnuk. “Our forefathers asserted,” wrote Hendrick Aupaumut in the eighteenth century,

> that their ancestors were emigrated from west by north of another country; they passed over the great waters, where this and the other country is nearly connected, called Ukhkokpeck; it signifies snake water, or water where snakes abounded; that they lived by side of great water or sea, from whence they derive the name of Muhheakunnuk nation. (Dunn 1994: 36-37)

He further writes,

> We understand that they were more civilized than what Indians are now in the wilderness; as it was said that they lived in towns, and were very numerous, until there arose a mighty famine which obliged them to disperse throughout the regions of the wilderness after sustenance, and at length lost their ways of former living, and apostatized. As they were coming from the west, they found many great waters, but none of them flowing and ebbing like Muhheakunnuk until they came to Hudson's river; then they said to one another, this is like Muhheakunnuk our nativity. And when they found grain was very plenty in that country, they agreed to kindle fire there and hang a kettle, whereof they and their

children after them might dip out their daily refreshment.

(*ibid.*:37)

The modern location of Ukhkokpeck is now unknown. The people of today's Mohican nation live in the great forests west of Lake Michigan in the state of Wisconsin. This is considered by some a homecoming to the Muhheakunnuk of their origin. Hudson Bay may be another possibility. The similarity of this history to the modern archaeological theory of the peopling of the Americas across the Bering land bridge (or in this case, the Bering Sea) is also easily recognized, and intriguing if not compelling.

Geographic and temporal clues in the story could lead to a more grounded attempt at identifying Ukhkokpeck's location and the trail from thence to Muhheakunnuk, but our immediate concern is for the people, and their relations. According to the Delaware tradition recorded by Heckewelder, these relations have their origin in that same journey. Migrating eastward from "a very distant country in the western part of the American continent," the Lenne Lenape[5] "at length arrived on the Namaesi Sipu, where they fell in with the Mengwe,"[6,7] who were likewise traveling east. Beyond *Namaesi Sipu* lived a powerful people called the *Talligeu*, *Talligewi*, or *Alligewi*, "who had many large towns built on the great rivers flowing through their land,"[8] the valley of the river called *Alligéwi Sipu* by the Delaware, Ohio by the Iroquois (Heckewelder 1876:47-48).

Their request to live in Alligewi land denied, they were granted permission to cross that land and seek on eastward. This the Lenne Lenape and their Mengwe

---

5 The parent nation of the Mohican, Delaware, and many other Northeastern Algonquian-speaking tribes.

6 Heckwelder translates Namaesi Sipu (Mississippi) as River of Fish from *Namaes*, "a fish" and *Sipu*, "River" (1876:47).

7 The Mengwe, Heckwelder tells us, are the Iroquois. (Heckewelder 1876:47)

8 According to Heckewelder fortifications said to have been built by these people could yet be seen; he mentions two that he himself had visited, one near Lake St Clair and another some miles up the Huron River from Lake Erie. (Heckewelder 1876:48)

companions did, but seeing how numerous this people were, the Alligewi attacked them, dividing the people on either side of Namaesi Sipu. Those remaining in the west fled, while those east united with the Mengwe and made war on the Alligewi. The war lasted many years, and many hundreds were lost and buried or heaped together and covered with earth, but the Alligewi were defeated. The Lenne Lenape with the Mengwe carried on to settle the East. The Mengwe dwelt in the area surrounding the Great Lakes, and the Lenne Lenape settled on the four great rivers, the Potomac, the Susquehannock, the Lenapewihittuck, and the Muhheakunnuk (*ibid.*:50).

The Lenne Lenape divided into three tribes, Unâmis (Turtle), Unalâchtgo (Turkey), and Minsi (Wolf[9]). The Unâmis and Unalâchtgo settlements "extended from Mohicannittuck... to beyond the Potomack." The Minsi

> extended their settlements from the Minisink; a place named after them, where they had their council seat and fire, quite up the Hudson to the east; and to the west or south west far beyond the Susquehannah: their northern boundaries were supposed originally to be the heads of the great rivers Susquehannah and Delaware, and their southern boundaries that ridge of hills known in New Jersey by the name of *Muskanecun*, and in Pennsylvania, by those of *Lehigh*, *Coghnewago*, &c. (*ibid.*:51-52)

Over time as the offspring of the three tribes settled in distant places and grew, they "gave themselves names or received them from others," and thus "formed

---

[9] Or perhaps more correctly, Roundfoot or Pawfoot. Heckewelder notes in a discussion of the tribes or clans of the *Mohican* that the wolf clan is more properly referred to as Pauk-sit or P'duk-sit, "which means *round-foot*, that animal having a round foot like a dog (Heckewelder 1876:253)." It is striking that the Mohican tribes or clans appear to have these same three divisions, with an additional bear clan that has puzzled historians discussing Mohican clans. It is suggested below that this fourth clan may have been incorporated when the Mohicans arrived in and met the existing inhabitants of Muhheakunnuk, a possibility to be explored more fully in the future.

separate and distinct tribes, yet did not deny their origin, but retained their affection for the parent tribe, of which they were even proud to be called the grandchildren." Among the grandchildren of the Lenne Lenape were the Nanticokes and their offspring on the Potomack and the Mohicans of Muhheakunnuk and their offspring to the east. (*ibid.*:53)

A similar narrative was related by Mohican Chief John Quinney on July fourth, 1854:

> A great people came from the North-West; crossed over the salt-waters, and after long and weary pilgrimages, (planting many colonies on their track,) took possession, and built their fires upon the Atlantic coast, extending from the Delaware on the south, to the Penobscot in the north. They became, in the process of time, divided into different tribes and interests; all, however, speaking one common dialect. This great confederacy, comprising Delawares, Munsees, Mohegans, Narragansetts, Pequots, Penobscots, and many others... (Dunn 1994: 38)

Whatever the specific details of their origins and journey, the preceding narratives provide a clear picture of Mohican perceptions of their place in the northeast. They were a people surrounded by elders, allies, brethren and offspring. This is not to discount the possibility (in some cases the certainty) of sibling rivalry, filial rebellion or treachery between allies, but rather to suggest the way Mohicans saw themselves within the social geography of the world as they knew it, even as European people began to become a part of that social geography, and again it changed.

According to tradition (quoted at length from Heckewelder below, but attributed to Pyrlaeus in Dunn 1994:42-43), soon after the arrival of the Dutch, the role of the Mohican, their brethren, and their grandfather changed:

The old and intelligent Mahicanni, whose forefathers inhabited the country on the east side of the North river, gave many years since the following account... They said that their grandfather (the Lenni Lenape), and the nations or tribes connected with them, were so united, that whatsoever nation attacked the one, it was the same as attacking the whole; all in such cases would unite and make a common cause. That the long house (council house) of all those who were of the same blood, and united under this kind of tacit alliance, reached from the head of the tide, at some distance above where Gaaschtinick (Albany) now stands, to the head of the tide water on the Potomack. That at each end of this house there was a door for the tribes to enter at. That the Mengwe were in no way connected with those who had access to this house; but were looked upon as strangers. That the Lenape, with the Mohicans and all the other tribes in their connexion, were on the point of extirpating the Five Nations, when they applied to the *Dutchemaan*, who were now making a settlement at or near Gaaschtinick, to assist them in bringing about a peace with the Lenape. That accordingly these new comers invited the Lenape and Mohicans to a grand council, at a place situated at some distance from where Albany now stands, which the white people have since called by the name of *Nordman's Kill* [the Normanskill Creek]. That when at length, by their united supplications and fair speeches, they had got the hatchet out of the hands of the Lenape, they buried that weapon at Gaaschtinick, and said that they would build a church over the

> spot, so that the weapon could never any more be got at, otherwise than by lifting up the whole church, and whatever nation should dare to do this, on them the Dutchemaan would take revenge. That now, having succeeded in getting the weapon out of the hands of the Lenape, the ceremony of placing them in the situation of "the woman," for the purpose of being mediators, took place, when the Mengwe declared them henceforth to be their cousins, and the Mahicanni, they said, they would call their nephews.
>
> The Mahicanni further say, that it was fear which induced the Dutchemaan to aid the Five Nations in bringing about this peace, because at the place where they were at that time making their settlement, great bodies of warriors would pass and repass, so that they could not avoid being interrupted in their undertakings, and probably molested, if not destroyed, by one or the other of the war parties, as their wars, at that time, were carried on with great rage, and no quarter was given. That in producing this peace, the white people had effected for the Mengwe, what no other nation could have done, and had laid the foundation of the future greatness of their Iroquois friends, as the same policy was pursued by the English, after they came into possession of this country. -- So far the tradition of the Mahicanni. (Heckewelder 1876 [1819]:60-61; insertions in round brackets are Heckewelder's, square brackets are mine)

In this tradition the ancient alliance between the Haudenosaunee and the Lenape has been forgotten, and it appears that some years of war preceded the literal

burial of the hatchet of the Lenne Lenape at Gaaschtinick. Whether these wars preceded the introduction of European people and the intensification of the fur trade is unclear, but Dunn notes that none of the records from Henry Hudson's two week stay in Mohican country indicated Mohican fortifications or other preparations for war. She does however mention a Jesuit account from 1659 in which a Mohawk informant related how the Mohawk were at one time “reduced so low by the Algonkins that there seemed to be scarcely any more of them left on the earth” (Dunn 1994:92). Whether these “Algonkins” were the Indians of the Adirondacks and St. Lawrence acting of their own accord or in concert with the rest of the Lenape confederacy, and the Mohican specifically, is unclear.

Dunn recounts two major historical episodes of war between the Mohican and Mohawk; these would have affected generations of Mohicans. The first occurred between 1625 and 1628. The Mohicans had denied the Mohawk free passage through their territory to make war on Mohican allies, but the Mohawk ignored the prohibition. The Mohican initially chased the Mohawks from their easternmost settlement in 1625, but in 1626 a Mohican war party accompanied by Daniel van Krieckebeeck, commander of Fort Orange, was defeated just a few miles from Fort Orange. One common interpretation of the defeat is that Van Krieckebeeck had apparently overestimated the shock value of his firearms, and underestimated the ferocity of the Mohawk, armed though they were with only hatchets, bows and arrows. However another possibility is that Van Krieckebeeck had orchestrated the defeat himself (he was among the few survivors in the defeated party), in order to strengthen ties with the Mohawk, and weaken the Mohican hold on land west of the Hudson River. Among the Mohican dead was the Sachem Monemin, whose castle (a fortification noted on historic maps and in documents, but archaeologically unidentified) is noted at the Mohawk-Muhheakunnuk confluence near Quahemesicos, Cohoes, on modern Peebles

Island (Huey 2002).

Though after the above described battle fighting between the Mohawk and Mohican continued with some help from the Mohican's northern allies, ultimately the Mohawk were the victors, and by 1629 the Mohicans sued for peace. In 1630 they sold their land on the west side of the river north of Koxhackhung to the agents of Kiliaen Van Rensselaer, and, according to Van Wassenaer, relocated to the Fresh River[10] (Figure 1) (Dunn 1994:96-99).

The era of uneasy peace that followed gave way again in the 1660s as fighting between the Mohawk and the Abenakis and other "Northern Indian" allies began to rage on Muhheakunnuk. Soon the Mohican and other "Eastern Indians" joined the alliance, and the war raged in earnest until 1669 when a large force of the allies attacked the easternmost Mohwak village, Gandaouague (Caughnawaga). As the village awaited reinforcements, the Mohicans retreated and took up a fortified position. The Mohawk located them, and set an ambush at Kinquariones (Figure 1) into which the allies fell. There were heavy casualties on both sides, but in the end the Mohawk were the victors (Dunn 1994:114-121).

In the aftermath of the battle of Kinquariones, Jeremias Van Rensselaer worked to make peace between the Mohicans and Mohawks, writing. "On the 8th of November 1671, last past, a firm peace was concluded by us here between the Maquas and the Mahikans in general and all those who carried on the war" (Dunn 1994:121). This seems to be the peace related by Heckewelder above, in which the hatchet was buried at Gaaschtinick.

[10] probably upriver from Schaighticoke on the Little Hoosic Creek, per Brasser (1978), but possibly the Connecticut, per Dunn (1994)

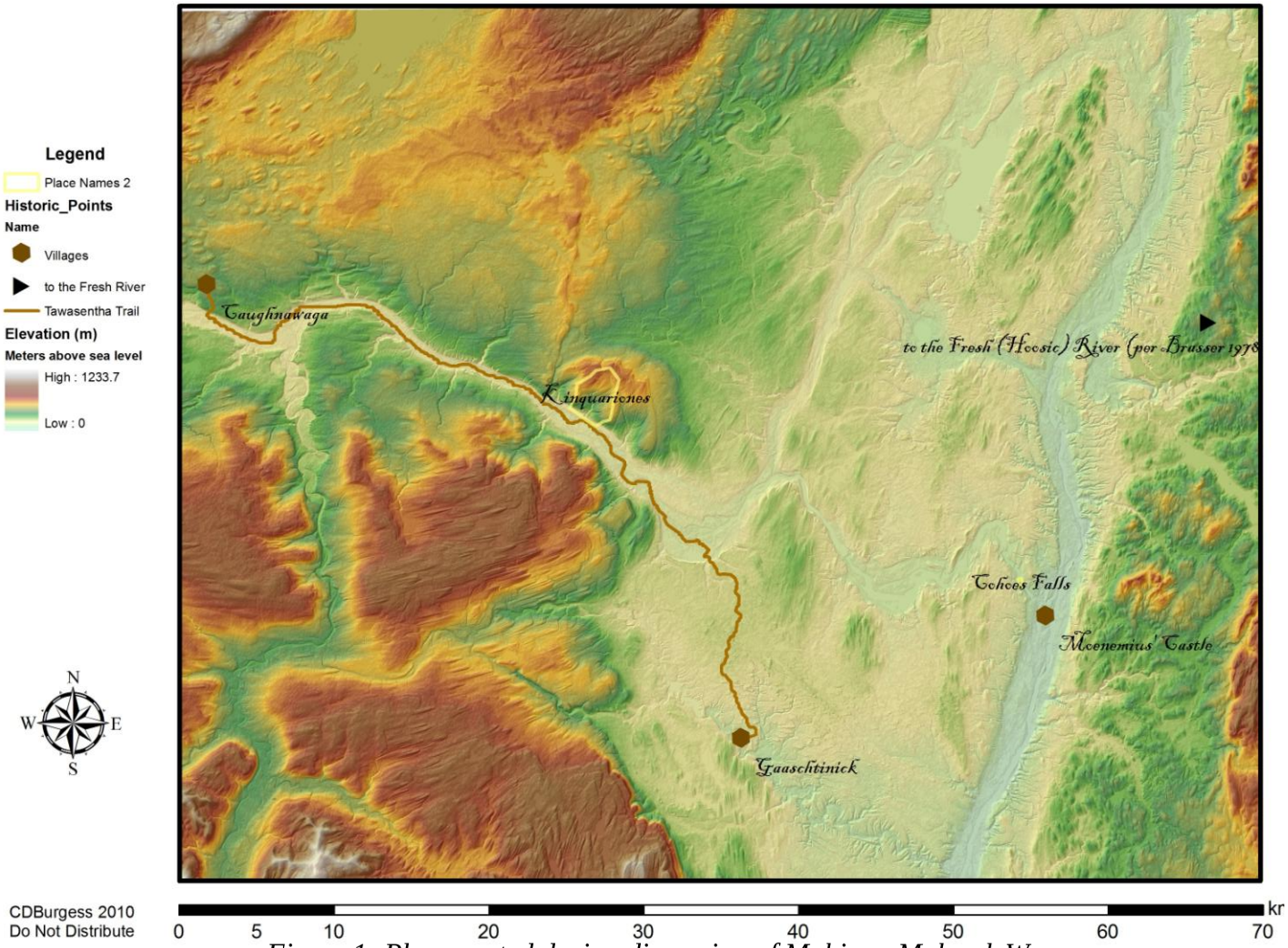


Figure 1: Places noted during discussion of Mohican-Mohawk Wars

(See Figure 2 on page 48 to orient this map with modern political boundaries)

This was by no means the end of the Mohican people, nor of their days as warriors (in fact in 1672 the Mohawks accused the Mohicans of commiserating with the French to "again take up the hatchet with them against the Maquase" [Dunn 1994:121]) but it was the end of a certain era of Lenne Lenape dominance in the Northeast. With the burial of the Lenape hatchet, the Lenne Lenape and the Mohican would adopt the role of mediators and interpreters between warring parties. They would wear the belt of peace across their shoulders, with the Haudenosaunee holding one end, and the Europeans holding the other (Heckewelder 1876 [1819]:62)[11].

These histories of Mohican interactions with their neighbors around Muhheakunnuk give us brief glimpses of two distinctly turbulent times in Mohican life, and each alludes to times less so. The days that followed their arrival in that land of abundant grain where they named the river Muhheakunnuk in honor of their nativity seem surely days of peace and plenty; likewise the accounts of war upon the Mohawk trail seem to imply an earlier time when it was safe to travel through Mohican land. This alluded-to time: those generations lived and left becoming Muhhekunneyuk and painting the Mohican way of life across the places of the great Mohican Valley in houses and granaries, fields and gardens, forests and marshes, weirs, torches, fences, bows and arrows, in celebrations and in mourning, in smoke and signs and ceremonies- this is the period on which the majority of this thesis focuses.

[11] For more on the tradition of Mohican diplomacy see Brooks 2009.

Chapter Two:

Chronology

It is my hope that by focusing upon the space of time between these two historical points-- the arrival in and naming of the valley Muhheakunnuk and the burial of the hatchet at Gaaschtinick-- we will for a moment set aside the western preoccupation with point-by-point chronology, and see instead the ebb and flow of life within these contextual boundaries of environment and neighbor, one and the same.[12] In setting temporal boundaries that emphasize continuity rather than change, there is a danger that I may present a static picture of both the place and people called Muhheakunnuk. This is not my intention. There were undoubtedly periods of both ebb and flow. The most salient of ebbs apparently occur on either side of the study period, in the journey from their former homeland and after the arrival of the Europeans, dramatically symbolized in the burial of the Lenape hatchet. Just so, the arrival in that land of abundant grain and the time just prior to European arrival represent apparent periods of flow. Even within the temporal boundaries of the study period there must have been dynamics, and further research should help to illuminate these.

The ways Muhhekunneyuk related to their environment and neighbors (on two legs or four, or green and growing); the ways they dealt with the elements, cured their illnesses and filled their bellies in conditions of ebb or flow; these are the true trappings of Mohican life. They have been described generally by Brasser (1978), Dunn (1994, 2000), Ritchie (1965) and others, and will be given specificity in the sections to come. The spiritual motivations for these ways of relating, then, constitute

[12] I use the word boundaries hesitantly here, because restraining and limiting though an environment may be, the possibilities of human adaptation to survive and thrive in a given environment are essentially endless. This is to say that we should avoid reading these "boundaries" as deterministic, but rather as making available a suite of possibilities.

the spirit of Mohican life. The Creator of the heavens and the earth provided a place like that ancient land of Mohican nativity so beloved, and if we understand how they nurtured that provided place, and how it cradled them, it is my hope that the spirit of Mohican life will be revealed in a way that is impossible in a history of point events, or in an archaeology divorced from landscape, tradition, and spirit.

The archaeological record does not contradict the saga of Mohican arrival. Despite my hesitance to belabor chronology, some discussion of the local archaeological record is in order. Table 3 shows the major periods, cultures, and phases discussed below along with their chronological positions. Although many of the sources I rely heavily upon in this discussion are over thirty years old, I felt it necessary to return to the roots of much of the scholarly debate regarding migration and diffusion in New York State broadly, and the Hudson Valley specifically.

The insistence of Mohican history upon a prehistoric migration makes it, in my opinion, worthwhile to give the work of the twentieth century culture historians a second look, despite the modern sway in opinion toward *in situ* development of the various archaeological cultures discussed below, with even sharp changes in material assemblages generally interpreted as ideological and material introductions rather than actual movements of peoples (Mackey 2007). I agree with Snow (1995) that "outlawing" discussion of prehistoric migration in the Northeast is not a productive way to move forward. I find it curious, though, that in all the years of conjecture with regard to prehistoric migration, the case for a Lenape-Algonquian migration has never (to my knowledge) been seriously presented, despite the apparent ubiquity of the oral tradition. Perhaps the political stakes of the latter are simply not so intriguing.

Table 4: Ritchie's Culture History of NYS (adapted from Funk and Ritchie 1973)

Period	**Date**[13]	**"Culture or Tradition"**	**"Phase"**
Late Woodland	A.D. 900 – A.D. 1500	Iroquois	*Garoga*
			Chance
			Oak Hill
			Castle Creek
			Canandaigua
		Owasco	*Carpenter Brook*
			Hunter's Home
Middle Woodland	A.D. 100– A.D. 900	Point Peninsula	*Burnt Hill*
			Kipp Island (?)
			Fox Creek
Early Woodland	1000 B.C.– A.D. 100	Adena	*Middlesex*
			Meadowood
			Orient (?)
Transitional	1500 B.C.– 1000 B.C.		*Orient*
Late Archaic	4000 B.C.– 1500 B.C.	Susquehanna	*Snook Kill*
			River
		Laurentian	*Sylvan Lake*
			Vosburg
Early & Middle Archaic	8000 B.C.– 4000 B.C.	Laurentian	*Vergennes*

[13] Dates are from Kurt Jordan (personal communication, 2010).

Iroquois, Algonkian & Owasco in the Late Woodland Period

One of the great talking points of archaeology in the northeast has been the development of Iroquois culture; specifically, whether Iroquois culture developed "*in situ*" or whether they supplanted some earlier "Algonkian" culture (Ritchie 1965:299). Since the mid twentieth century, the popular archaeological opinion has shifted to support an *in situ* development of Iroquois culture "from Owasco antecedents" (*ibid.*). "Owasco" culture is the culture-historic taxon which Ritchie defined to represent the "onset of recognizable northern Iroquoian traits" (Hart and Brumbach 2003:737). Four characteristics set Ritchie's Owasco culture apart from its predecessors. These are: "Owasco" pottery types, three sisters agriculture, longhouses, and nucleated villages. Previously, these four characteristics were all believed to have somewhat spontaneously appeared in what is now New York State at around A.D. 900-1000. This apparent coalescence of discontinuities with prior archaeological manifestations led Dean Snow (1995) to reintroduce a migration hypothesis, suggesting that the ancestors of the Iroquois (the Owasco) migrated from central Pennsylvania beginning around A.D. 900. Recent evidence has demonstrated that these four traits do not in fact coalesce at A.D. 900 as previously considered. Hart and Brumbach's "The Death of Owasco" (2003) summarizes the new evidence:

> What is evident from the new data on the timing of traits Ritchie used to define the origin of Owasco and thus New York northern Iroquoians is that those traits do not appear together at ca. A.D. 900-1000. Pottery types assigned to Early Owasco by Ritchie and MacNeish (1949) are present several centuries earlier. Maize and squash are similarly early, while beans, maize-beans-squash agriculture, longhouses and associated matrilocality, and villages are later. (Hart and Brumbach

2003:746)

Pottery types previously considered Owasco appeared as early as A.D. 400 and were apparently in use as late as A.D. 1400 (Brumbach, personal communication, 2010). While maize was formerly believed to have been introduced to Iroquoia around A.D. 1000, recently "maize phytoliths were recovered from the seventh-century-A.D. cooking residues from the Kipp Island and Wickham sites" in western New York (Hart and Brumbach 2003:746). Squash phyoliths were recovered from the same context. Beans, however, apparently appear across the greater northeast around A.D. 1300. Moreover, new radiocarbon dates also indicate that large longhouses "were not present in New York until the thirteenth century A.D. and were not common until the fourteenth century A.D." (*ibid.*:745). The earliest currently recognized nucleated villages, defined as those settlements having two or more households, also date later than A.D. 1000, generally around the 13th century (*ibid.*:745-746). The new dates clearly suggest substantial revision of Snow's (1995) migration scenario. Ultimately, Hart and Brumbach recommend that Owasco be discarded as a concept (2003).

Quite frankly I agree with the conclusion that the term "Owasco" should be abandoned, unless there is some utility to redefining the term to match the new evidence. Even so, I use the term here in order to engage with the work of Ritchie and Funk more effectively. As will be seen below, my interpretation of "Owasco" is that several different cultures were amalgamated into one term, and that the oral traditions offer a way to disentangle these.

William Ritchie's excavations on Minisink Island (the place of the council seat and fire of the "Minsi", for whom, according to Heckewelder [1876], the Minisink was named) "led him...to the conclusion that the Munsee division of the Lenni Lenapé or Delaware Nation, of known Algonkian linguistic affiliation, were participants in the Owasco culture in a late prehistoric phase of their development" (Ritchie 1965:299).

Ritchie continues,

> There seems to be no equally logical alternative to the judgment that Munsee culture, as it first appeared at their Minisink Island capital, conformed with the Castle Creek phase of the Owasco; that it underwent, prior to European impingement, progressive acculturation from neighboring groups, and from developing cultures up river to the north which can historically be related to Iroquoian-speaking people. (*ibid*.)

In truth, there are numerous equally logical alternatives, one of these being the genealogical relationship between the Munsee and their other Lenape neighbors, all grandchildren of the same grandfather, all sharing an ancient relationship with the Haudenosaunee (Heckewelder's "Mengwe"), born in a time long before they lived "up river to the north." The changes cultures undergo as they interact with neighboring groups are rarely if ever unidirectional. Peoples, like people, inherit certain qualities, and explore new ones as they leave the proverbial nest. In turn elders learn from what their offspring have gleaned in their explorations, trials and errors in the modern world, working with new and different people, materials, landscapes, and ecosystems.

The Lenape tradition demonstrates how interpretations founded on principles of unidirectional acculturation can mask the familial relationships between peoples. Richard White's (1991) "accommodation" or Kurt Jordan's (2008) "entanglement" are more demonstrative of the true nature of these intercultural relations, and though these were originally employed to describe cases of Native-European interaction, they are equally applicable in Native-Native relations, Mohican-Mohawk, for example, or Lenape-Haudenosaunee, more broadly.

The discussion of *in situ* and "elsewhere" Iroquois cultural development is centered on a false dichotomy: whether Iroquoian peoples moved in and supplanted an

“Algonkian” precursor or whether they developed locally. One of the many other possibilities is that both peoples arrived in their respective homelands together, bringing with them their own nascent forms of “Lenape-Owasco” and “Haudenosaunee-Owasco” cultures, or (more likely), their antecedents. This is to say that they were culturally entangled and accommodating even before settling in to their homelands east of *Namaesi Sipu*. As time passed and people and generations lived and let go, variations in the landscape and its fruits (and numerous other factors) helped to shape the individuality of the descendants in each of the many localities settled and called home. Seasonal abundance and want along with geographically-based differences in resource distribution ensured that the lives of those living in different places would intersect. This necessitated diplomacy and its ceremonies. Marriages refreshed and re-literalized longstanding kinships of the Lenape family and its clans. They facilitated technological and ideological exchange between descendants. More formal political ties could be relaxed or reaffirmed as needed. Historical examples of each may be the relaxation of formal ties that was necessary to over-spread the land after victory against the Allegwi, and the reaffirmation of formal ties in the form of the sixteenth century Lenape military alliance which, according to Pyrlaeus' Mohawk informant, nearly resulted in the extinction of the Mohawk people (Heckewelder 1876).

Those technological changes discussed above (changes that, to Ritchie and his followers, signaled a shift from Point Peninsula to the Owasco “proto-Iroquoian” culture)- which were originally thought to have coalesced around A.D. 1000 but have now been proven much later adaptations- can be better understood in the context of the environmental changes that were taking place beginning during the thirteenth century. Temperature reconstructions based on tree ring chronologies have demonstrated “strong evidence for inferred below-average temperatures over much of

the [A.D.] 1200-1500 interval, which may be regarded as a NH [Northern Hemisphere] extratropical expression of the Little Ice Age" (Esper et al. 2002:2251, my brackets). The temporal proximity of the onset of relatively drastic climate change to significant shifts in settlement form (both nucleation of settlements and the shift in house form to the archetypal large longhouse) suggests that these may have been adaptations to environmental pressure and the associated political pressure (i.e. conflict) that may have ensued between communities as the shorter growing season and harsher winters added significant resource stress to Haudenosaunee communities. Under such circumstances one would also suggest that surplus food production and storage would also become increasingly important. The other signatures of Ritchie's Owasco culture: a distinctive pottery type and three sisters agriculture, have their roots almost one thousand years before the Little Ice Age during the Middle Woodland Period, around A.D. 400 in the case of pottery and A.D. 700 in the case of maize and squash agriculture. Whether and how the introduction of the third sister, beans, relates to the Little Ice Age climate change is unknown.

If it were climate change that was the impetus for the change in settlement form across greater Iroquoia, how did this same period affect Muhheakunnuk? Generally, the primary material differences between the Mohican and their Haudenosaunee neighbors are considered to be lack of settlement nucleation and accompanying fortification (prior to European entanglement), and a preference for smaller wigwams rather than the large longhouses that are the hallmark of Iroquoia. These technological differences have tended to be viewed from an evolutionary perspective, in which the Iroquois have progressed along their chain of development further than the Mohican and their northeastern Algonquian neighbors and kin. However if these generalizations about pre-European Mohican culture withstand the test of time and further archaeological inquiry, it may suggest that the Little Ice Age

was not so stressful a period in Mohican country.

In fact, the Little Ice Age may have actually served to *improve* the Muhheakunnuk fishery, as colder temperatures may have brought cold water fish like salmon to and up the river to spawn, adding another element to an already abundant ecosystem. According to the NOAA Fisheries website, "U.S. Atlantic salmon were once native to almost every river north of the Hudson River."[14] If the Little Ice Age pushed that boundary just slightly south, the Hudson River- Muhheakunnuk- would be included. In my review of Mohican site reports I have never encountered fish remains identified beyond the most general terms ("fish bones") with the exception of the (until recently) enduringly ubiquitous sturgeon, easily identifiable from their durable plates. If identification of fish remains to the species level is possible in future examinations of both existing collections and new excavations, it will be interesting to note whether and for how long Salmon are represented in the archaeological record.

One further previously unmentioned difference between Mohican and Haudenosaunee material culture is in projectile point preference. In Haudenosaunee country, large, triangular arrow points (Levanna points) are replaced by smaller points of generally the same triangular shape (Madison points) around A.D. 1350, according to Ritchie (1997). Jim Bradley has suggested that Madison points were probably specifically developed to be used for "hunting" two-legged animals: that is, people (personal communication, 2008). In Mohican country, the Levanna point remained dominant until contact. If Bradley's suggestion is correct, it reinforces the notion that the Mohican were not under the same political tension as their Mohawk neighbors. Furthermore it suggests that peaceful relations with the Mohawk were maintained despite a major potential resource inequality. This was probably accomplished by welcoming the Mohawk to Cohoes to share in the abundance of the annual fish runs.

---

[14] http://www.nmfs.noaa.gov/pr/species/fish/atlanticsalmon.htm

This possibility is further discussed at the close of the thesis.

Middlesex and Meadowood in the Early Woodland Period

The Early and Middle Woodland periods have tended to be perplexing to archaeologists. Boundaries between cultural attributions (like "Middlesex," "Meadowood," and "Point Peninsula") have been regularly redrawn (Ritchie 1965; Funk 1976), while site stratigraphy, seriation and imprecise C-14 dating have continually challenged archaeologists' efforts to categorize. To comprehensively untangle the threads of this complex period is beyond the scope of this project, but some tentatively suggested general observations on the archaeological evidence will show how compatible the archaeological record is with Lenape history.

There are two primary Early Woodland "phases" discussed by Ritchie (1965) and Funk (1976). These are the Middlesex and Meadowood phases. Both phases show strong material and ideological ties to the Ohio Valley, the valley of the *Allégwi Sipu*. Both phases have overlapping, but not identical, temporal and geographic distributions. According to Funk, "The Meadowood is principally a western and central New York culture, whereas Middlesex is confined largely to central and eastern New York" (Funk 1976:277). However, "a number of significant finds connected with both cultures, but especially the Middlesex, have been reported in New England all the way from Connecticut to Maine" (*ibid.*:278). Furthermore, "Manifestations attributed to the Meadowood phase have recently been reported for the Upper Delaware Valley" and "Scant traces of the phase have been observed by the writer in the Upper Susquehanna Valley" (*ibid.*). Ritchie and Dragoo (1959, 1960 in Ritchie 1965) regarded Middlesex as "essentially Adena in the north, the locally varying products of contact metamorphosis of actual splinter groups of Adena people and already resident groups" (Ritchie 1965:200). Ritchie also mentions "important discoveries of Adena in the Chesapeake Bay district, in Delaware and in New Jersey" (*ibid.*).

Today, these apparently Adena related traits are rarely interpreted as resulting from an actual migration of people. Rather they tend to be interpreted as transfers of materials and ideas between relatively static populations (Mackey 2007). Even so, Ritchie and Dragoo's hypothesis is relevant to our discussion because of the context of the Mohican origin traditions discussed above. Ritchie and Dragoo hypothesized:

> that a strong movement or expansion of Hopewell people from the Illinois Valley into the central and upper Ohio Valley resulted in the social and political disruption of the Adena civilization, with the displacement of some of the more dissatisfied groups. An actual transfer of a sizable body of Adena people and their treasures, probably via the Monongahela and Potomac valleys to Chesapeake Bay, is virtually certain on the evidence of the Sandy Hill and West River sites in Maryland.
>
> From this new center in the east, dispersal northward can be traced through Delaware...and New Jersey...into central and eastern New York and New England, via the Delaware, Hudson and Connecticut rivers.... A less well defined route along the Ohio and Allegheny rivers may also have led from the parent area into western and central New York. (Ritchie 1965:200-201)

Ritchie continues, noting that

> The south-to-north dispersal is unequivocally attested by the fact that a high percentage of the classic Adena-type artifacts in Middlesex sites are made from stone materials native to the Ohio River basin, but exotic in the north, viz., fireclay or Ohio pipestone which occurs near Portsmouth, Ohio; Flint Ridge, Ohio, chalcedony; Ohio banded slate; Indiana limestone; and

Harrison County, Indiana, nodular flint. (*ibid.*:201)

Furthermore, the ratio of occurrences of classic Adena elements to those of local origin "varies inversely with the distance of the sites from the Adena centers to the south" (*ibid*.).

In addition to these direct material connections noted by Ritchie, stylistic, perhaps ideological connections are illustrated in Ritchie's list of "The most widely prevalent artifacts on Middlesex sites" which also happen to be "those most distinctive of the Adena culture" (*ibid*.). These include the "blocked-end tubular pipe, large leaf-shaped and lanceolate knife, javelin and spear heads with straight or lobate stem or side-notched, ovoid and trianguloid cache blades, copper celt, copper awl, boat-stone, bar amulet, truncated or bust type birdstone, several styles of gorget and pendant, cylindrical copper beads, discoidal, barrel-shaped and cylindrical shell beads, and *Marginella*-shell beads" (*ibid*.). He also notes that "Extensive use was made of powdered red ocher" in cemetery contexts, as well as a "usual accompaniment of grave offerings, a number of which appear to have ritualistic rather than secular significance," saying furthermore that "Many of them are obviously treasures from the homeland, carefully conserved, since they are rarely found except in graves" (*ibid*.).

Apparently, the path of Adena/Middlesex people into Muhheakunnuk follows the same route as that remembered in the Mohican and Lenne Lenape traditions, and matches the distribution of Lenape grandchildren from the Chesapeake to and through New England. Though the stimulus for Adena dispersal proposed by Ritchie does not match that recorded in Lenape history, the similarities are striking.

Meadowood sites seem to have artifact profiles somewhat similar to

Middlesex, featuring gorgets, birdstones, tubular pipes, copper awls, tubular copper beads. However in contrast to Middlesex sites, which seem to demonstrate a preference for Ohio Valley raw materials for "classic Adena-type artifacts" (*ibid*.), "The great majority of Meadowood points, wherever found, have been fashioned from a western New York variety of Onondaga flint of mottled gray-and-brown color" (*ibid.*:182). This suggests a comfort and familiarity with western Onondaga flint dating back to a point in time before "Meadowood" was "Meadowood." Perhaps the Mohawk chose to settle in the Land of Flint because the eastern Onondaga material resembled that of their nativity.

Aside from the difference in flint-source preference, the major distinguishing factors appear to relate to treatment of the dead. Both cultures made extensive use of red ocher in burial contexts, but where a variety of mortuary practices have been reported for the Middlesex burials, Meadowood burials followed a specific practice, including the deposition of caches of masterfully worked, thin, leaf-shaped blades[15] (*ibid.*:182). Notably, the Middlesex dead were not interred beneath mounds as was practiced by their supposed Adena predecessors in the Ohio Valley (*ibid.*:201-202).

Ritchie traces the roots of the Meadowood culture to the "Red Ocher and intimately related Glacial Kame cultures," postulated descendants of the "Old Copper culture" of the Upper Great Lakes. The Red Ocher culture was centered in southeastern Wisconsin, northern Illinois, northern Indiana, and southern Michigan (Ritchie 1965:198-199). The Mengwe of Lenape lore, then, may have been an offshoot of a Red Ocher branch, who, frustrated with life among the

[15] Those interested in reading more about Meadowood burial practices can do so in Ritchie (1965:179-200)

tyrannous Allegwi, saw an opportunity to escape to a new life with the arrival of the Lenne Lenape. The Lenape and Mengwe (Adena/Middlesex and a Red Ocher/Meadowood offshoot, respectively) traveled together towards Muhheakunnuk, "planting many colonies on their track" (Quinney 1854 in Dunn 1994:38).

It is possible that this offshoot of the Red Ocher/Meadowood people came to settle in the upper Susquehanna, upper Delaware, and Mohawk valleys, often settling near to and intermingling with their Lenape allies. The Red Ocher/Meadowood people who remained behind moved into the Genesee Valley, Finger Lakes region and elsewhere, entangling with other preexisting Red Ocher/Meadowood populations, as well as the descendants of Archaic cultures like those represented at Lamoka Lake and Brewerton. In time these would become the western Haudenosaunee.

Sites in the Mohican Valley with apparent Meadowood components like Dennis at the end of the Pine Plains south of the Mohawk River and Vosburgh in the Catskill Highlands would then appear to be the traces of that shared journey. If this were the case, it would be no surprise that at the Dennis site, Adena points, diagnostic projectile point of the Middlesex phase; were found in "seeming association with Meadowood points" (Funk 1976:278), the diagnostic projectile point of the Meadowood phase. Funk acknowledges that "the data from this [the Dennis] site indicate that Adena and Meadowood points do not represent horizons far separated in time" (*ibid*.). I would suggest that the simplest explanation of their "seeming association" is that they are contemporaries.

Point Peninsula and the Middle Woodland

If Middlesex and Meadowood do represent that period of seeking out the future homelands of the Lenape nations: of carrying traditions from *Ukhkokpeck* and even before, of carrying the material spoils from *Alligéwi Sipu* that complemented those things that crossed *Namaesi Sipu* and those found along the way through what would become *Lenapewihittuck* and *Muhheakunnuk*, of planting settlements like corn plants all along the rivers and tributaries of the East; then Ritchie's (1965) "Point Peninsula" culture represents the period of settling-in to these homelands. Old traditions were practiced using new, local materials; old kinship ties were maintained, or let go; and new relationships were built in diverse new ecosystems, with plants and animals both new and familiar, and also with new people. It is the uniqueness of these new circumstances: new environments, each with its own geographic and biocultural palette in and on which to paint Lenape life; that gave rise to the numerous peoples who called the Lenne Lenape their grandfather. Even among the grandchildren there was diversity, born of unique places, tied together by water, blood and history.

One major archaeologically-identified phase of the Middle Woodland period is the "Fox Creek" phase. According to Funk and Ritchie (1973) this culture's "center of distribution was in the New York coastal region," and in the "Susquehanna, Schoharie and Hudson Valleys," but "its influence reached into central New York, Pennsylvania, New Jersey, and Southern New England" (Funk and Ritchie 1973:356). In other words, the geographic spread of the Fox Creek phase appears to correspond to that settled by the Lenne Lenape (Heckewelder 1876), and settled by the Middlesex culture phase (Ritchie 1965; Funk 1976). Temporally, Fox Creek "occupied a time period roughly coeval

with early Kipp Island groups in central New York; yet there are few trait correspondences between the two groups" (Funk and Ritchie 1973:356). This lack of trait correspondence with central New York would be expected considering the proposed path of historical development, and the already noted geographic distributions of the respective Middlesex and Meadowood precursors.

Along Muhheakunnuk specifically, other phases identified (like the "Four Mile" and "Burnt Hill" phases of the Catskill and Saratoga-to-Lake George regions, respectively) may represent not so much chronological horizons in pan-regional culture change, but rather highly specific local adaptations to the intricacies of resource extraction in a particular place. In some cases these adaptations were likely innovated internally;[16] in other cases adaptations may have resulted from entanglement with preexisting populations.[17]

This proposed period of cultural synthesis and environmental adaptation is little understood. The variety of lithic and ceramic styles and their overlapping temporal ranges are perplexing to say the least. The dominant projectile point styles of the Archaic period occupations, the Normanskill and Snook Kill points, bear some rough similarities to points of the Early Woodland period, Meadowood and Adena points, respectively (Ritchie 1997: 91, 104, 89, 61). They also share similar geographic ranges (Funk 1976). Meanwhile the Middle Woodland Petalas blades and Fox Creek (formerly Steubenville) points share similar forms as well (Funk 1976:66; Ritchie 1997:107,108). These at first

---

[16] The Four Mile phase of the Catskill area may be of this sort: the diagnostic Petalas blades form part of a toolkit demonstrating heavy emphasis on sturgeon exploitation (Funk 1976:64-65, 295).

[17] The Burnt Hill phase of the Lake George-Saratoga region may fall into this category, with pottery evidencing ties to Lake Ontario and the St. Lawrence region (Funk 1976:296-297). These ties may have their roots in the Archaic period Glacial Kame culture (Ritchie 1965:131).

glance seem anomalous to the Middle Woodland period, but may have their roots in the ovoid cache blades of the Early Woodland Middlesex phase (Ritchie 1965:201,202). In any case, Funk notes that by about A.D. 700, the triangular Levanna points appear to have completely replaced all other styles (Funk 1976), with the transition to the Late Woodland Period and the "homogenization" of the various proto-Owasco cultures already described well underway.

The Woodland Period and Mohican Culture

The foregoing interpretation has been admittedly speculative. The apparent correlation between the Mohican/Lenape origin history and the Middlesex/Meadowood departure from *Alligéwi Sipu* would be further illuminated by a better understanding of the origins of the preexisting Archaic populations of Muhheakunnuk. It seems likely that the area was populated by a combination of peoples: hunters and fishers from the St. Lawrence drainage who followed the Champlain corridor south and/or coastal peoples following fish runs north up Muhheakunnuk (Wabenaki and/or Algonquin[18] ancestors?), as well as bands of Ohio Valley malcontents, dissatisfied with increasing social stratification in the land of the Allegwi all seem possible candidates.

One interesting piece of material culture from the Archaic period's River phase is the Bear effigy pestle, like that pictured in Ritchie (1965:130). These pestles, "having the top carved into an animal-head effigy, apparently a bear in all cases" (Ritchie 1965:129), have been recovered from River phase sites primarily along the Mohawk River (Funk 1976:259). Ritchie (1965:129) mentions their recovery at the Bent and Hoffman's Ferry sites, both well within the acknowledged bounds of Mohican territory (per Dunn 1994). It is tempting

[18] The spelling "Algonquin" is intentional here, signifying the Anishinaabe-related people of just north of the Saint Lawrence River, rather than the broad Algonquian/Algonkian linguistic group.

to interpret these pestles as representing the ancestors of the Mohican Bear Clan, a clan unknown in greater Lenape culture as a whole, but well documented for Mohican culture (Dunn 1994).

More synthetic research needs to be done in order to understand the way these archaeologically identified cultures related to one another and to their predecessors. As the Archaic inhabitants of Muhheakunnuk are better understood, our understanding of the Middle Woodland Point Peninsula cultures should also be greatly improved, thereby illuminating the Muhheakunnuk-Owasco cultures and their proposed descendants. In terms of understanding the development of Haudenosaunee culture, it is particularly important to continue working to understand the Archaic and Early Woodland connections between the Ohio Valley and the Great Lakes Region, and how the diverse cultures of these regions came together with the preexisting populations of their shared peripheries, particularly in the Finger Lakes and the Genesee country.

Table 4 is a modified version of the table at the beginning of this chapter. The suggested Archaic Period cultures are speculative, presented here to suggest an area for further research. How do the remains of these "phases" in Muhheakunnuk relate to those of the non-Lenape Algonquian northeast, particularly in the Champlain corridor, the upper Connecticut, the St. Lawrence and St. John Rivers, and the rest of the Dawn Land, *Wabenaki*? Are there enduring traits that may archaeologically differentiate these material cultures from those of the Lenape sojourners who called their place and people Muhheakunnuk?

Table 5: Modified Culture History of New York State

Period	Date[19]	Proposed Culture
Late Woodland	A.D. 1000 – A.D. 1500	Muhheakunnuk
		Haudenosaunee
		Muhheakunnuk – Owasco
		Mohawk – Owasco
Middle Woodland	200 B.C. – A.D. 1000	Muhheakunnuk – Point Peninsula
		Lenapewihittuck – Point Peninsula
		Mohawk – Point Peninsula
Early Woodland	1000 B.C. – 200 B.C.	Lenape – Middlesex
		Mohawk ("Mengwe") – Meadowood
		Wabenaki or Algonquin – Orient
Transitional	1500 B.C. – 1000 B.C.	Wabenaki or Algonquin – Orient
Late Archaic	4000 B.C. – 1500 B.C.	Wabenaki or Algonquin – Snook Kill
		Wabenaki or Algonquin – River
		Wabenaki or Algonquin – Sylvan Lake
		Wabenaki or Algonquin – Vosburgh
Early & Middle Archaic	8000 B.C. – 4000 B.C.	Wabenaki or Algonquin – Vergennes

[19] Dates are from Kurt Jordan (personal communication, 2010).

Popular archaeological opinion seems to remain aligned with Snow's (1995) reluctance “even to use national terms such as 'Seneca' or 'Mohawk' [or Mohican or Wabenaki] for periods prior to A.D. 1500,” because of the judgment that it is “uncertain that such groups existed even in incipient forms” (1995:62, my brackets). I clearly disagree. That they existed upon European arrival proves incontrovertibly that they were incipient (for a flower to be in bloom, there must have been a bud), and for archaeologists to throw away such vital pieces of cultural information is to grievously hinder our ability to interpret and understand the past. This is not “upstreaming,” it is “keeping all the parts” (Kassam, personal communication, 2009).

How these cultures were manifested- the rigidity of their political structures, the oldness of their social institutions, and the durability of their particular subsistence strategies- these are all malleable. Among other things, it is the domain of the archaeologist and historian (oral or otherwise) to research, excavate and otherwise seek to discover, understand and pass on these specifics of cultural manifestation. To suggest that the Seneca were not Seneca until they lived in a particular kind of house, decorated their pottery a particular way, or grew their corn with beans misses the essence of Seneca identity. Just as Kurt Jordan (2008) has demonstrated how changes in Seneca settlement form during the 18th century corresponded to a time of Seneca prosperity- and by extension strengthened Seneca identity- so is it possible that prior to the 13th century consolidation into nucleated villages, Seneca identity (for example, by whatever indigenous self-name) was as strong as ever. It is certain that the people of the longhouses (within a few generations, at least) understood their descent from the people before the longhouses, just as the people who live in timber houses today recognize their descent from people who lived in longhouses.

In addition to hindering the progression of our fields, implying that national identities are predicated on material trappings like house form or village type is an

unfounded affront to modern descendant communities, as if Senecas or Mohicans who do not live in longhouses or wigwams no longer have a claim to their respective national identities, or to the authorities and rights guaranteed them in perpetuity by treaties negotiated with the United States government- treaties which are, by and with the Constitution, the supreme law of the land (Wilkins and Lomawaima 2001).

Just as in the west, it is vital to our understanding of the pre-European peoples of the Mohican Valley that we be unafraid to acknowledge the legitimacy of the pre-European Mohican relationships with and within their land. This chapter has shown how much clearer the archaeological record becomes when viewed through the lens of Mohican/Lenape history. In the following chapters, I turn to the landscape in an effort to further contextualize that record.

Chapter Three:

The GIS Data

GIS Data for this project was compiled from numerous sources, then manipulated using Environmental Systems Research Institute, Inc.'s (ESRI's) ArcMap 9.3. The steps for taking the data from raw its form as downloaded from the respective repositories to its current form in the maps is discussed below.

Topography

Elevation data, in the form of Digital Elevation Models (DEMs) was downloaded from the Cornell University Geospatial Information Repository (CUGIR). The data is organized according to the corresponding USGS 7.5' Topographic maps. Data from 56 quadrangles was used. The DEMs are a raster-based data set, with a ten meter grid cell (i.e. each 10 meter cell is assigned an elevation-above-sea level value. Individual DEMs were then stitched together using the *Mosaic* tool in the ArcToolbox. Because of the intensive resource requirements for this operation, DEMs were mosaiced in three sections, a northern, central, and southern. These three sections were then mosaiced once again to produce one elevation layer for the study area. Once mosaiced, the elevation layer was filled using the *Fill* tool in the ArcToolbox. This tool fills “sinks” in the layer to remove small imperfections in the data; for example, an isolated gridcell with a value of 0 amidst values ranging from 100-110 would be reassigned a value in the appropriate range. With the data filled, the elevation layer was then projected from the North American Datum (NAD) of 1927 to NAD 1983, UTM zone 18N, using the NAD-CON conversion (the standard tool for converting NAD 1927 to the more current NAD 1983) within the *Project Raster* tool. This resulted in the final **elevation** layer.

An **aspect** layer (showing direction of exposure) was derived from **elevation**

using the *Aspect* tool in the ArcToolbox Spatial Analyst. This provided a layer with each gridcell having 9 possibilities, the four cardinal directions, the four cross-quarters, and flat. These were then reclassified using the *Reclassify* Spatial Analyst tool, so that Southern, Southwestern, and Southeastern exposures were coded “1” for “Southern” and all other exposures were coded “0” for “Non-Southern.” In retrospect, coding “flat” land as “Southern” may have been more appropriate.

A **hillshade** layer (which interprets the elevation data three dimensionally) was then derived from **elevation** using the *Hillshade* Spatial Analyst tool. Default Azimuth and Altitude inputs of 315 and 45, respectively were used, with a Z factor of 1, and with an Output cell size of 10 (meters), matching the input cell size. The **hillshade** has not been essential to the analysis, but gives a three dimensional feel to the topography, which helps in interpreting the maps. Moreover it may be very useful in future attempts to pin-down the amount of sunlight received in a given location. By adjusting the Azimuth and Altitude ratings to match particular times of day (for example, morning, noon, and evening), it may be possible to show which locations are in shade at which parts of the day. This would greatly improve upon my effort to introduce light and shade to the habitats using only aspect as described above.

Several layers of contour lines have also been produced, for use at various scales. These were derived from **elevation** using the *Contour* Spatial Analyst tool. Contour intervals of 100 meters, 40 meters, and 10 meters will occasionally be displayed in the maps to come.

Elevation data has been one of the primary limiters of the study area. Because this data is of such high resolution, analytical operations like those described above regularly crashed both my own personal laptop computer and Cornell's desktop computers. Initial difficulties locating data for the portions of the Mohican homeland outside of modern New York State- particularly the portions of the Housatonic and

Hoosic river valleys in Vermont, Massachusetts and Connecticut- served to further complicate matters. As such, the eastern boundary of the study area is limited to the easternmost quadrangles completely contained in New York State. Thus the study area extends to roughly 50 kilometers west of today's Hudson River, and only 20 meters to the east. This study area, in the form of **elevation** (at 50% transparency) laid over **hillshade** (0% transparency) is shone in relation to state and county boundaries on Figure 1.

Soil

Soil data from eight counties was used in this study, all downloaded from the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) soil data mart.[20] The counties include all of Albany and Schenectady counties; parts of Columbia, Green, Rensselaer, Saratoga and Washington counties; and one small spur at the northeast corner of Ulster county. In order to work with specific soil characteristics like reaction and drainage, it was necessary to download the NRCS Soil Data Viewer (version 5.4) from the NRCS website. One county at a time, soil characteristics were mapped using the Data Viewer. These characteristics include Reaction (pH), Surface Texture, Drainage Class, Organic Matter, and Corn Yield. The resulting maps were then merged using the *Merge* tool in the ArcToolbox, and trimmed to the study area using the *Clip* tool, resulting in the **pH**, s**urface texture**, d**rainage**, **organic matter**, and **corn yield** layers. **Surface texture**, **drainage** and **pH** were then dissolved by the appropriate attributes using the *Dissolve* tool, resulting in one feature in each layer for every possible pH, for each possible drainage class, etc, thus reducing the total number of feature polygons in, for example, the pH layer, from seventy-four thousand one hundred fifty (74,150) to twenty-five (25).

[20] http://soils.usda.gov/survey/geography/ssurgo/

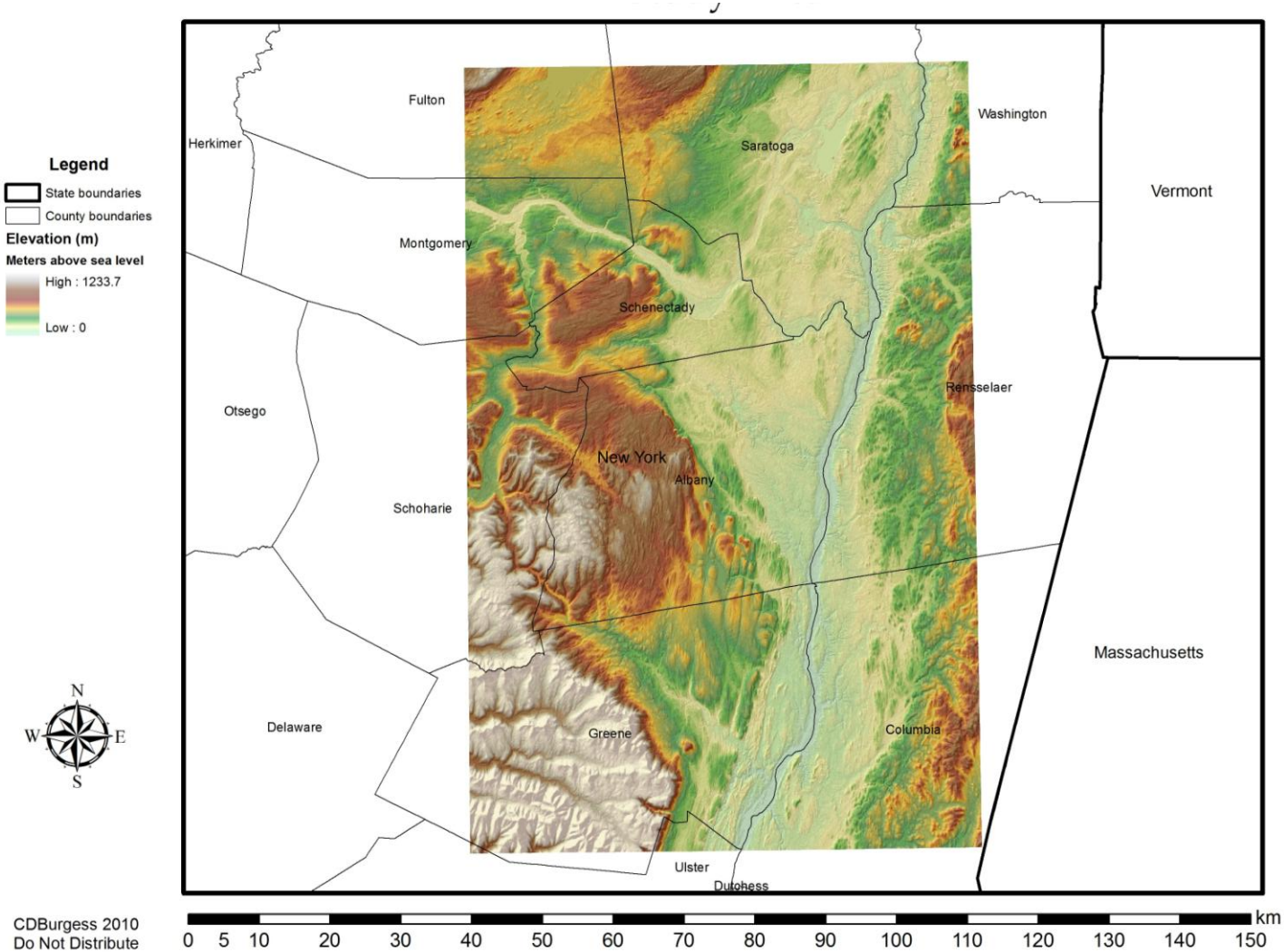


Figure 1: The Study Area

The dissolved layers are far less demanding of computer resources, enabling further analyses that would otherwise grind my machine to a halt.

In order to predict the past locations of Mohican agricultural fields, a ***cropland*** layer was derived from **corn yield** by selecting all features with a corn yield rating of one hundred bushels per acre or greater. Corn yield estimates assume modern western farming techniques, fertilizers, etc. As such, these yields were cut in half to roughly reflect Mohican three sisters corn yields, as suggested by agricultural experiments carried out by Jane Mt. Pleasant (personal communication, 2009). The area in acres of each of these **cropland** polygons was calculated using the *Calculate Geometry* function within the **cropland** attribute table. The area was then multiplied by both the Western and Mohican corn yield estimates to provide an estimated yield-in-bushels for each field.

Using only those features with a yield rating of one hundred bushels per acre and greater is just one suggested solution for the problem of determining which places were actively farmed. One outstanding problem is that many of the most productive features in the study area are high acreage polygons with yields lower than one hundred bushels per acre. In fact the nine highest-yield features in the study area have predicted corn yield per acre ratings ranging from fifty-five to ninety bushels per acre over areas ranging from two thousand to nearly seven thousand acres. Other high yield features lie just outside of the study area. Whether these have ever been fully cultivated- have ever been used as one coherent field- is unknown, but seems unlikely. Even so the possibility is there.

The two maps (Figures 3 and 4) of Nachtemack (a Mohican place name meaning "Excellent Land" [Dunn 1994:288]) illustrate an oversight of the **cropland** layer. In Nachtemack we find the potential field polygon that is predicted to yield the third-most bushels of maize in the study area (191,072 bu), where low content of organic matter in the sandy soils that may hinder maize yield is made up for in total bushels by the great area (6,824 ac) of the potential field polygon (see also Figure 9 and Figure 11, showing soil texture and soil organic matter, respectively, for the entire study area). Mohican farmers practicing three sisters agriculture probably had ways or dealing with low organic content, including incorporation of organic content like tillage from the former year. These may be more effectively introduced using mound or row systems, raising organic content in specific points (mounds) rather than attempting to adjust soil properties across entire fields, in what would have been a time consuming and inefficient investment of labor (Mt. Pleasant 2006). Thus it is possible that low estimated yields may have in fact been higher than predicted due to Mohican styles of negotiating environmental conditions.

Alternatively, it may be that what we see playing out at Nachtemack is in fact an example of Mohican resistance to European exploitation in land sales. Perhaps their description of Nachtemack as "excellent land" was tongue in cheek, selling the Dutch purchasers what they knew to be a worthless stretch of pine barren mineral sand under the false pretense that the land would surely be "excellent." Another possibility is that Nachtemack refers to the "excellent land" on either side of that "worthless stretch of pine barren mineral sand."

In either case, it is clear that while only one means of determining "best farmland" has been systematically incorporated into the building of this model of the landscapes of Muhheakunnuk, other possibilities should be considered at every corner, and incorporated in future explorations.

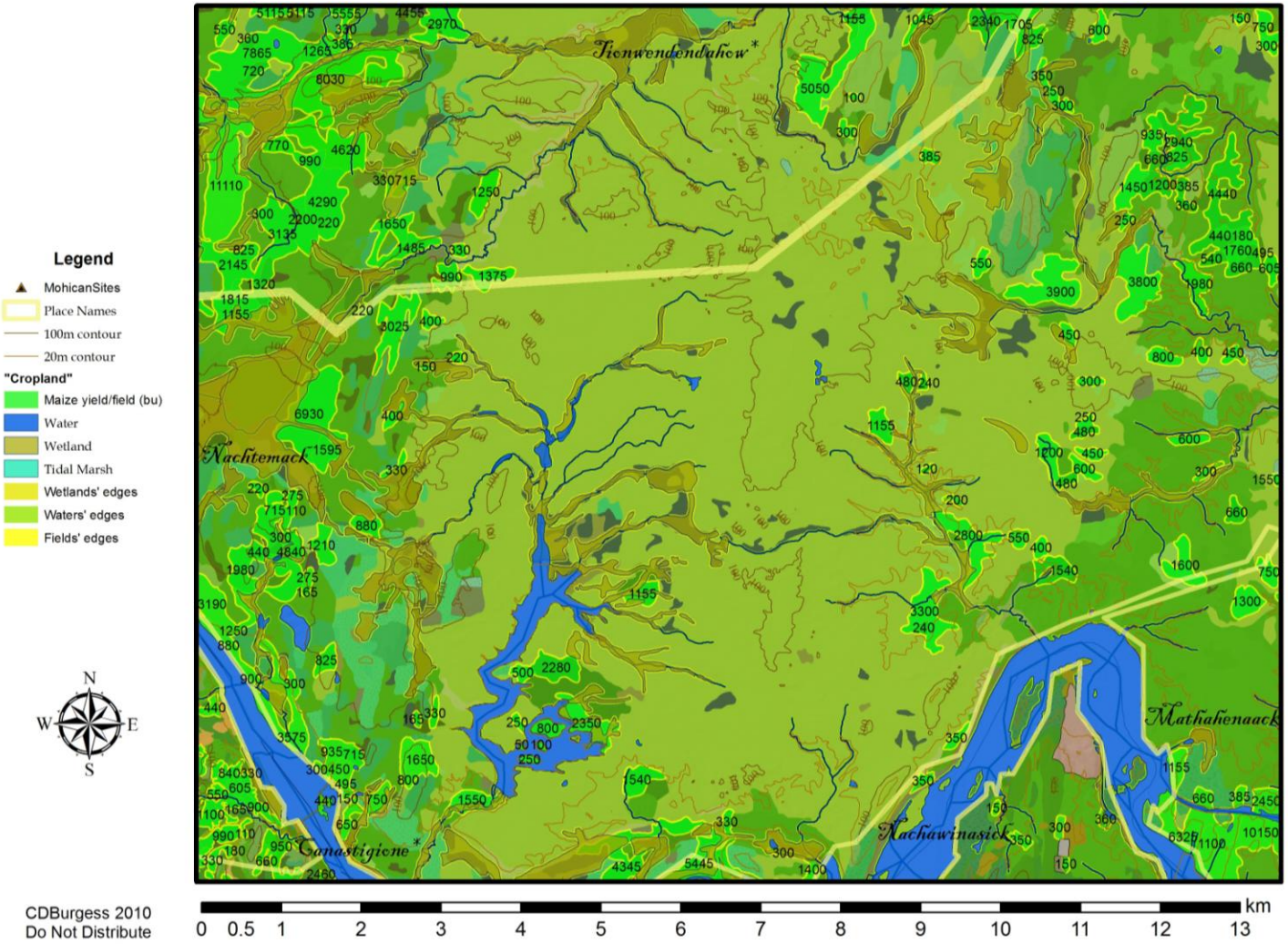


Figure 2: Nachtemack "Cropland" (Mohican yield = 50+ bu/ac) field yields

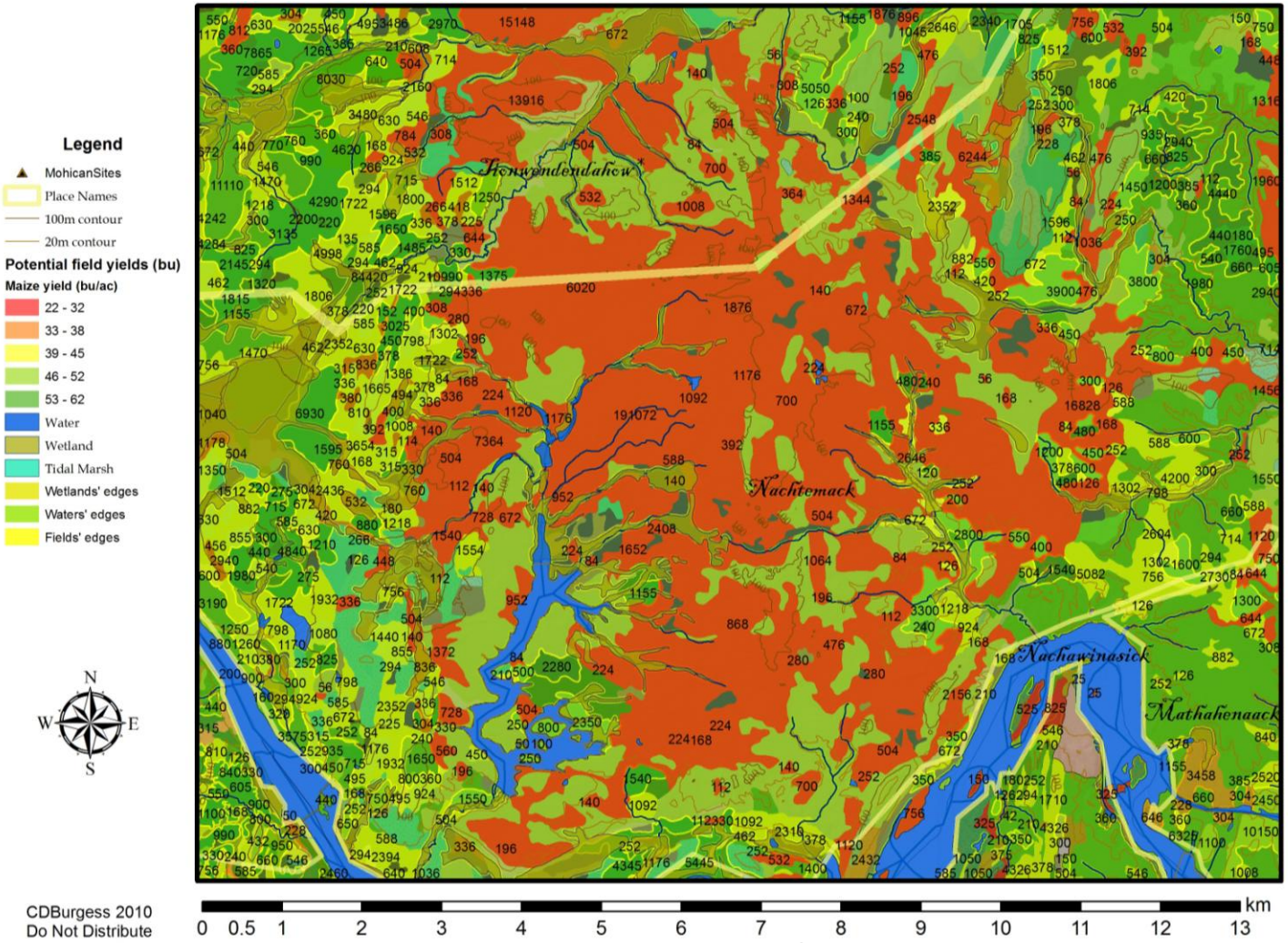


Figure 3: Nachtemack potential field yields

Water Features

Water features for the study area were derived from three major sources: New York State (NYS) Department of Environmental Conservation (DEC) wetland inventories, USGS large scale hydrography, and the county soil surveys described above. Wetland data from the U.S. Fish and Wildlife Service (FWS) National Wetland Inventory was downloaded from CUGIR in the polygon shapefile (.shp) feature class format. This was then clipped forming the **Wetland** layer. Hydrology data for the Upper and Middle Hudson River Watershed in the form of linear shapefile feature classes, was likewise merged and clipped, producing the **Streams** layer. Water features delimited on county soil surveys were selected using the "select by attribute" function within the **soil** attribute table. All **soil** features with "MUSYM = 'W'" (for water) were selected and exported to a new layer, **Water**, which was then clipped to the study area. One further class of polygonal water features, the **Tidal Marsh**, was likewise derived from the **soil**, as all features with "MUName = 'Medisaprists-Hydraquents, tidal marsh'" were selected and exported to a new layer, **Tidal Marsh**. These were also clipped to the study area.

Edges

Because of the significance of "edge" habitats for many important plants and animals, it was deemed important to attempt to set these apart graphically on the maps. Three different types of edge layers have been developed: farmland edges, wetland edges, and waters edges. Each of these were developed using the *buffer* tool. A twenty meter (20m) buffer was placed around **Cropland**, **Wetland**, and **Water**. In order to buffer **Streams** it was necessary to first *clip* streams into three regions (north, central and south) because the massive amount of data continually crashed my computer when trying to run the analysis. Each of these regions was then buffered, and the three resulting buffer layers were then *merged* together.

Overlapping edges (like those where the **Streams** buffer underlies the **Water** buffer) were not removed. In some cases this may be more appropriate than others; for example stream buffers that pass through wetlands may indicate areas in which more sunshine reaches the wetland, as the standing waters of wetlands dry during the heat of summer, the places where stream currents pass through would remain wet the longest, and their edges may become significant microhabitats.

Chapter Four:

Plant Resources

Below, several plants are briefly profiled, in terms of human relations thereto (uses), and in terms of the environmental contexts in which they are found (habitat), as well as the archaeological and historical contexts in which they have been noted. Habitats are synthesized from a handful of sources, including field guides (Brockman 1968; Foster & Duke 2000; Peterson 1978; Tull 1987) Kiviat and Stevens' *Biodiversity Assessment Manual for the Hudson River Estuary* (2005), and the ethnohistorical sources discussed below. Continuing to refine habitat determinations such that they more directly relate to the specific characteristics accounted for in the maps (or vice-versa) will be a high priority in future manifestations of this work.

Two sources have been heavily relied upon for information relating to use: Gladys Tantaquidgeon's *Delaware Folk Medicine and Beliefs* (1972) and Alma R. Hutchens' *Indian Herbalogy of North America* (1973). Archaeological context has been drawn from various site reports, and Adriaen Von der Donck's *Description of the New Netherlands* (1968 [1655]) has been largely relied upon as a historical source, in addition to Shirley Dunn's syntheses of the historical record, *The Mohicans and their Land* (1994), and *The Mohican World* (2000). A few notes on the authors are below, followed by the plant profiles.

Gladys Tantaquidgeon is the Mohegan[21] scholar who published *Delaware Folk Medicine and Beliefs*. Her record of the Delaware traditions is based largely upon her interviews with her informant Witapanoxwé, a Delaware man whose was called on by

[21] The Mohegan of Connecticut were, according to the tradition Tantaquidgeon's mother passed on to her, the same people as the Mohican of the Hudson River. The Mohegan were once a part of the Pequot nation, and split off from them around the time of King Philip's War. All spoke Algonquian languages, and, as discussed in the opening chapters, their conception as one people is not at odds with the Delaware and Mohican traditions.

the Creator to be a healer (Tantaquidgeon 1972:11). Mohegan beliefs were mostly recollections from her own family's traditions.

Alma R. Hutchens' primary source was a thirty-volume work by N. G. Tretchikoff, an herbalist from Windsor, Canada. For each plant she lists, she makes some general statements on the uses of the plants, including Native American uses, and then describes the Russian homeopathic tradition with the plant, as well as some folk beliefs. I have generally only included uses listed in her general statements or in her descriptions of Native American uses.

Adrien Von der Donck's *Description of the New Netherlands* was published in 1655 after some 14 years of living and traveling in the New World. His descriptions are interestingly contradictory, as he will in the same breath discount the abilities of the Natives and then describe with admiration those same abilities. For example, in his discussion of "a colouring, wherein they dye the hair [which they use instead of plumes] a beautiful scarlet," Von der Donck asserts that "Although the Indians do not appear to possess any particular art in this matter, still such beautiful red was never dyed in the Netherlands with any materials known to us" (1968:39). For a people who appear not to "possess any particular art," Von der Donck seems rather impressed. In general, his accounts of flora and fauna seem largely unbiased, though it should be borne in mind that one of the purposes of the *Description* must have been to entice settlers to move to New Netherlands.

Just leafing through Tantaquidgeon, Hutchens or any edible or medicinal plants field guide reveals that almost all plants have some use, usually many uses. Of necessity many of these have been left out of the profiles below- even some that have been recovered archaeologically, like red clover (a cough and cold remedy), wood sorrell (a salad green), and amaranth (a spinach green having native and non-native varieties), all of which were recovered from Goldkrest (Tantaquidgeon 1972;

Hutchens 1973; Largy et al 1999). Other useful plants are noted specifically in Kiviat and Stevens' (2005) descriptions of habitats. Among these are edge bark and berry bushes like bear berries, shadbush and spicebush, as well as Arrowood viburnum, common around all edges, cut and bound to dry for arrow shafts; Sycamore, the magnificent silver trunked trees of the bottomland that must have been a huge part of the phenomenal experience of walking or canoeing through Muhheakunnuk; and birch, whose bark's combustibility is well known, and whose utility for writing paper and canoe-building is equally renowned. Sadly, there are many, many more, but I remain hopeful that this sample will help to color the maps, and to connect the places depicted thereon to the people who lived in them.

Trees

Ash. Tantaquidgeon (1972) tells us that young black ash (*Fraxinus nigra*) logs were split for baskets, bows, handles for tools, brushes, pipe stems, and arrows were all made from small branches and twigs. White ash (*Faxinus americanus*) is often used for the same today, due to the modern rarity of black ash. Hutchens also mentions musical instruments as well, and mentions that the “Tree yields manna” (1973:20). The bark and leaves, according to Hutchens, are useful for gout, arthritis and rheumatism, dropsy and for kidney stones, and also as a laxative for children (1973).

According to Sidell, “White ash grow in rich woods, and green ash is found on hillsides and riverbanks or wet woods” (2002:245). Sidell considers ash an indicator of floodplain or bottomland forest, along with elm, butternut, alder and willow (2002). Black ash prefer lowland deciduous forests (Watts 1998). Kiviat and Stevens note white ash as a species of secondary importance in mature mesophytic lowland forest along with shagbark hickory, basswood, tulip poplar and black birch. In mature mesophytic forests, then (generally dominated by sugar maples, oaks, chestnut, American beech or hemlock), perhaps these secondary species would be most safely

predicted to be found along field and stream edges-particularly poorly and somewhat poorly drained edges.

Black Walnut. Burnt shells of black walnut (*Juglans nigra*) were recovered from the Black Duck site in *Waen Naemka*, south of *Caniskek* on the west side of Muhheakunnuk *(*Weinman and Weinman 1974). Among the Delaware, according to Tantaquidgeon's informant Witapanoxwé, in order to treat intestinal discomfort, three branches were roasted according to a particular practice. The bark was then peeled (the end from which it is peeled determining effect) and tied in three separate bundles. A strong tea was then made by boiling the bundles together. Leaves were scattered around the house to remove fleas. Juice from the nut can be applied topically to cure ring worm. Hutchens lists numerous medicinal uses, including as treatment for scrofula, ringworm, colic, and dyptheria, as well as its use as a dye (1973).

According to Brockman, black walnut are found in rich woods (1968). Hutchens elaborates, locating them within "rich, moist well drained soil such as is found in valleys" (Hutchens 1973:52). Black walnuts ripen from October through November.

Cedar. Eastern Red Cedar (*Juniperus virginiana*) and Northern White Cedar (*Thuja occidentalis*) both produce aromatic oils which provide excellent insect protection. Their fibrous bark is also a great help in fire starting.

According to Brockman's Field Guide (1968), eastern red cedar are found in "infertile soils," while northern white cedar are found in swamps and cool rocky woods. Kiviat and Stevens (2005) list northern white cedar as a calcicole. On the habitat maps, we should interpret calcareous swamps (wetlands or poorly/very poorly drained soils) and calcareous sheltered rocky woods as good northern white cedar habitat. Their propensity for swamps seems to indicate that when interpreting woodland habitats, we might not expect northern white cedar in excessively and

somewhat excessively drained soils, or in soils that are very poor in organic matter (<2, for example).

The proclivity of eastern red cedar for “infertile soils” appears to be in line with Kiviat and Stevens' mention of red cedars as often populating both carbonate and non-carbonate crest, ledge and talus environments. It appears that in this case “infertile soils” may be interpreted not as pertaining to the relative acidity of the soil or bedrock, but rather to the shallowness of soils and the limited availability of moisture in environments where bedrock is close to the surface. Kiviat and Stevens also mention that in rich rocky woodland, red cedar may be present, but is generally scarce (2005:183). This presence-but-scarcity may be due to the rarity (but presence) of infertile soils in rich rocky woodland environments. Their occurrence in these environments may be difficult to predict, but shallow topsoil, boulders and some stream banks may all provide potential habitat for red cedar within otherwise rich rocky woods. There are no known seasonal restrictions on cedar use.

American Chestnut. American Chestnut (*Castanea dentata*) were an abundant food resource. According to Von der Donck,

> There also are chestnuts here [in the New Netherlands], like those of the Netherlands, which are spread over the woods. Chestnuts would be plentier if it were not for the Indians, who destroy the trees by stripping off the bark for covering for their houses. They, and the Netherlanders also, cut down the trees in the chestnut season, and cut off the limbs to gather the nuts, which also lessens the trees (1968:22).

Von der Donck's assumption that “Chestnuts would be plentier if it were not for the Indians” does not take into account the anthropogenic nature of the landscape. It may well be that the Mohicans could afford the luxury of this apparently wasteful practice

because they had so well cultivated the successional system that there was no need to fear lack. Rather than a wholesale and wanton destruction, their practices may have been a carefully calculated and accounted-for exercise in forest management.

According to Sidell, chestnuts prefer dry, upland deciduous woods, considering chestnut an indicator of dry open woods environments alongside oak and hickory. These trees are able to survive forest fires by sprouting from stumps, unlike sugar maple, beech, hemlock, and yellow birch (Sidell 2002).

Among the Mohegan, infusion of chestnut leaves was considered a cure for whooping cough, according to Tantaquidgeon (1972). Among the Delaware, nuts were ground and mixed with tallow for earaches. The ground up nuts are used as fish poison in streams, making fish 'dizzy' and easily caught (*ibid.*). Hutchens lists the leaves and inner bark as tonic, mild sedative, and astringent.

Elm. American elm (*Ulmus americana*) and slippery elm (*Ulmus rubrum*) have both medicinal and more practical utilitarian uses. Though there are alternatives, including the chestnut mentioned by Von der Donck (1968) above, elm bark was the ideal sheathing for longhouses and wigwams (Dunn 1994, Brasser 1974, 1978).

According to Tantaquidgeon, *U. americana* inner bark was used by the Mohegan steeped as a remedy for coughs and colds; *U. rubrum* inner bark was chewed, releasing a mucilaginous substance said to be soothing to the throat. The inner bark of *U. rubrum* root was also used as lashing. Among the Delaware, *U. americana* was also steeped and ingested for coughs and colds.

Field guides place elm trees in moist woods (Brockman 1968). More specifically, Sidell notes “moist soil, especially along streams and in swampy lowlands” (2002:245). Sidell groups elm with other indicators of floodplain forest, including ash, butternut, alder and willow. On the maps, these would again appear to follow the edges of streams, fields and swamps, particularly through mesophytic

lowland forests, where somewhat poorly drained and poorly drained soils are present.

Hickory. Butternut hickory (*Carya cordiformis*) and shagbark hickory (*Carya ovata*) were the two most widespread varieties of hickory in the study area, while mockernut hickory (*Carya tomentosa*) pignut hickory (*Carya glabra*) and shellbark hickory (*Carya laciniosa*) were present but less common (Sidell 2002). Undifferentiated hickory shells were recovered at the Mechanicville Road site, and butternut hickory was recovered from Goldkrest.

Von der Donck discusses a certain kind of "nut-wood" that was considered superior to oak firewood "as well for heat as duration," possessing "a peculiar sap, which causes it to burn freely, whether green or dry" (1968:19,20). Because he mentions both chestnut and oak *separately* in the same section, it seems likely that he is referring to hickory here. Von der Donck mentions by name the use of hickory saplings for the vertical supports of longhouses, and split hickory for lathing.

According to Brockman's guide, hickory is found in dry, rich woods (1968). Sidell considers hickory an indicator of dry, open woods, along with oak and chestnut all three of which regenerate from stump sprouts after being damaged by forest fire. Sidell also notes, however, that many species of hickory, oak, and chestnut may also grow in rich (here interpreted to mean moist or mesophytic) woods alongside sugar maple, beech, hemlock and yellow birch (1968).

Oak. Although acorns of the white oak (*Quercus alba*) or chestnut oak (*Quercus prinus*) or others have not been recovered in a late woodland context from any of the archaeological sites considered, their use as food is noted by Von der Donck (1968), as well as Funk (1976), Brasser (1978), and Dunn (2000). According to Von der Donck, "The oak trees in alternate years bear many acorns of the chestnut species. The nuts grow about as large as our persimmons, but they are not as good as ours" (1968:23). Acorn flour may have been mixed with the ground root of Chenopodium or

Corn meal and baked into bread. Ritchie (1965:126) mentions a stone feature identified in the River phase Bent site that may have been used as acorn roasting platforms. It would be interesting to investigate whether this practice carried on into the Mohican period.

According to Hutchens, a “decoction of acorns and bark added to milk and taken resists the forces of poisonous medicines” (1973:207). Acorns and bark were used as astringents, tonic, and for numerous inflammations. The inner bark from the white oak was used “as a liniment to allay pain in humans and horses” (Tantaquidgeon 1972:75). According to Tantaquidgeon, cut lengths from young oaks were used for hammer handles. Among the Delaware, tea was made from inner bark for severe coughs or gargled for sore throat. It was also used to clean bruises and ulcers.

Oak is considered an indicator of dry, open woods by Sidell, but some oaks, including swamp white oak, may also thrive in wet environments. Kiviat and Stevens note white, red, and chestnut oaks in rich rocky woodlands, with red oaks additionally noted on non-carbonate crest, ledge and talus environments. White and chestnut oak are also important in mature mesophyitc lowland forests. Like chestnut and hickory, oak regenerate after forest fires from stump sprouts.

Tulip Poplar. Dunn and Von der Donck mention the use of Yellow or Tulip poplar (*Liriodendron tulipifera*), or Canoe wood, for (unsurprisingly) carving canoes. Hutchens lists the leaves, bark and buds as a useful diuretic and stimulant, indicated in cases of hysteria, neuralgia, diabetes, hay fever, cholera, and infant's diarrhea.

Tulip poplar prefer deep, rich, lowland soils. Moderately well drained calcareous soils, particularly in alluvial valleys should be the ideal canoe wood habitat.

Shrubs

Blueberry. Highbush blueberries (*Vaccinium corymbosum*) and lowbush

varieties of blueberries (*Vaccinium angustifolium, Vaccinium pallidum*) were used for food, fresh or dried. Dried berries are beneficial to stomach conditions, according to Hutchens (1973). They were also used for brown and yellow dye for leathers, and mixed with other pigments to produce violet, red, green, and blue. Blueberries flower from May to July, and fruit in late summer.

Blueberries are very versatile, generally preferring acidic soils, forest edges, heaths, rocky barrens, and bogs. On the habitat maps, low pH edge areas, especially those near bedrock outcrops, or on sandy soils, should be safely interpreted as blueberry habitat.

Elderberry. Tantaquidgeon (1972) tells us that among both the Delaware and Mohegan, the flowers of elder (*Sambucus canadensis, Sambucus racemosa*) were dried and used for tea, administered to infants for curing colic. The inner bark was used as emetic and laxative. The Delaware used the leaves and stems to treat jaundice, and as a blood purifier. Bark scrapings were used in poultices for sores, swellings and wounds. The bark was also combined with poke root, bittersweet, and yellow parilla in a salve for curing chronic glandular swelling (see *Pokeweed*, below)

According to Hutchens, the elder is medicinal from top to bottom, for conditions ranging from skin conditions to colds, rheumatism to syphilis, and jaundice to epilepsy. Roots, inner bark, leaves, berries and flowers each have their particular medical uses. Hutchens lists the specifics of treatment, along with the advice that 'Often all that is needed is the virtue of necessity as a teacher.' (1973:115) Elder fruits from July to September.

Elderberry prefer rich soils, damp grounds, thickets and waste places. On the maps, edge areas on poorly and somewhat poorly drained calcareous soils could safely be interpreted as elderberry habitat.

Grape. Wild or mountain grapes *(Vitis labruscsa*) have been recovered from

the Goldkrest and Waterford sites. Adriean Van der Donck describes the abundance of the wild grape in great detail:

> We do not find a district or nook of land without grape vines. Many grow in the open fields; many in the woods under the wild trees, many along the rivers and the brooks; many along the hills and at the foot of the mountains, and run up the trees; some run over the scrubby bushes, some over the brush and weeds, some over the grass and ground, so that we are frequently, on horseback and on foot, entangled in the vines, and are extricated with difficulty and with loss of time. The vines which run up the trees bear grapes, but not many except in some years, when they bear everywhere in great abundance, and then it is gratifying and wonderful to see these natural productions, and to observe such excellent and lovely fruit growing wild; and very little attention is paid to the same. The country when the vines are in bloom is perfumed with the lovely fragrance of the blossoms, and it is delightful to travel at this season of the year. It is a pitiful sight to see the grape vines run up the trees, over the bushes, and hidden among the weeds, neglected, untrimmed, and uncultivated, where the roots never feel the sun, by reason of which the grapes do not ripen in the proper season. This, however, is true. Many of the vines extend to the tops of the tree, and to the outer branches, where they are hidden and covered by the leaves, and never nourished by the rays of the sun, which causes the fruit to be sour, harsh, fleshy, and strong, which with proper attention would be good. As a proof of this subject, we find that the vines which

> run up the dead and dry trees (from which the bark has been stripped by the Indians to cover their dwellings), and are of course exposed to the sun, bear sweeter and earlier grapes than ordinary. The like also occurs where the vines run along the brooks in a southern exposure, where the sun shines direct on the vine. I, with others, have seen this difference, and in such situations have found, gathered, and eaten, delicious ripe grapes in the middle of August. For the grapes to ripen this early is not common; but we may infer, and it is our opinion, that the fruit would be much earlier, if the vines were dressed, trimmed, and manured, than it now is, but this is never done to the wild vines. That the wild vines, with proper care and management, will produce as good grapes and as good wine as is made in Germany and France, is clear and undeniable. (1968:26)

In addition to the obvious use of grapes (fresh or dried) as food, grape vines were used as lashing, and for baskets, according to Tantaquidgeon. Mid-rib of the leaf was removed, and leaves were rolled slightly in the hands, then applied as a poultice for pain relief. The Delaware combined pokeweed root with the bark of sarsaparilla and mountain (wild) grape for a rheumatism remedy, as a stimulant and blood purifier (Tantaquidgeon 1972). Edge areas on moderately well drained to well drained soils are likely candidates for grape vine. Sunny edges should yield the sweetest grapes, so we might consider these the most consistently used grape habitat.

Raspberry. Charred seeds of *Rubus* were recovered at the Goldkrest site. Juice of raspberries was used as a cure for dysentery, according to Tantaquidgeon. Hutchens lists numerous uses, including astringent, stimulant, and tonic. Raspberries fruit from June to October, preferring edge areas.

Sumac. Berries of smooth sumac (*Rhus glabra*) and stag horn sumac (*Rhus typhina*) are diluted and used as a beverage. The Mohegan also used them as a gargle for sore throats, according to Tantaquidgeon. The root was used by the Delaware as a remedy for venereal disease. Hutchens also mentions the use of the berry for beverages, noting the sour taste due to malate of lime in their "external downy effervescence" (1973:265). The berries could also be dried and stored. The bark is useful as an astringent and antiseptic, the berries as a diuretic. Sumac prefers dry rocky soil, thickets, waste places. Therefore we should look for edge areas with rocky, well drained to excessively well drained soils for sumac habitat. Sumac flowers from June to July, and fruits from August to October.

Herbs

Black Cohosh. Hutchens lists Black cohosh (*Cimicifuga racemosa*), also known as Snakeroot, Black Snakeroot, Squawroot) as an antidote and antivenom for snakebites. Adrian Von der Donck, in his discussion "Of the Poisons" (primarily of rattlesnakes) relates that

> There is a certain plant which grows in the country, named snake-wort, which is a sovereign remedy for the bite of the rattlesnake. I have witnessed an experiment made on Long Island with snake-wort, on a large rattlesnake, when a person chewed a quantity of the green plant, and spit some of the juice on the end of a stick, which was put to the nose of the snake, and it caused the creature to thrill and die instantly. The Indians hold this plant in such high estimation, that many of them always carry some of it, well dried, with them to cure the bites of those serpents. (1968:58)

Black cohosh is also used for menstrual relief, and 'extensively' in childbirth. Hutchens

also notes its use in conjunction with pokeroot and prickly ash for rheumatism and arthritis (1973:223).

Black cohosh prefers rich upland woods and hillsides. Kiviat and Stevens (2005) identify black cohosh as a calcicole, therefore well drained calcareous woods' edges should be looked to for black cohosh habitat.

Blue Cohosh. Also known as blue ginseng and papooseroot, blue cohosh (*Caulophyllum thalictroides*) was considered 'very rare' according to Tantaquidgeon and that it was used in a medicine for treating kidney disorders (1972). Hutchens describes its use for promoting menstrual relief and for easy childbirth, ingested as tea during the last 3-4 weeks of pregnancy (1973). It should be noted that early European writers often emphasized their astonishment that the Native American women gave birth painlessly. Blue cohosh prefers moist rich woods, near running streams, low moist rich grounds. Kiviat and Stevens identify it as a calcicole (2005). Edge areas on calcareous, moderately and poorly drained soils may be interpreted as blue cohosh habitat.

Buckwheat/Sedge. Undifferentiated *Carex* was recovered from the Goldkrest site. Kiviat and Stevens identify sixteen varieties of *Carax* which are considered calcicoles. Seventy different species of *carex* have been identified in the Albany Pine Bush alone (Kiviat and Stevens 2005). More specific information would be needed to determine use.

Chenopodium. Chenopodium (*Chenopodium sp.*), also known as lamb's quarters, goosefoot, and orache, among other things, was recovered at the Goldkrest site. Chenopodium is a versatile food plant with numerous uses. The seeds can be boiled like rice or porridge, or they can be ground and used as flour. The root of the plant can be dried and ground to be used as flour. This could be used alone or mixed with cornmeal, acorn flour, or others and baked into bread. The leaves of

chenopodium can be picked and eaten as roughage like spinach.

According to Dunn (2000), its fresh berries were crushed and spread upon bark to dry; when dry, the powdered berries were scraped up and kept to be mixed with oils (like bear grease) for dye. Dunn cites Von der Donck as her source; in my (1968) edition of Von der Donck's *Description*, a translator's note suggests that "The colouring matter spoken of...[is believed] to have been made from the *Poke berries* (1968:39; emphasis in original)." This seems more likely, because neither the *Chenopodium sp.* nor their look-alike, Orache (*Atriplex patula*) are noted to yield such berries, nor produce such a color, elsewhere. It seems that either Von der Donck misidentified the plant from which the berries were picked, or that his name for that plant, "Orache" was later applied to a variety of Chenopodium rather than its original intention, pokeweed. Von der Donck's description of the process of producing the dye can be found under *pokeweed*, below.

All references note Chenopodium's preference for waste places, therefore edge areas with somewhat poorly drained, moderately well drained or well drained soils might be considered Chenopodium habitat.

Indian Potato. According to Tantaquidgeon, the root of the Indian Potato (*Apios Americana*) were cooked fresh or dried; it was also ground to make flour.

Indian potatoes prefer rich moist thickets, and are harvested from July to September. On the maps, edge areas with calcareous somewhat poorly drained to moderately well drained soils should be sought for Indian potato habitat.

Pokeweed. Tantaquidgeon tells us that the Mohegan saw the root of pokeweed (*Phytolacca americana*) as poisonous, but that the young shoots were cooked and eaten like asparagus (note however that Tull [1987] insists that at least two changes of water are necessary to remove the poisonous nature of the greens). The berries were used as a poultice for sore breasts. The berries were also used as a dark blue stain for

painting baskets. The Delaware combined the root with the bark of sarsaparilla and mountain grape for a rheumatism remedy, as a stimulant and blood purifier. The root is thoroughly roasted and crushed before use, and taken in small doses to avoid nausea. A salve was also produced by combining the roasted root with bittersweet, yellow parilla, and elder bark, which were placed in boiling lard with a piece of beeswax. The salve was applied for chronic sores and glandular swellings (1972).

Hutchens lists Pokeroot as an emetic, cathartic, alterative, and deobstruent, for numerous ailments, enumerating them and saying, “Very few, if any of the alteratives have superior power to Poke if properly gathered and prepared for medicinal uses,” and lists goiter and inflamed lymphatic glands among the ailments it cures (1973:223). The berries were also used for a dark blue ink. Poke may also be used with Black Cohosh and Prickly Ash for rheumatism and arthritis (Tantaquidgeon 1972).

Von der Donck describes the process by which the Mohicans produced “the finest purple colour I have ever seen” from the berries of a plant he identifies as “Orache.” While “Orache” is a name for a *Chenopodium sp.* lookalike, (*Atriplex patula*), from Von der Donck's description it seems clear that he referred to poke weed, as suggested by the translator in the note on the same page as the passage that follows:

> A certain plant springs up and grows in the country, resembling the *Orache*, or golden herb, having many shoots from the same stalk, but it grows much larger than the Orache. This plant produces clusters of red and brown berries, which the Indians bruise, and press out the juice, and pour the same on flat pieces of bark, about six feet long and three broad, prepared for the purpose; these are placed in the sun to dry out the moisture. If it does not dry out fast enough, or if they intend to remove, which they frequently do in summer, then they heat smooth stones, and

> place the same into the juice of the berries on the bark, and thus they dry out the moisture speedily. The dry substance which remains on the bark is then scraped out, and put into small bags for use. This produces the finest purple colour I have ever seen. The Indians, when they use this colouring, temper the same with water; hence it comes off easily; but we believe if it was properly prepared by artists, it would be highly esteemed. (Von der Donck 1968:38-39)

According to Tull (1987), pokeweed prefers disturbed, low, rich ground. Edge areas on calcareous, moderately well drained and somewhat poorly drained soils would then appear to predict poke habitat. Pokeweed flowers from July to September and fruits from August to November.

Wild Indigo. Adriaen Von der Donck describes what he calls *Indigo sylvestris*, wild indigo (*Baptisia tinctoria*), "The *Indigo silvestris* grows naturally, without the attention of any man, and there is no doubt but that with proper care and attention, much profit might be derived from its cultivation." He enumerates more than one experiment in which New Netherlanders' attempts to cultivate the indigo met with varying degrees of success. Tantaquidgeon tells us that among the Mohegan and Delaware both, the roots were "steeped in a small quantity of water to make a healing lotion for cuts and bruises." (1972:70) Von der Donck and other early Dutch travelers were astonished at the speed with which the wilden could heal such minor wounds. Hutchens mentions that any portion of the plant yields a blue dye when dried. She lists the bark of the root as a useful antiseptic, stimulant and purgative, helpful for ulcers, dysentery, and colitis, as well as tonsillitis (1973). According to Tull (1987), wild indigo prefers dry open woods and clearings. Edge areas on well drained soils should be considered potential wild indigo habitat.

Chapter Five:

Habitat Predictions and Interpretations

The habitats of Muhheakunnuk are many and varied. Below they are discussed with a view to interpreting their occurrence on the maps. Characteristics of the habitats are explored including some of their notable plant and animal inhabitants. In some cases, historical descriptions of habitats are also brought to bear.

Cropland

"Cropland" is depicted on the maps as all those areas estimated to yield fifty or more bushels of corn per acre using Mohican agricultural techniques. The data used to make the estimate comes from the **corn yield** layer produced from county soil survey estimates. Modern predicted corn yields per acre assume modern (Cornell University-recommended?) farming techniques like monocropping, additions of minerals, like lime and fertilizers like cow manure or synthetic substitutes. Rough estimates of three sisters corn yields were derived simply by cutting the soil survey corn yield estimates in half.[22] Field yields were then calculated by multiplying three sisters yield estimates by the acreage of each polygon.

It is my understanding that yield estimates reflect a moment in time; in the case of Albany county that time is about 1983, when the major fieldwork was conducted for the soil survey.[23] Therefore they account for soil degradation or regeneration by providing us a look at a point in or on a continuum from how the soil was, to how the soil will be. Built-in is the assumption of a complementary continuum of management practices that either have been implemented, are being implemented now, or have the

---

[22] This rough estimate was based upon experiments conducted by Jane Mt. Pleasant in 1997, discussed below.

[23] Further information on soil survey data can be found on the USDA NRCS soil survey geographic database website, http://soils.usda.gov/survey/geography/ssurgo/

possibility of being implemented in the future. The same should be said of forests, swamps, hillsides and all other places within the realm or sphere of influence of a people, their hands and feet, and/or their decisions. These practices will influence whether the variables of soil constitution are sustaining preceding trends or reversing them. Therefore all the layers of soil characteristics compounded in these maps- and all the variables that compound to make up the actual soil- are constantly in flux, to varying degrees. Management practices, from *laissez-faire* to hands-on are constantly affecting them.

It is difficult to predict which lands would have been selected to be planted and turned to fields for three sisters. In the context of over a thousand years of maize planting and harvesting and many more years of cultivating chenopodium, purslane, elderberry, and many more- in fact possibly all- known useful native plants as ways of life unfolded across the valley, the picture complicates almost unfathomably. Even in that postulated time before anything definably resembling cultivation took place, repeatedly exploited camp grounds would more and more take on the looks of domestication, as bark-stripped trees died, fell, and went up in cooking fires, tallow fires, flint-treatment fires, and fires for other purposes, and by other means decayed. Burnt or cut-back brambles would make way for grass and sedge and strawberries, and the brambles saved from ax and flame for the sweetness of their fruit would have softened out the land and made it pleasant. Over time, as lands were further domesticated some became too fruitful and pleasant to ever leave for long, as cultivation started to demand more land of particular qualities, clearings would expand, edges would be shifted and replenished as land, water, sun and shade defined.

Shirley Dunn summarizes Hendrick Aupaumut's impression of ancient farmland selection; she writes that “Mohican historian Hendrick Aupaumut later wrote that the Indians of old cultivated only fertile locations along rivers, creeks, and ponds

for raising corn, beans and squash" (Dunn 2000:16). She demonstrates the continuity of this practice citing a New England minister (John Sergeant? Jonathan Edwards?) who noted "that Mohicans 'make little or no use of any but interval [intervale] land'" (Dunn 2000:16, Dunn's insertion). Land estimated to yield the greatest amount of corn per acre is intended to provide a rough approximation of how fields and gardens would be distributed upon the landscape. When interpreting the maps, we should mentally filter these with the above impressions in mind.

The decision to cut predicted modern corn yields in half to determine Mohican corn yields was loosely based upon experimental work conducted by Jane Mt. Pleasant (personal communication, 2010) in which three sisters were planted at experimental stations in Thompkins and Cayuga county, New York in an effort to understand the relationships between corn, bean and squash yield. Data from the 1997 Cayuga county experiments was also used to roughly suggest corresponding bean and squash yields in Mohican country. Though pumpkins were used in these experiments, in Mohican country the squash referred to by Von der Donck in his *Description* may be more appropriate. Von der Donck writes:

> The natives have another species of this vegetable ["cucurbites"] peculiar to themselves, called by our people *quaasiens*, a name derived from the aborigines, as the plant was not known to us before our intercourse with them. It is a delightful fruit, as well to the eye on account of its fine variety of colours, as to the mouth for its agreeable taste. The ease with which it is cooked renders it a favourite too with the young women. It is gathered early in summer, and when it is planted in the middle of April, the fruit is fit for eating by the first of June. They do not wait for it to ripen before making use of the fruit, but only until it has attained a

> certain size. They gather the squashes and immediately place them on the fire without any farther trouble. When a considerable number have been gathered, they keep them for three or four days; and it is incredible, when one watches the vines, how many will grow on them in the course of a single season. The vines run a little along the ground, some of them only two or three steps; they grow well in newly broken woodland when it is somewhat cleared and the weeds are removed. The natives make great account of this vegetable; some of the Netherlanders too consider it quite good, but others do not esteem it very highly. It grows rapidly, is easily cooked, and digests well in the stomach, and its flavour and nutritive properties are respectable. (1968:68-69)

In an editor's note, Roger Williams' description of the same plant is given thus: “Askutasquash, their vine-apples, which the English from them call squashes; about the bignesss of apples, of several colours, a sweet, light, wholesome refreshing” (Von der Donck 1968:68). In the future, identification of *quaasiens* at the modern species level (*Cucurbita pepo*?) will allow for experimentation and incorporation of its projected yields within the model.

The mean yields from four experiments varying plants per acre (10,000 ppa and 20,000 ppa) and plant spacing (40 inch and 60 inch) were: maize, at 15% moisture, sixty-two bushels per acre; beans, at dry weight, twenty-one pounds per acre, and pumpkin, at an estimated 90% moisture, forty pounds per acre (Mt. Pleasant, personal communication, 2010). Assuming maize weighs fifty-eight pounds per bushel, the mean maize yield from the experiments would be 3,472 pounds per acre. If we were to reduce the amount of moisture weight in the pumpkins (by drying) to 15%, the mean pumpkin yield for the experiment would be ten pounds per acre. This is a

very “maize-heavy” yield.

In truth, there is a complex relationship between the yields of these three sisters; this is to say that situations in which there is lower corn yield (either because of a smaller population or wider spacing) are often less competitive environments for beans and even more so for squash, where high corn population crippled pumpkin yield. Therefore, simple proportional estimates extrapolated and applied to all possible corn yields from just one set of yield experiments is quite unsound. Even so this has been attempted, in order to give rough impressions of yield potential, while suggesting that interpreters of the maps understand that yields of any particular sister could be massaged into higher ranges by cutting back competition either by planting fewer plants, increasing the space between them, or both. Ideally, future estimates will identify and employ the optimal yield ratios (or a set of three or more potentially optimal ratios, as “optimal” is a culturally, communally and individually relative term) in our calculations.

From the above reported yields in pounds per acre dry weight[24], a ratio of one pound corn to 0.00605 pounds beans to 0.00288 pounds pumpkin is derived. Mohican corn yields from the soil surveys were then converted from bushels to pounds per acre, and these were multiplied according to the above recorded, admittedly over-simplified, ratios for beans and squash. These yields were then totaled for an estimate of pounds of food per acre and multiplied by the area of **cropland** polygons for pounds of food per field-polygon. This was then divided by the number of days in a year (365.25) for an estimate of how many people could have eaten (or could yet eat) one pound of three sisters per day from each field polygon. The resulting figure was halved to show how many could eat two pounds of three sisters per day from each field polygon. In my opinion, the results are quite staggering. Assuming that all the

[24] Fifteen percent moisture, in the case of both corn and pumpkin squash.

farmland in the entire study area estimated to yield fifty or more bushels of corn per acre were under cultivation at once, that land would provide one pound of three sisters per day every day of the year for 1,107,288 people. This is more than the current population of the seven counties in the study area (Albany, Columbia, Greene, Rensselaer, Schenectady, Saratoga and Washington) - including portions of these beyond the study area- combined. That population in A.D. 2000, according to the US Census, was 966,624[25]. This raises serious questions about how our modern way of life is serving those 966,624 people, and their roughly 6.5 billion neighbors world wide. It also makes strong suggestions about pre-contact population estimates, implying the possibility for hundreds of thousands more than the meager few thousand proposed by most mainstream archaeology (Funk 1976, Ritchie 1965, Brasser 1974, 1978). Dunn writes, "In pre-contact times, hills and swamps were not needed for farming in Mohican territories, a sign that the native population had not reached a level which forced them to use less than desirable land" (2000:16). If my analysis stands up to further scrutiny, neither has the modern population of New Yorkers.

This pound-or-so of three sisters per day would be complemented by the fruits and vegetables of household gardens, field edges and wetlands (some of which were discussed above) as well as the fish and game so renownedly plentiful in the study area.

An example of the abundance of domesticates comes from Henry Hudson's journals. Hudson described with amazement the incredible surplus of corn that was being stored for winter during the time of his first visit in September 1609:

> He found, stored in a large longhouse, a great quantity of maize (corn) and shell beans, and, he said 'there lay near the house, for

[25] This figure was calculated from US Census data included in the the county shapefile of the NYS Civil Boundaries dataset found at: http://www.nysgis.state.ny.us/gisdata/inventories/details.cfm?DSID=927

> the purpose of drying, enough to load three ships, besides what was growing in the fields.' (Dunn 2000:15-16)

While the site Hudson described is unknown, if he was in fact docked opposite the Normanskill, as Dunn (2000) suggests, he was probably describing the area around Papscannee's Island, Sankhasick. Many of the islands of the Muhheakunnuk had remarkably productive soils like Sankhasick, and their surpluses may have been stored by individual owners or kin groups, or in more centralized storage areas (granaries) like the one Hudson described.

There were two short longhouses excavated at the Goldkrest site, and either or both of these structures may have at some stage in its life cycle been used as a store house rather than a living space. One house measured eight by eleven meters, the other four by eleven (Lavin et al. 1996). Using an estimate of two point five for a height, (modestly assuming the structure was only three meters tall at the peak, arching down from the center line) the volumes would be 220 and 110 square meters, respectively. How much of that volume would have been considered usable storage space would depend upon the methods and mores of food storage. The ethnographic and ethnohistorical records should be searched for indications of common Mohican storage practices and practices that may have varied by family, sub-clan, geographic context or other social or environmental factors. For example, a trend or prediction of increasingly high floodwaters in spring may be responded to by internal structural and/or organizational modifications that may result in decreased usable volume. With varying environmental conditions the sorts and likelihoods of pest problems and solutions also vary, and these may also cut down on the total available storage space.

Some possible practices for maize storage may include braiding and hanging from the rafters, stacking on shelves and/or in baskets, or simply heaping on the earth or on mats under the assumption that the gains in expediency and capacity would out

measure losses due to pests and rotting (though the latter seems unlikely). Storage of other important materials should also be considered. Were the storehouses Hudson saw packed only with maize, or were there black ash baskets woven with dyed and un-dyed bands and full of beans and hickory nuts? Were there shelves of squash, gourds, and potatoes, braids of sweet grass, tobacco, indigo and sage, pots of berries, chenopodium, dried fin- and shell- fish and venison, grease, or medicines bundled and braided, with pots incised as to contents, or to contents' owners? Were there raw stone slabs of slate or nodes of green and blue flints, pestles yet un-ground, clay un-molded and unfired, pigment and mordant yet un-ground, hides uncut, un-sewn, rope unspun, reed mats yet unwoven? If these were not there, were they not stored, or were they stored elsewhere?

Many of these materials- particularly plant materials- were recovered at the Goldkrest site in charred and uncharred contexts. The uncharred plant materials include purslane, elderberry, green amaranth, goosefoot, wild pink, daisy, grass, chickweed and wood-sorrel; charred remains include elderberry, raspberry, buttercup, goosefoot, grape, sedge or buckwheat, grass (millet), maize and purslane. Butternut Hickory shells were also recovered (Largy et al. 1999). Whether these were stored there, processed there, ingested there or all or none of the above is not certain, but the all-around usefulness and goodness-for-eating of the botanical remains strongly indicates that these were not accidentals or "blow-ins"[26].

If Hudson's longhouse was comparable to one of the Goldkrest short longhouses, and if "packed full" truly meant filling all two hundred twenty or one hundred ten cubic meters, an estimated 6243.03 bushels could have fit in the larger house, 3121.52 bushels would have filled the smaller. To this we add the storage

[26] More information regarding the botanical remains recovered at Goldkrest discussed below and may be found in Tables One and Two, in the Introduction.

capacity (in bushels) of “three Dutch ships” (Hudson in Dunn 2000:15-16). The modern replica of the Halfmoon has an eighty ton storage capacity. Assuming one ton is equal to one hundred cubic feet, and that one bushel of corn is equal to 1.24 cubic feet,[27] “three Dutch ships” with the storage capacity of the Halfmoon could carry a total of 19,285.53 bushels. Add to this the capacity of the larger or smaller longhouse, and the result is a total of either 25,528.57 bushels or 22,407.05 bushels, respectively.

Referring to our maps we can now compare Hudson's to the yield estimates for the cropland nearest to the storehouse. Figure 5 shows Sankhasick, the rough location of the Goldkrest site, and the estimated corn yields of the cropland. If all the Sankhasick cropland was under cultivation (that is, all of the cropland within the boundary labeled “Sankhasick,” its fields are estimated to yield 22,800 bushels of corn, just enough to fill three Dutch ships and the narrower Goldkrest longhouse.

Enough corn to astound Hudson could have been produced merely by cultivating one small piece of high quality farmland: Sankhasick. If we look just four kilometers inland (see Figure 6) we can see another even larger area of adjacent high productivity fields, capable of producing well over 60,000 bushels of corn, or 3.5 million pounds of three sisters; enough to offer over ten thousand people one pound of three sisters per day. Small wetlands intermingled would have provided quality wetland habitat for “wet gardens,” and high ground all around would have provided dry space for houses.

[27] A ratio of 1 bu = 1.24445608 cu ft was actually used in calculations.

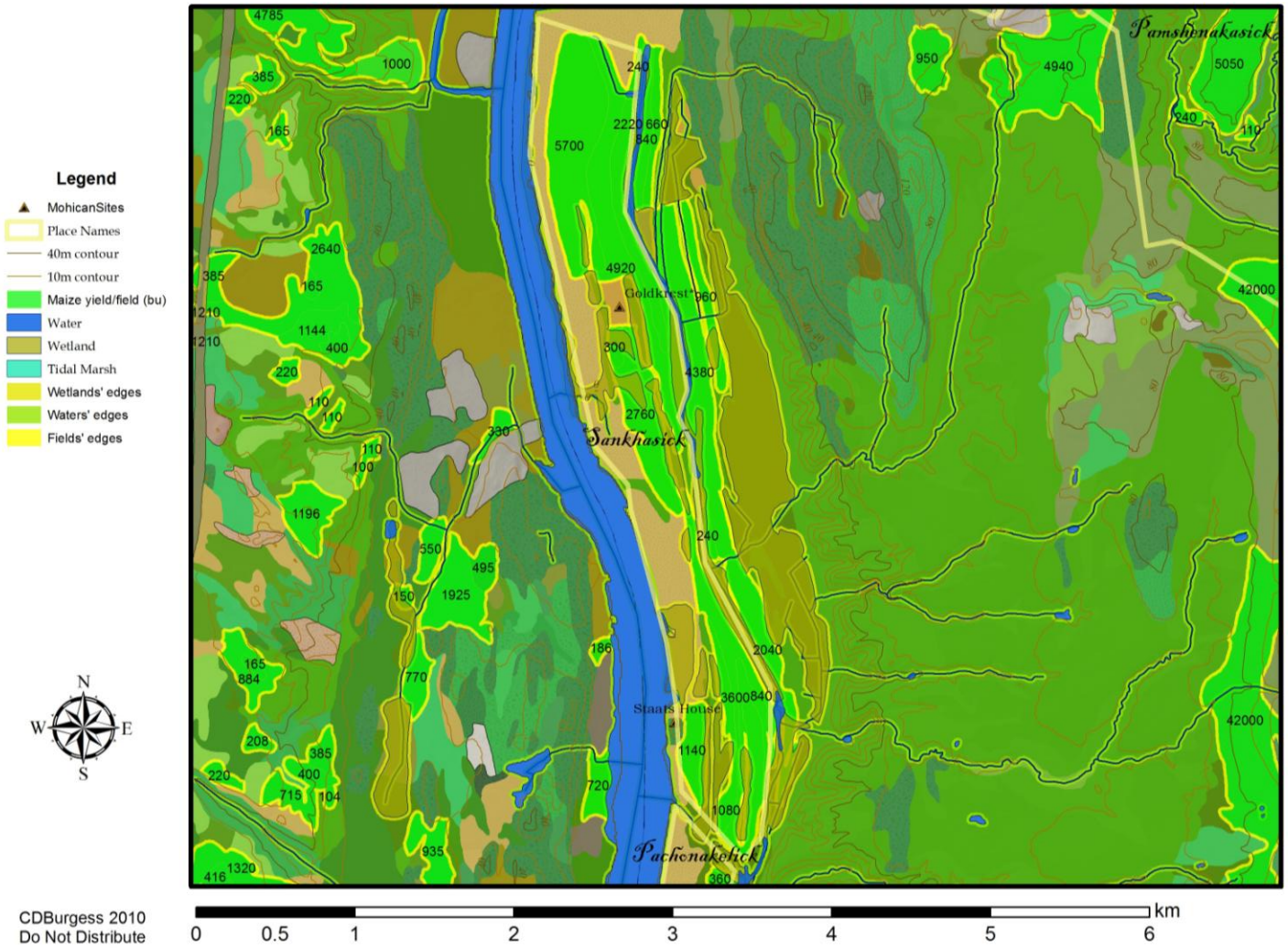
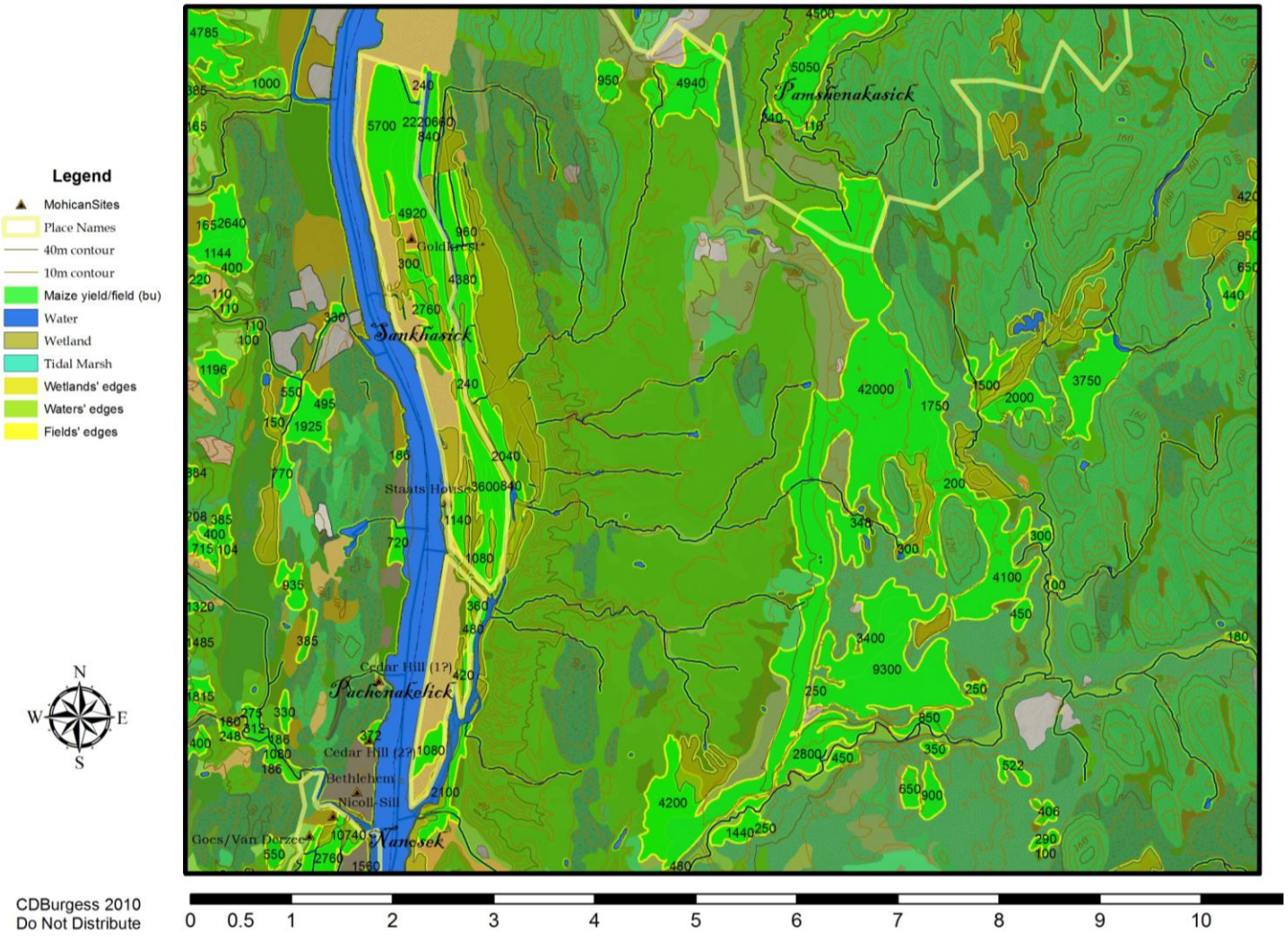


Figure 4: Sankhasick



CDBurgess 2010
Do Not Distribute

Figure 5: Greater Sankhasick

Water

Water habitats have not been given systematic treatment in this work to date. Brumbach's (2002) discussion of subsistence change in the upper Hudson valley offers a great resource for interpreting the maps. Historically noted fishing locations, like that at Cohoes falls, just above the juncture of the Mohawk and Mohican rivers (Huey 2002), and Chickekawick, the fishing place, at the juncture of the Kinderhook and Claverack Creeks (Dunn 1994), could be noted on the maps, complemented by more general habitat-based predictions. Further more, predictable and actual weir locations, trout pools, and other noted significant sites could be marked as well.

Depth charts could be employed for underwater landscape elevation reconstruction. This would be especially helpful in situations like that encountered at reservoirs. Elevation reconstruction could be followed by interpolation of soil cover from surrounding landscapes, with special note given to how soil responds to variations in topography, particularly elevation and aspect.

Wetland

A walk or paddle through any of the wetlands in the study area will inevitably demonstrate the incredible richness of life living there, and there are numerous distinct wetland environments within the study area. The tidal nature of the Muhheakunnuk makes for a suite of tidal and supratidal habitats distinct to the immediate environs of the river. Until the modern construction of dams along the river, the tide reached far beyond Cohoes and even to Amissohaendiek, the Fish Creek, and beyond, so we should be mindful of these patterns even so far north (Funk 1976). Because Muhheakunnuk is “substantially fresh” above Newburgh, NY (Kiviat & Stevens 2005:83) no brackish habitats have been considered. Kiviat and Stevens describe four Hudson River tidal zones, defined by their position in relation to mean low water (MLW), mean sea level (MSL), and mean high water (MHW). The tidal zones are: the

subtidal zone, from two meters below MLW to MLW, consisting of deep water habitat and subtidal shallows; the intertidal zone, from MLW to MHW, consisting of mudflats, tidal marsh (herbaceous wetland) and tidal swamp (wooded wetland); the supratidal zone, from MHW to one meter above MHW, consisting of supratidal swamps and supratidal pools; and the nontidal zones, like nontidal forests, more than one meter above MHW.

Though these zones have not been distinguished on the maps, this could be accomplished with relatively little effort (if not little time) by analyzing the study area elevation data. The zones are mentioned here in order to remind those interpreting the map that the boundaries between land and water are not so fixed as these maps may seem to portray. If we examine the landscapes of Schotack and Machtequack (Figure 7), we can see that in some places- especially along the zero elevation contour- the **Water** layer, and the **Wetland** and/or **Tidal Marsh** layers all overlap. If we interpret these overlaps in relation to Kiviat & Stevens' tidal zones, considering the zero-contour as representative of mean sea level, we may predict that the intertidal zone is represented by those places where **Wetland** or **Tidal Marsh** overlay **Water** along the zero-contour. “Downhill” from MSL (just below MLW), either within or beyond the overlapping **Wetland/Tidal Marsh** areas, subtidal shallows are probably present. “Uphill” from MSL (beyond MHW) pools and wetlands indicated may represent the supratidal pools and swamps of the supratidal zone.

Because these habitats are so dependent upon tide, season and climate, we should recognize that few if any of these boundaries are fixed: they can vary with time of day, time of year, and time in history. These variations are predictable as well, however, and can be readily accounted for in a case-by-case situation. For example, the wetland at the mouth of the Hannacroix creek (labeled *?Mackawameek?* on Figure 7), though its contours have undoubtedly shifted with time as sediment deposition and

variations in mean high and low water, likely represents a relatively stable habitat. Though certain subtleties have certainly varied with time, its ecological community was probably a relatively stable one until modern industrial pollution and dredging drastically altered the riverine environment as a whole.

These areas appear to have been key locations for Mohican subsistence. Kiviat and Stevens note that subtidal shallows are "especially important to juvenile striped bass, alewife, blueback herring, American shad," and other fishes (2005:85). Tidal tributary mouths are also essential to alewife, striped bass, and American eel and other fishes. With the possible (but unlikely) exception of striped bass, all of these species have been historically noted to be of great importance to Mohican subsistence, particularly during the spring fish runs (Brasser 1974, 1978; Dunn 1994; Huey 2002). Whether these were harvested from subtidal shallows and tidal tributary mouths in general, from specific types of these habitats, or from a different habitat altogether will be considered more fully below in discussions of open water resources.

Kiviat and Stevens list several species of mussels which are found in subtidal shallows. They further note that subtidal shallows are key habitat for shortnose sturgeon. Sturgeon plates and fresh water mussel or clam shells are some of the most ubiquitous materials recovered from riverine Mohican sites, and were probably harvested from these subtidal shallows. Subtidal shallows also provide key habitat to various types of turtles and to waterfowl. Turtle species mentioned by Kiviat and Stevens include diamondback terrapin and map turtle.

The intertidal and supratidal zones also provide valuable habitat to numerous waterfowl and turtles. In addition to their mention in relation to subtidal shallows, map turtles are noted on estuarine rocky shores in and above the intertidal zone, and in intertidal and supratidal marshes. Wood turtle and snapping turtle are noted in intertidal and supratidal swamps, and spotted turtle in supratidal pools. While only two

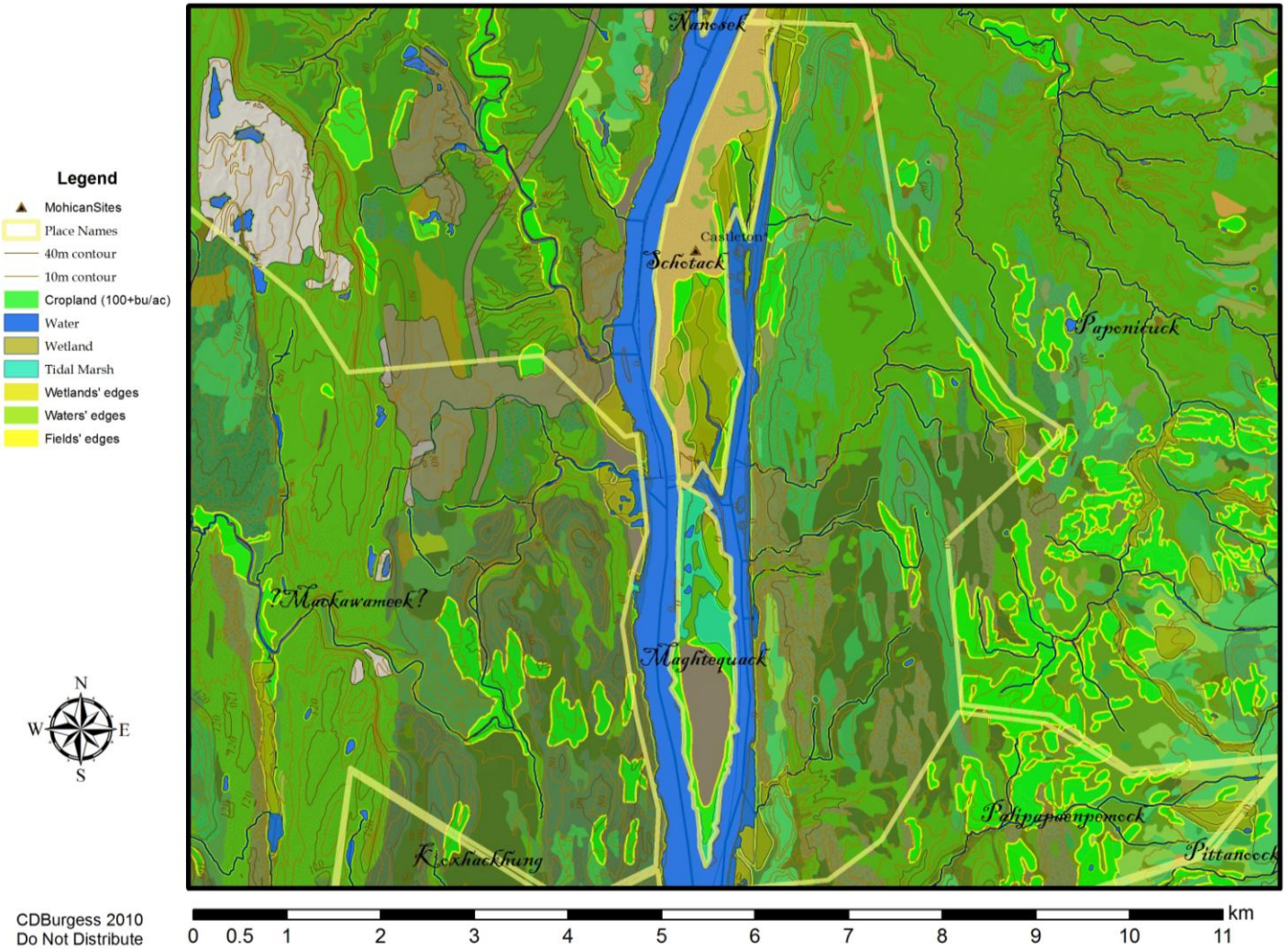


Figure 6: Schotack-Machtequack

species of turtle (box- and snapping- turtle) have been identified archaeologically, other species may have been important as well.

Intertidal and supratidal marshes provide habitats for numerous important plants as well, including strapleaf- and broadleaf- Arrowhead, an edible sort of "Indian potato," found (respectively) in the lower- and middle- intertidal zones of intertidal marshes; wild rice, found in the middle intertidal zone; softstem and river bulrush, hybrid and narrow-leaf cattail and common reed are all found in the various zones of the intertidal marshes.

Intertidal swamps are commonly dominated by red maple, and both red and black ash, but are also commonly populated with Slippery elm, American sycamore, swamp white oak, silver maple and eastern cottonwood. Willow, yellow birch, shagbark hickory, quaking aspen, American hornbeam, northern white cedar, and white pine may also be present. Northern arrowood, the standard material for arrow shafts in the northeast, is a common shrub in intertidal swamps. Intertidal swamps are also used by other terrestrial animals; of particular note are ruffed grouse, wild turkey, and eastern cottontail, all of which use this habitat in the winter.

Nontidal wetlands also provide key habitats for Mohican subsistence. Two major types of nontidal wetlands are nontidal swamps (wooded wetlands) and nontidal marshes (herbaceous wetlands). These types have not been distinguished beyond the general category "wetlands" on the habitat maps; it is left to the viewer to interpret them case by case. Kiviat and Stevens note that "many...lakes and ponds have marsh fringes of variable widths" (2005:159). We might also suggest that landlocked wetlands will tend to be swamps while wetlands adjoining or overlapping open water will tend typically to be marshes. Broad area landlocked wetlands may have both swamp and marsh habitats represented within the same polygon. Variations in soil drainage class within wetlands may also be indicators of corresponding variations in

plant cover. On Figure 8, showing Amissohaendiek, we can predict both transitional marshes, where wetland meets the waters of Saratoga Lake, and swamps, like the wetlands surrounding the tributary streams near the Saratoga Springs northwest of the lake. The three large, broad wetlands immediately northwest of the lake likely include both open marsh areas and more densely, wooded hardwood swamps. Note that the linear interruptions in the wetlands pictured represent the paths of the modern highways that intersect them.

In addition to nontidal marshes and nontidal hardwood swamps, Kiviat and Stevens mention several other nontidal wetland types, including calcareous and non-calcareous wet meadows, glacial kettle shrub pools, intermittent (seasonal) woodland pools, beaver ponds, circumneutral bog lakes and acidic bogs. They do not specifically mention non-hardwood swamps (cedar swamps, for example) but the maps seem to indicate that these should also have been present. All of these types will have to be interpreted on a case by case basis, taking into account factors like topography, soil reaction and soil organic matter. Again, as with tidal wetlands, few if any wetland boundaries remain stable over time. Entire beaver ponds can be destroyed in a single flood, or built in a single season. It is likely that some massive networks of beaver ponds were destroyed during and following the fur trade years as beaver populations were decimated and land was subsequently settled and drained by European colonists. This kind of shifting undoubtedly took place prior to the arrival of Europeans, though perhaps never before so drastically. In our interpretations therefore we should consider whether the wetland we observe may be relatively new developments in the living landscape, or whether they may represent relatively stable ecosystems, remarkably unchanged despite the trammeling of the dominating ways of life prevalent in the eighteenth, nineteenth and especially twentieth centuries.

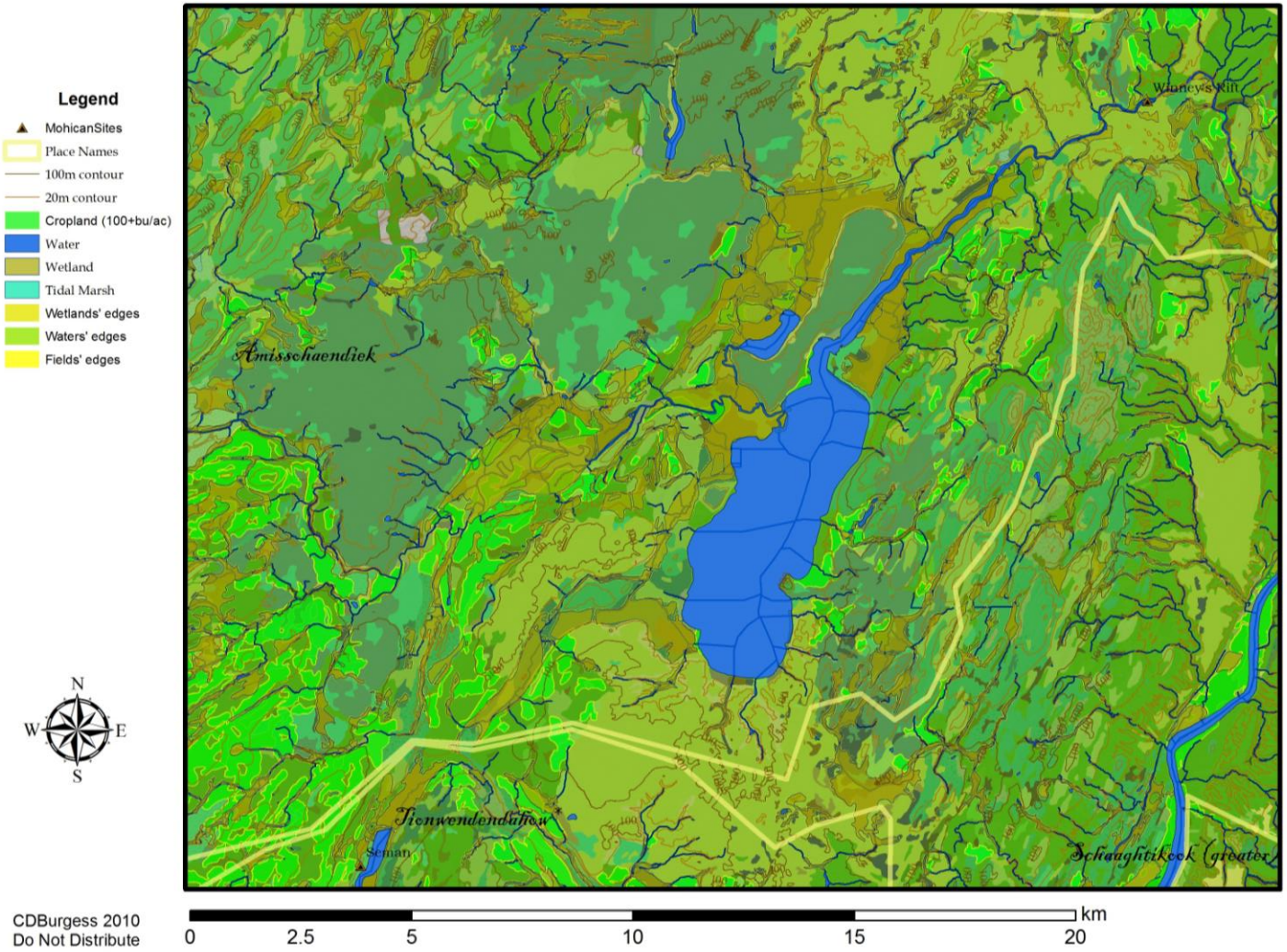


Figure 7: Amissohaendiek

Common dominant trees in hardwood swamps include red maple and red ash, with American elm, slippery elm, pin oak, swamp white oak, white pine, hemlock, tupelo, black ash, and black birch appearing as well, "usually in small numbers" (Kiviat and Stevens 2005:141). Many of these species played integral roles in Mohican life, including elm as sheathing for wigwams, ash for baskets and bows, and black birch for medicine. Common shrubs include silky dogwood, arrowwood, nannyberry, highbush blueberry, winterberry, swamp azalea and alder. Hummocks formed by elevated root crowns create unique micro habitats for certain other rare plants and animals. Sedges, ferns and other plants present in the herb layer may also have had their respective uses. Beaver ponds tend to be similar to these hardwood swamps, often edged with cattails in addition to the reeds, sedges and grasses at their edges. In addition to the beavers that create them, muskrats, minks, river otters, raccoons, water birds like fowl, herons, and belted kingfisher, water snakes, painted turtles and snapping turtles are all noted to use beaver ponds habitats; many of these may also use hardwood and (or coniferous) swamps. Predicting the occurrence of circumneutral bog lakes and acidic bogs may be more difficult than distinguishing between swamps and marshes. One possible clue may be the high organic matter associated with bogs. When high organic matter is found in association with poor drainage, a bog may be indicated.

Woodland

Because of the disconnection between the actual complexity of these ecosystems and the simplified, comparatively narrow range of mapped variables, identification of habitats- woodland habitats in particular- must be an interpretive act. The boundaries between forest habitats are dynamic and sometimes diffuse. They may blend seamlessly one into another or respect boundaries etched in water, stone or other unseen matters. In the maps of Woodland that follow, forests are depicted by using

four characteristics: soil texture (ST), soil organic matter (SOM), soil drainage class (DC) and soil reaction (pH). The values of these variables are grouped into what it is hoped are analytically useful categories and locally intuitive color representations, such that they effectively display the full range of data when viewed as a single layer, but also such that their composites when viewed together at forty, sixty, eighty and sixty percent transparency, respectively, again produce locally intuitive color representations of the habitats: from cedar swamps to high oak-chestnut forests stretching their arms for miles.

Figures 9 through 16 show surface texture, soil organic matter, drainage class and reaction for the entire study area. These are followed by a composite image, viewed at the aforementioned transparencies. They give us a broad view of the nature of the study area's forestland; more specific local examples will illustrate the complexity of the overlaps of variables and the complexity of the ecosystems.

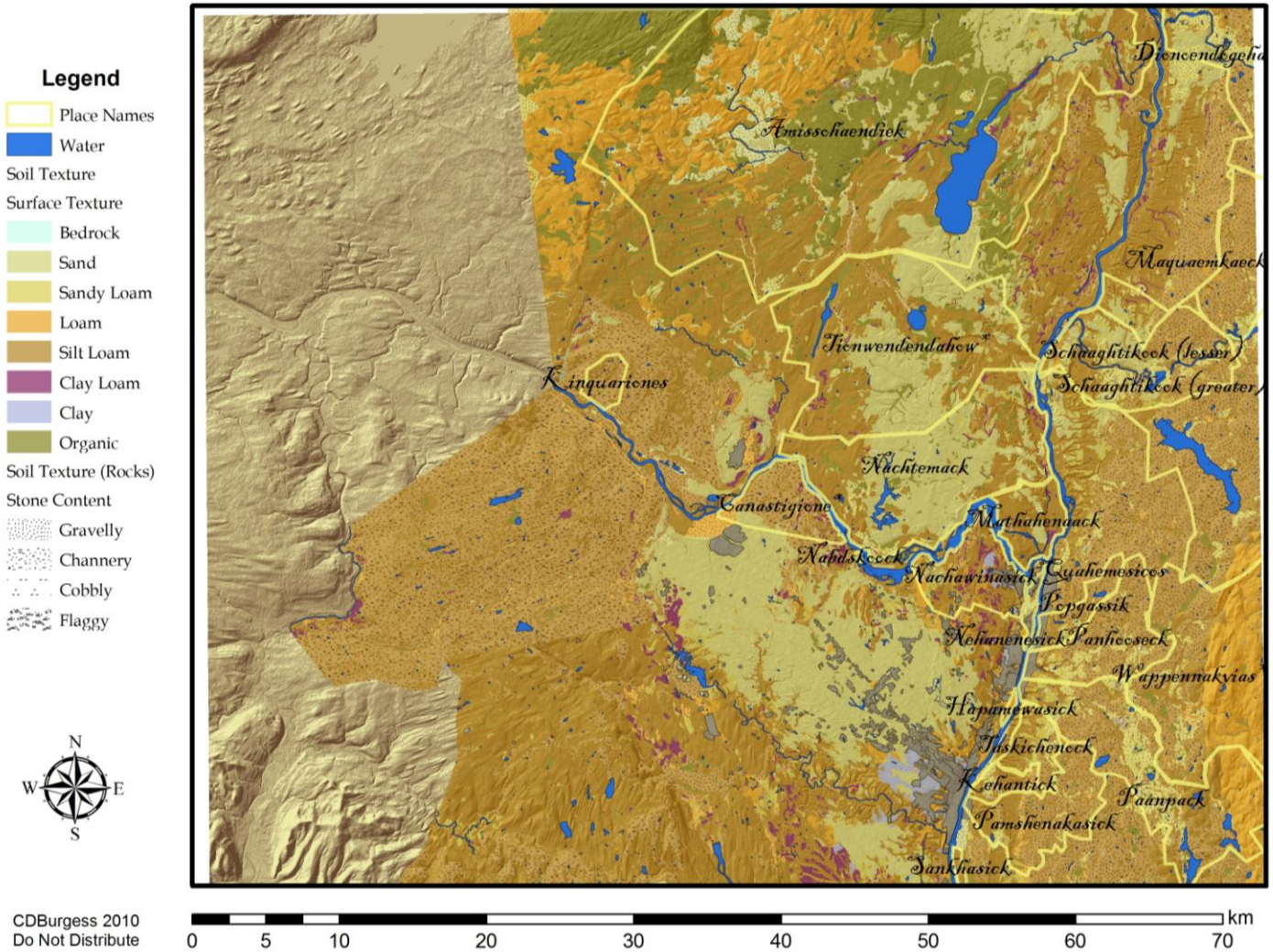


Figure 8: Soil Texture (North)

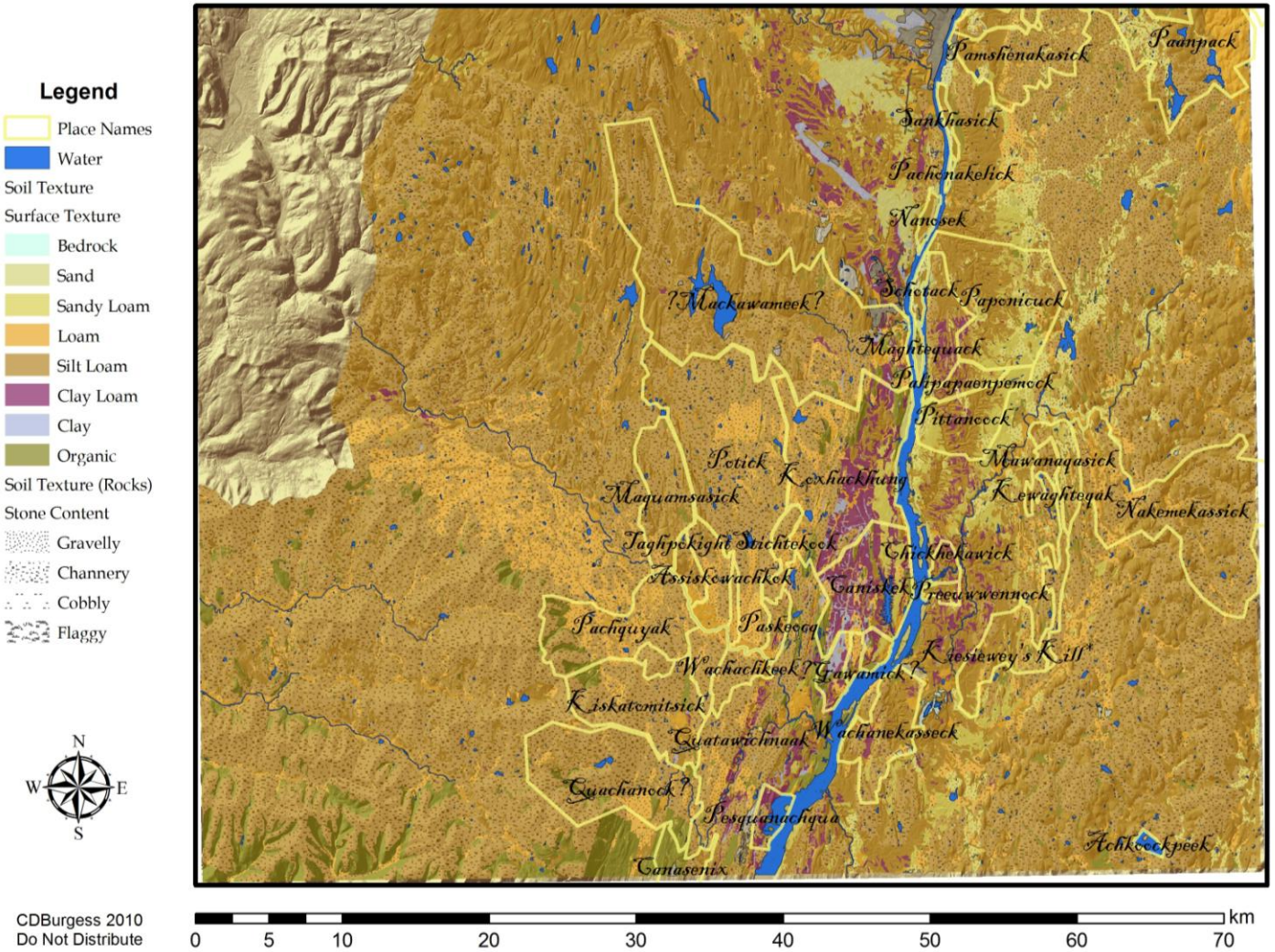


Figure 9: Soil Texture (South)

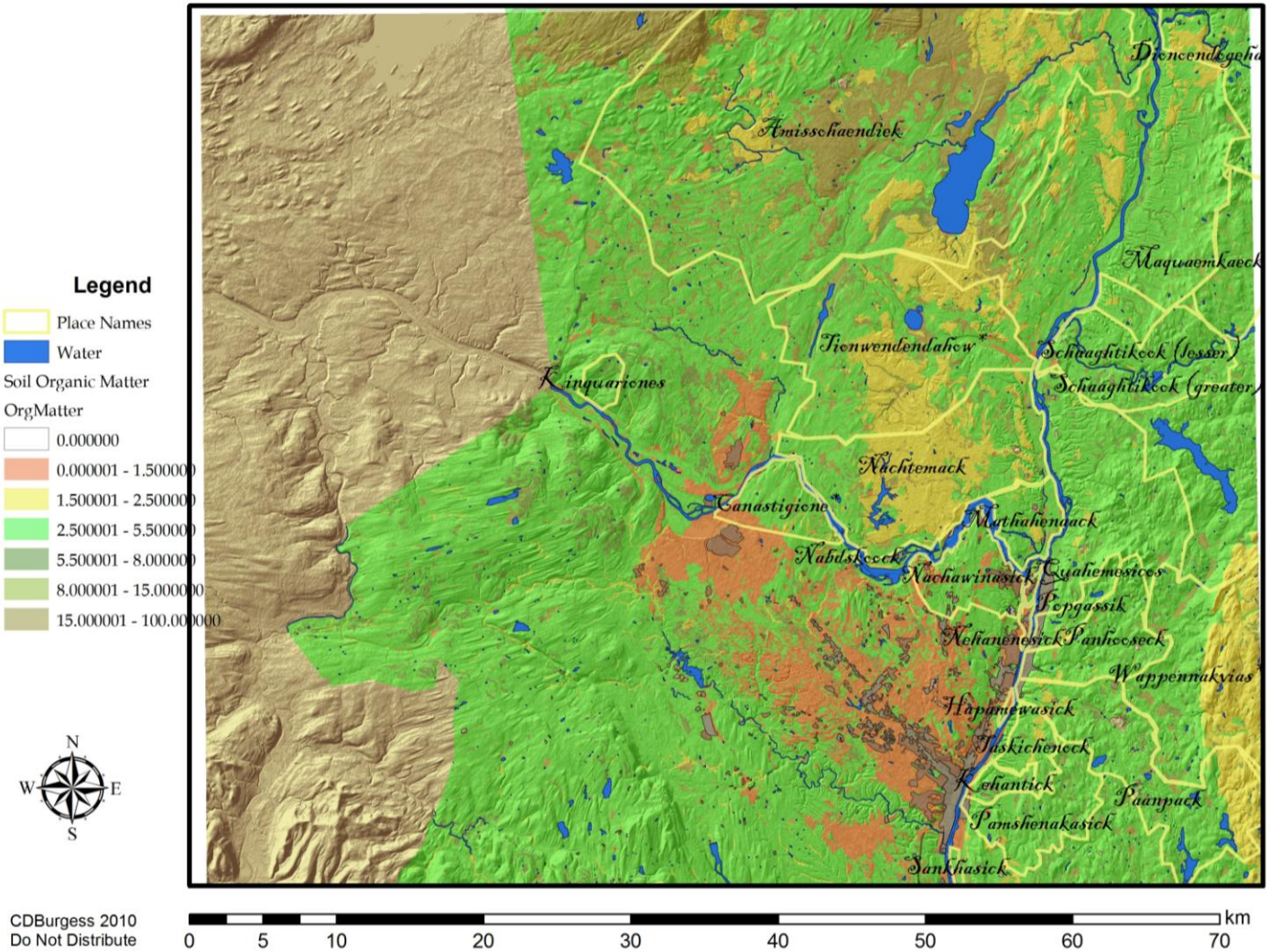


Figure 10: Soil Organic Matter (North)

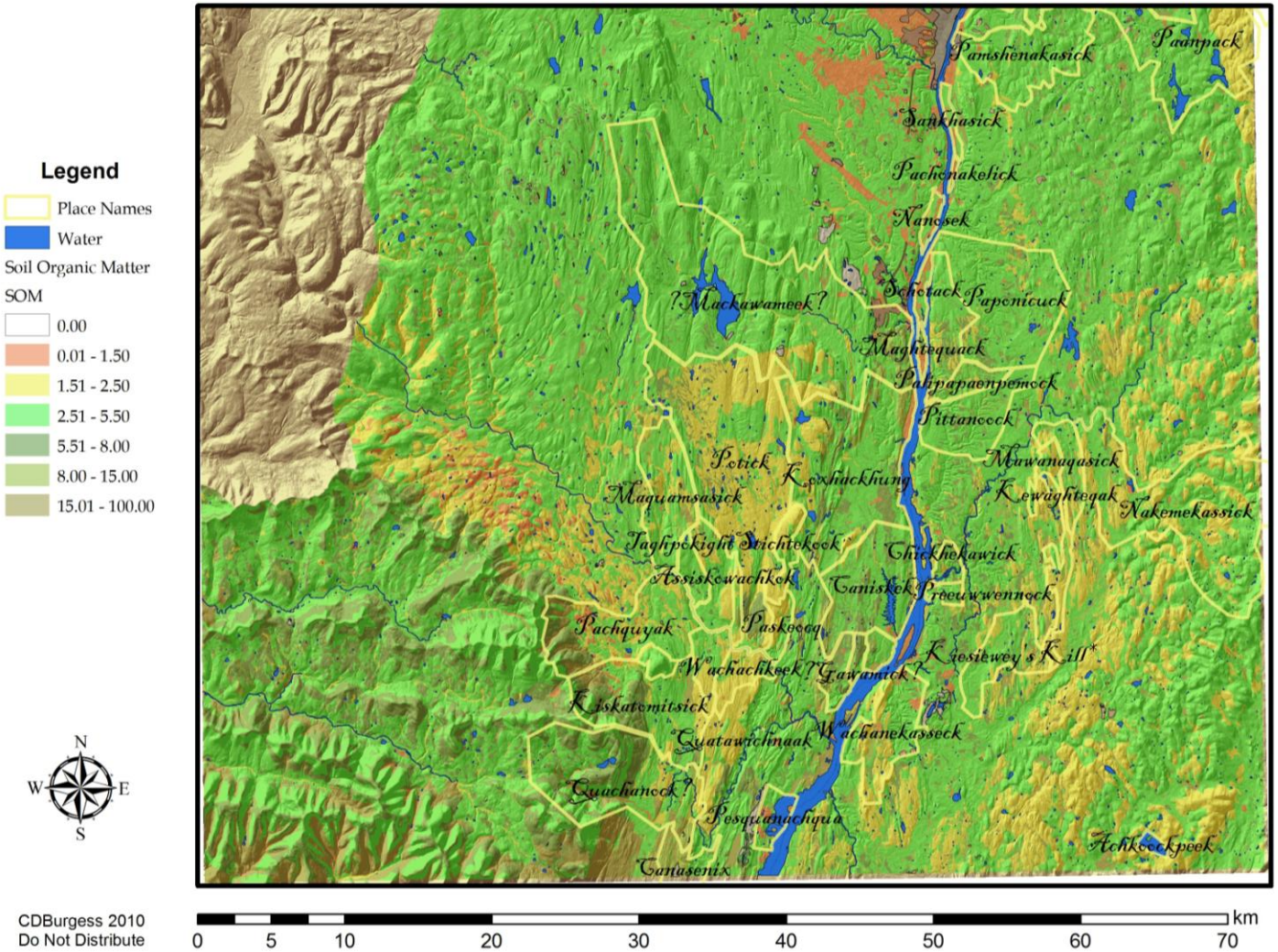


Figure 11: Soil Organic Matter (South)

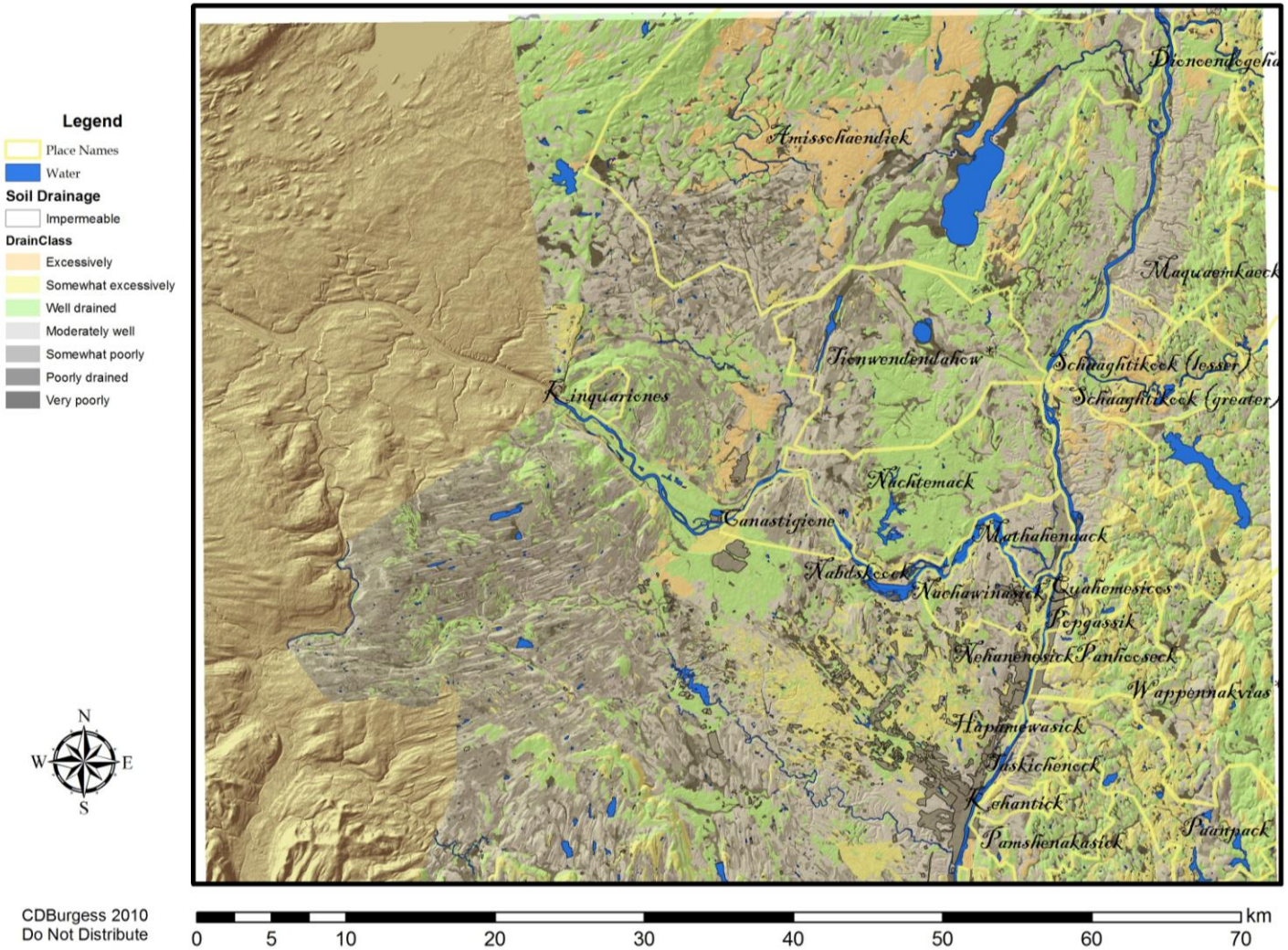


Figure 12: Soil Drainage Classification (North)

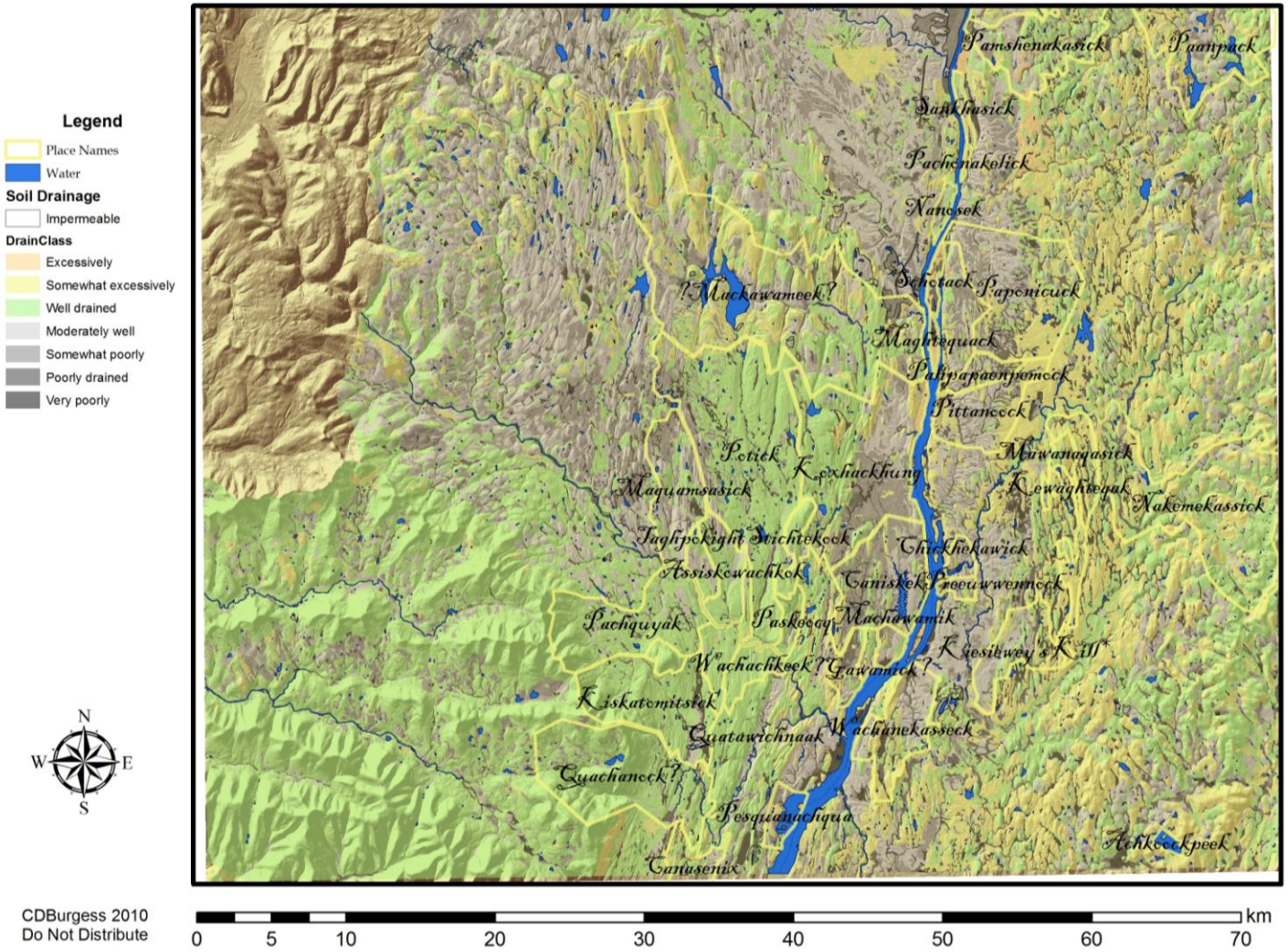


Figure 13: Soil Drainage Classification (South)

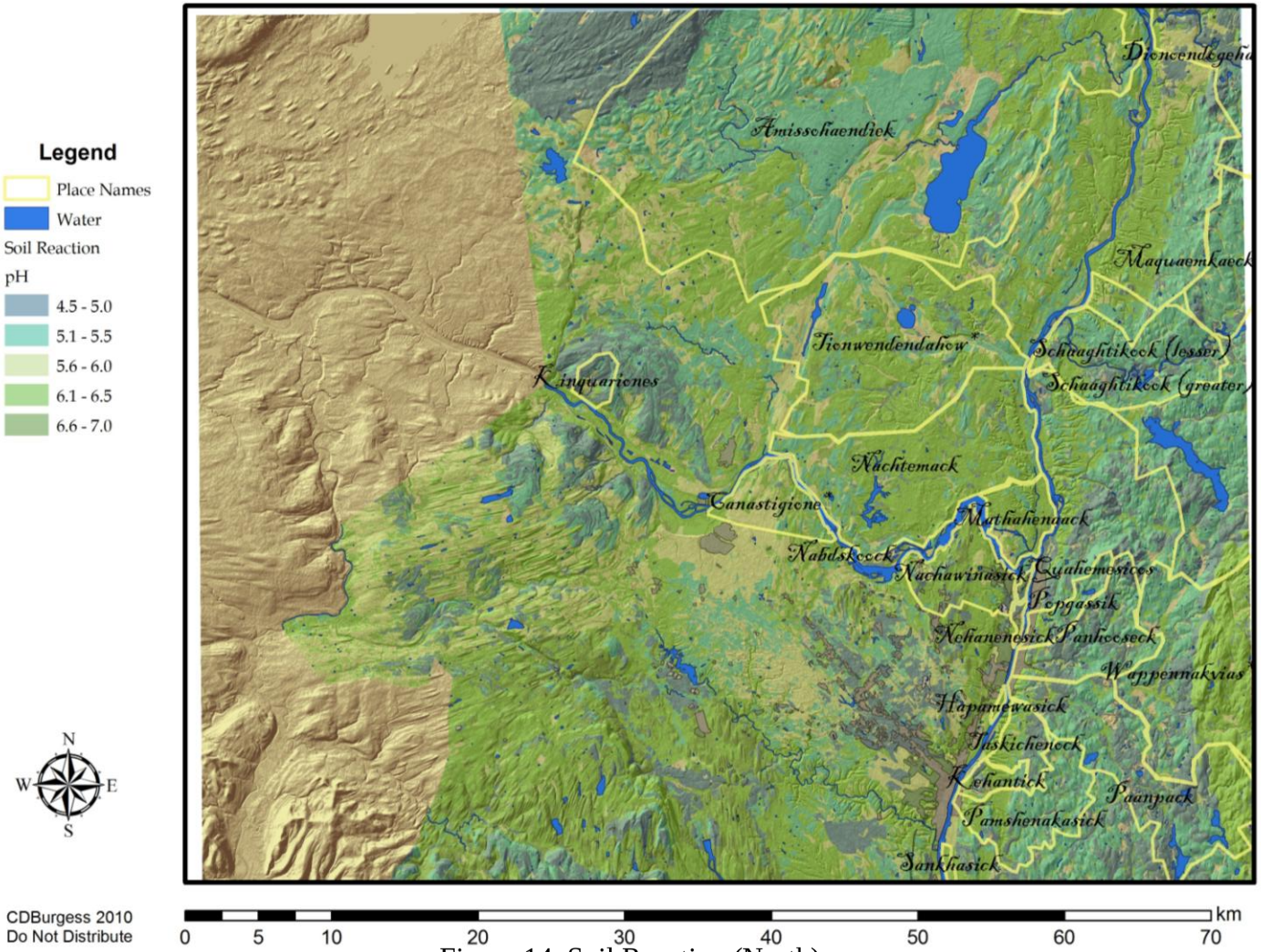


Figure 14: Soil Reaction (North)

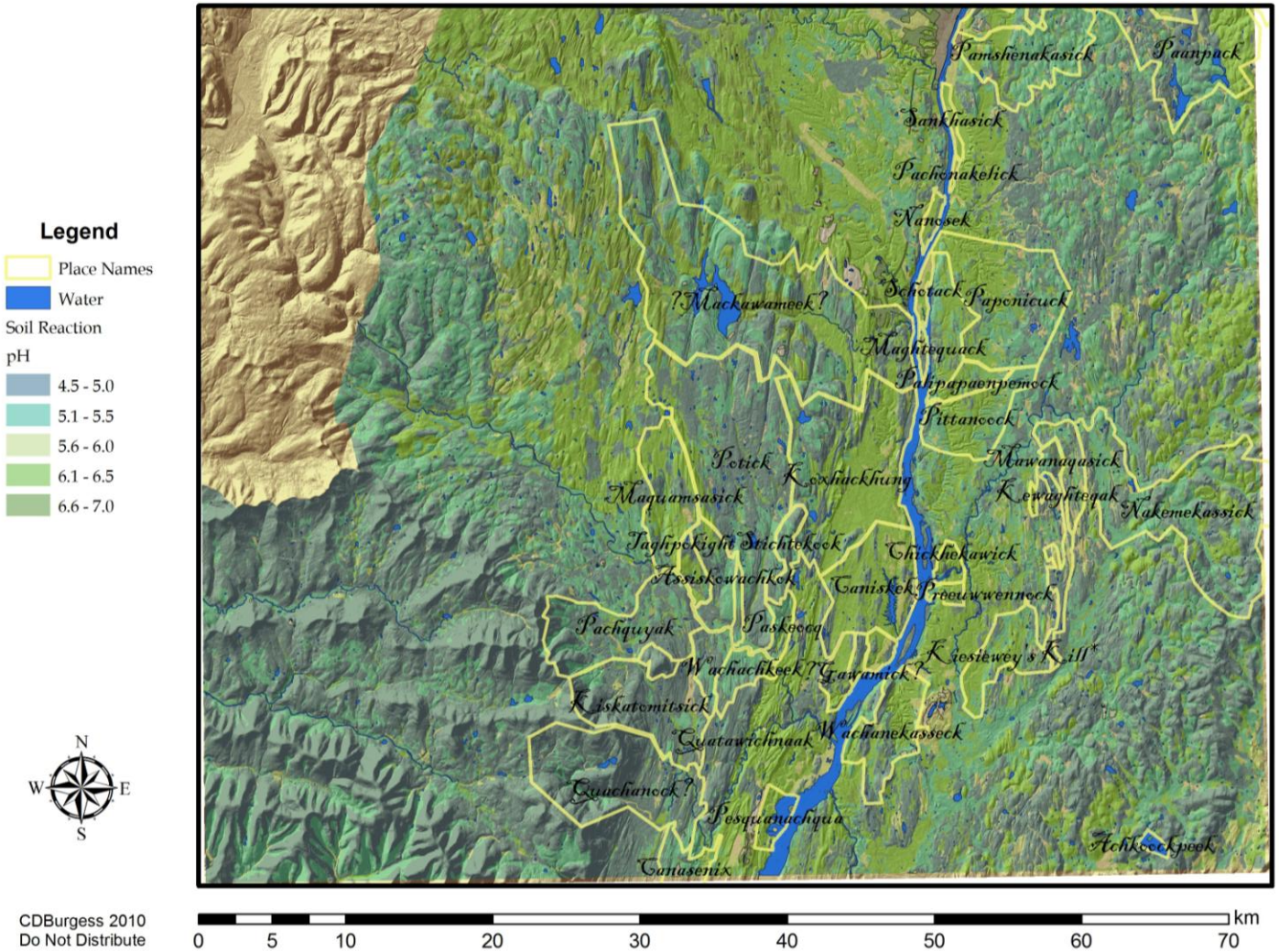


Figure 15: Soil Reaction (South)

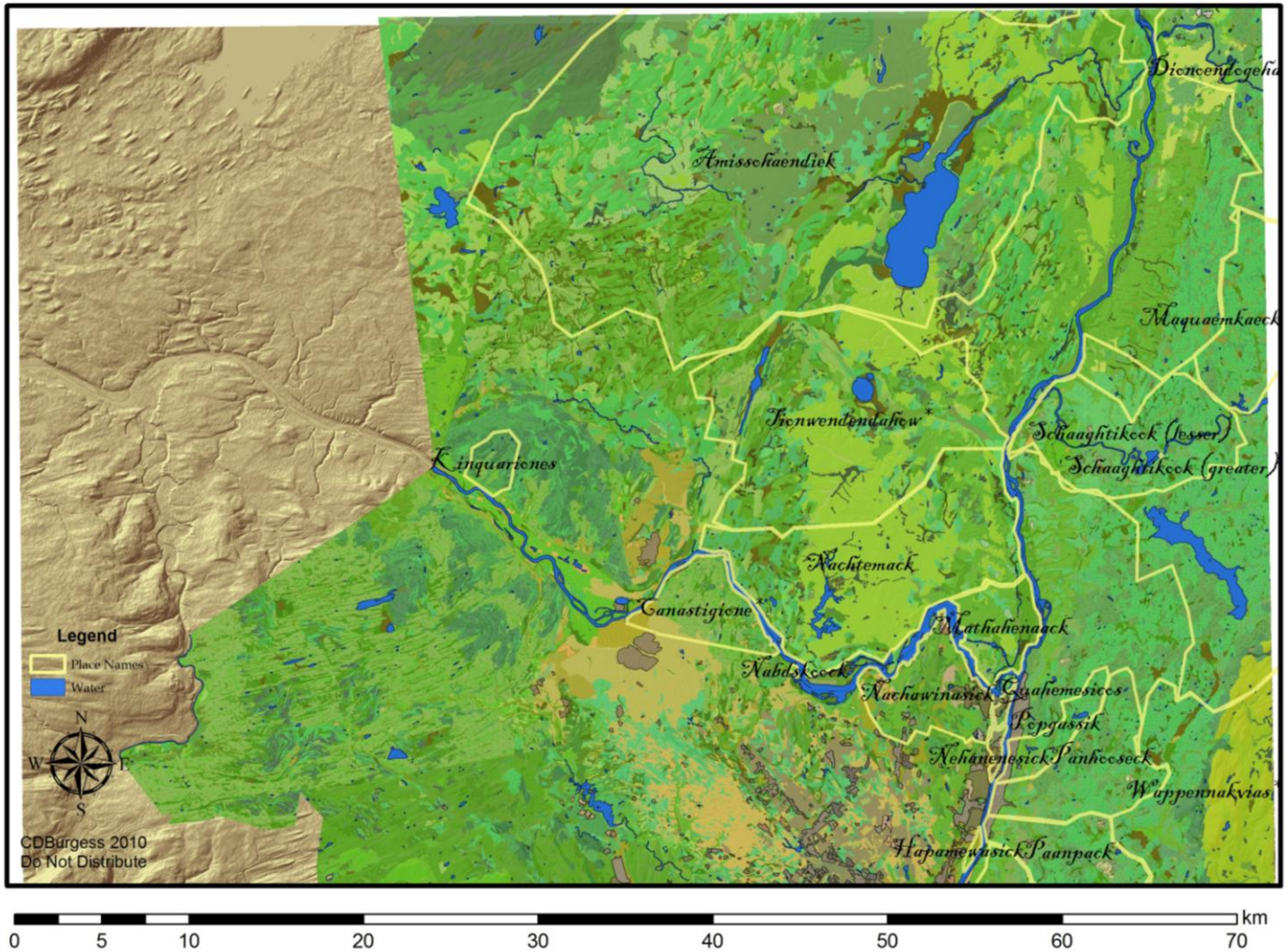


Figure 16: Soil Composite (North)

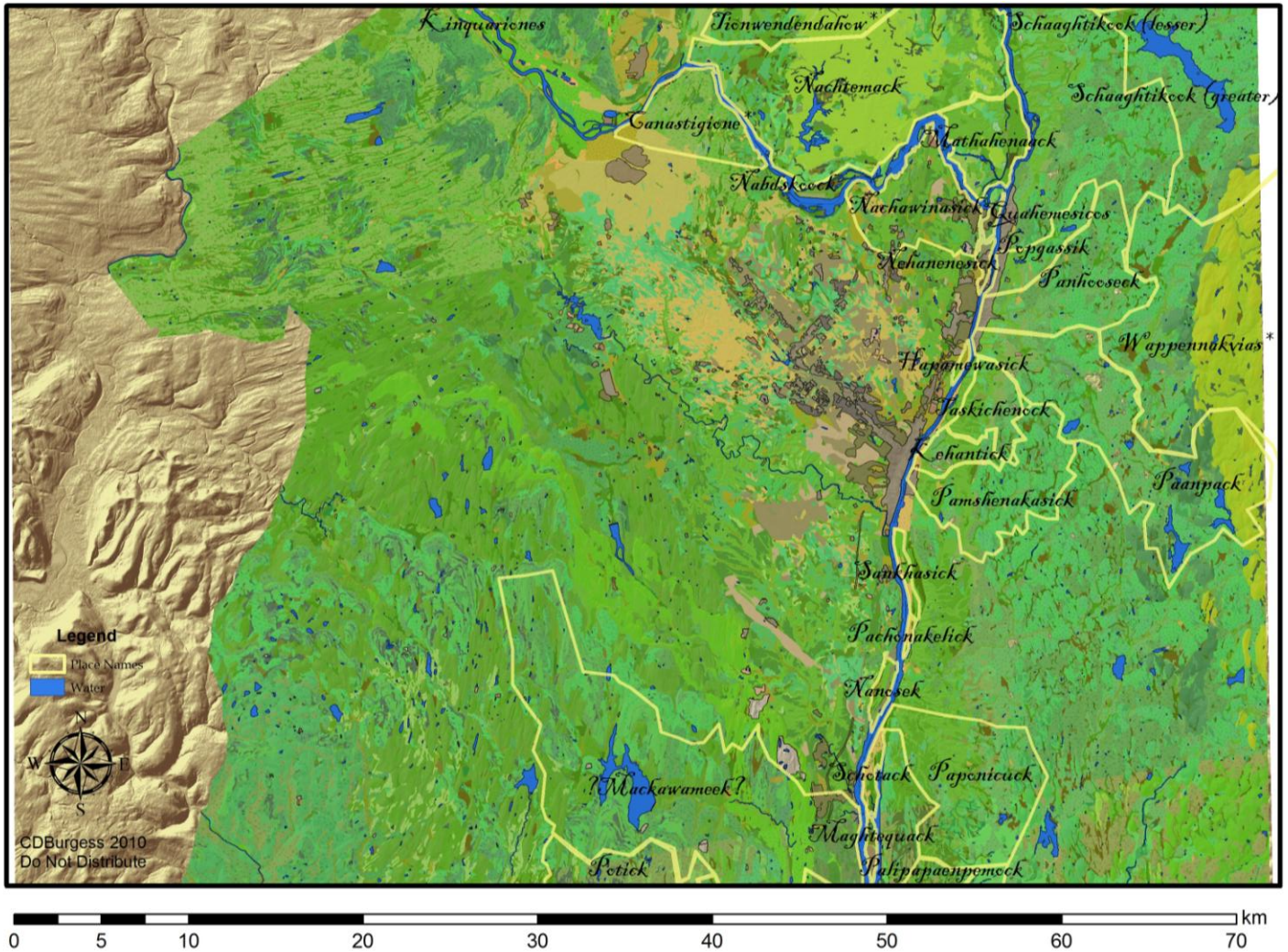


Figure 17: Soil Composite (Central)

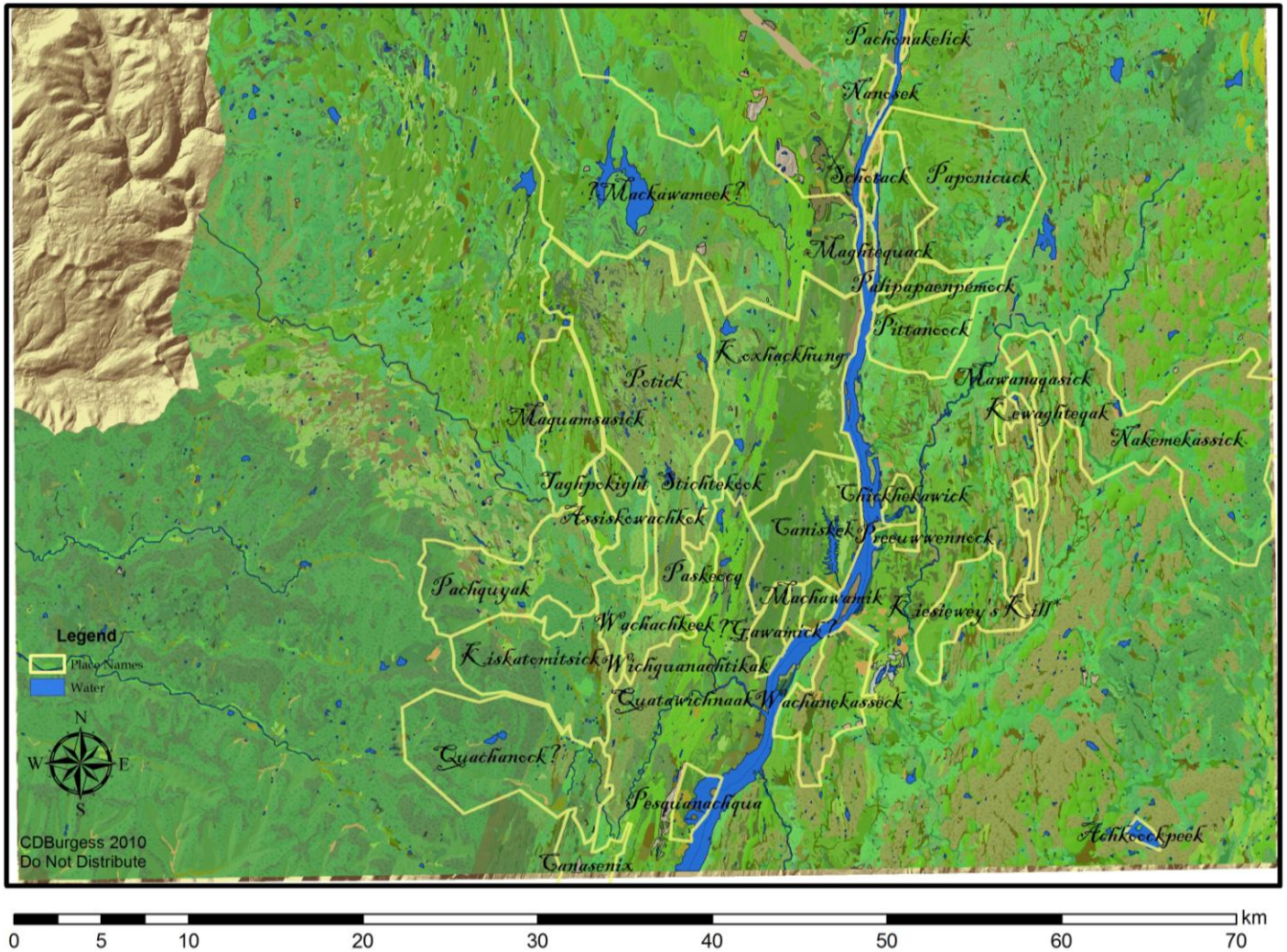


Figure 18: Soil Composite (South)

Surface Texture. In order to intuitively display surface texture, a composite of two surface layers are shown in Figures 9 and 10. The bottom layer shows rocky soils by stippling. Channery, cobbly, gravely, and flaggy soils are each differentiated by distinct stippling patterns. These are less distinguishable beyond roughly a 1:150,000 scale, where numerous small polygons have a tendency to distort the stipple patterns; as such these stippled soils are generally considered and referred to as “rocky” in the text. The second surface texture layer shows composition, including bedrock, clay, sand, muck, and loam, as well as sandy loam, silt loam and clay loam.

Looking at Figures 9 and 10, we see a band of rock-free silt-, clay-, and sandy-loam as well as clay and sand, extending north on both sides of Muhheakunnuk beginning around the mouth of Cat's Kill and reaching to and beyond *Amissohaendiek*. Throughout the study area, highland soils are almost ubiquitously rocky, with the exception of tributary floodplains and some highland silt loams west of Hannacroix and Onesquawthaw. In the lowlands, beginning just south of Nanosek, the lower reaches of the great sand plains, more fully realized north of Gaaschtinick in what is now called the Albany Pine Bush, extending from modern Albany to modern Schenectady, both visible on the maps as large stains of urban land. These sand barrens extend across the Mohawk River to beyond Amissohaendiek as well, reaching from Canastigione to Nachawinasick, and forming the central swath of Nachtemack and Tionwendendahow. The rich silt loams of Nachawikasick and Mathahenaack interrupt the sand plains at the Mohawk River's confluence with Muhheakunnuk, Cohoes. Vast reaches of rock-free loam and silt loam are found in the western reaches of Nachtemack, Tionwendendahow and Amissohaendiek in a swath roughly paralleling that directly flanking Muhheakunnuk. On the north side of Kayaderoserras, the northwest tributary of Amissohaendiek, the loam and silt loam are separated by a thick band of heavily organic soil; west of the south-running branch of the same

stream we find a parallel band reaching towards the northeast beyond the border of the study area.

East of Muhheakunnuk, beyond the narrow band of rock-free soil along the river, a thick swath of rocky sands and silt loams stretches from one end of the study area to the other, bordered on the east by the rock-free highland loam. The rocky central swath is interrupted at times by rock free silt loams; these rockless patches appear more often from upper Paanpack south. Small patches of sandy soils seem to mark the transition between the rock land and the rockless lowlands beside Muhheakunnuk.

The only major concentration of clay soils appears to make up the better part of Caniskek and Koxhackhung. Clay loams and clay soils do appear regularly along the west bank of the river, stretching west towards Onesquawthaw and Tawasentha outside of the sand plains. On the east side of Muhheakunnuk, clay soils are not reported from Schaaghtikook south until Maghtequack. It is not known whether this is the result of a true lack or if it is rather the result of a different means of classification between Columbia and Rensselaer counties, but it is clear that clay abruptly ceases to be reported when crossing from Columbia to Rensselaer county, implying the latter explanation. A similarly peculiar line is respected between Albany and Greene counties; this has yet to be explained. In any case, though there appears to be a band of clay loams corresponding roughly to the riverside silt loams, no clear examples of clay soils are present on the east side of the river. If these patches of clay soil represent the only sources of locally available fireable clay, then strong ties must have necessarily crossed the river during the age of pottery. How access to clay was moderated will be an interesting question for a later discussion.

Soil Organic Matter. The vast majority of the study area is covered in soil with a moderate amount of organic matter, between two point five and five point five parts

per hundred (ideal corn land is roughly four parts per hundred [Jane Mt. Pleasant, personal communication, 2009]). In the southern portion of the study area, bands of mineral soil are found interspersed throughout the highlands on both sides of the river, with significant patches in Potick and following along south of Cat's Kill upstream from Pachquayak. In the northern study area, the sand plains are again visible as the extremely mineral soils south of the Mohawk River and as band corresponding to the sandy soils of Nachtemack, Tionwendendahow and Amissohaendiek. Along the Taconic Mountains to the east another band of mineral soil extends beyond the study area. Heavily organic soils are rare in the study are, and though not confined to the river flood plane, they appear to be most abundant within this same corridor- particularly near Caniskek and Koxhackung, as well as in the swaths northwest of Saratoga Lake already mentioned in the discussion of soil texture.

Soil Reaction. A now familiar band once again follows the lowland path of Muhheakunnuk, where rich calcareous soils are represented. Meanwhile the highlands display high- and medium- acidity soils on both sides of the river, with the most significant concentrations of high acidity soils high in the Catskill Mountains. Another significant patch of acidic soil is found in the northwestern corner of the study area in the Adirondack foothills. The Pine Bush is again visible as a band of variably acidic soils corresponding to the sand plains between Albany and Schenectady. The vast area of alkaline soils south and east of Saratoga lake, comprising much of Amissohaendiek, Tionwendendahow and Nachtemack is interesting in that it does not appear to respect so rigidly the boundaries between sand and silt loam; differences between alkaline and acidic sandy environments should be explored to aid in our interpretations. Other major areas of calcareous soils can be found south of Gaaschtinick, through Onesquawthaw and especially on top of the Helderberg Escarpment, where the limestone bedrock lends its calcarity to the soils, and in the Taconics east of Paanpack

and Panhooseck.

Drainage Classification. As is to be expected, sloping highland soils tend to be well drained, with saddles, stream sources, and other depressions set apart as more poorly drained locations. Again, a major highland exception is the area upon and south of the Helderberg escarpment, where less well drained soils dominate the landscape. Excessively drained soils tend to correspond to sandy areas like the Pine Bush and those sandy soils marking the meeting of the silt and clay loams along the east of the river with the rocky inland soils. One unexpectedly dry area is the excessively drained area northwest of Saratoga Lake in Amissohaendiek, where the organic nature of the soils would imply a mucky bog. This is one example in which field visits and localized research would be necessary to understand what exactly is represented.

Woodland Habitats

Now that we understand how the maps were developed and have some broad familiarity with the study area, I turn to a discussion of significant woodland habitats in the area that have been identified in Kiviat and Stevens' *Biodiversity Assessment Manual for the Hudson River Estuary Corridor* (2005). Categories of woodland identified by Kiviat & Stevens do not cover the full range of possible habitats predicted by the map, but rather those of particular interest for purposes of environmental conservation and habitat restoration. Therefore some habitats indicated by combinations of variables not included in other habitats will be assigned to proposed habitats as intuitively as possible. Ecological information for these habitats will undoubtedly be somewhat less comprehensive than others, and other sources might be looked to for more rich descriptions of the ecological communities associated therewith.

Mature Mesophytic Lowland Forest. Mature trees are defined as those thirty centimeters in diameter at breast height, mesophytic refers to medium moisture soils

(here considered “moderately well drained” and “somewhat poorly drained;” “poorly drained” soils may also warrant a second look, but may more likely correspond to wetland environments discussed below). Lowland refers to lands with elevation less than or equal to two hundred fifty meters above sea level, but should be considered relative. Though this was once one of the most abundant habitats in the study area, today, “Because lowland areas are the most attractive for development, logging, and agriculture, the [Hudsonia's] study area has very few remaining extensive mature forests” (Kiviat and Stevens 2005:179; my insertion).

Sugar maples, oaks, chestnut, American beech or hemlock are of noted importance in these environments, while shagbark hickory, white ash, basswood, tulip poplar and black birch may also be present. Noted trees of the understory include flowering dogwood and hop hornbeam, while spicebush, maple-leaf viburnum, witch hazel and shadbush are among the shrubs expected to be found. In Mohican forests managed by burning, these would have been confined to the edges or places protected by wetland, where the fires would not have cleared the understory (fires are discussed further below). Mature mesophytic forests may also have diverse forest wildflowers, sedges and ferns; Kiviat and Stevens list American ginseng, bellworts, hepatica, rue-anemone, baneberries, black snakeroot, starflower, wood lily, blue cohosh, may-apple and twin-leaf. They also note that “lichen and bryophyte flora may be especially abundant and diverse in mature and old growth forests” (Kiviat and Stevens 2005:179).

Many of the plants listed above would be of particular interest to Mohican people; oak and chestnut for mast, maple (potentially) for sugar, ash for baskets and bows, tulip poplar (“canoe wood”) for boats, black snakeroot and blue cohosh for healing. Red-shouldered hawks, barred owls, pileated woodpeckers, various warblers, neotropical-migrant songbirds are additional inhabitants of these mature forests.

Major mature mesophytic lowland forests are centered at Caniskek and Koxhackhunk, and extend, with a slight interruption at the mouth of what has here been labeled “?Mackawameek?” (the Hannacroix Creek) beside the islands of Maghtequack and Schotack beyond Nanosek to the mouth of Gaaschtinick opposite Sankhasick, Sachem Papsikene's island. The mesophytic lands further extend northwest along and upon the Helderberg escarpment and even return back south along the northern upstream tributaries of the Catskill Creek. They also follow the east side of the river Muhheakunnuk from the southern to northern border of the study area with only few interruptions.

Rich Rocky Woodland. Rocky woodlands with calcareous soils, rich rocky woodland tree canopies tend to be composed of pignut hickory, white oak, red oak, chestnut oak, white ash, black cherry, hop-hornbeam and basswood; red cedar may also be present but scarce. Shrubs (again, probably confined to edges in most of the study area, where controlled burns would have cleared the understory) include black-haw, downy arrowwood and choke cherry. Abundance of broad leaved herbs is cited as the major distinguishing trait between rich and acidic rocky woodland habitats, among which rock-cresses, bittercress, wild columbine and two-flowered cynthia are mentioned, as well as tick-trefoils, bush-clovers, and others. The area surrounding Potick contains both acidic and rich rocky woodlands.

Crest, Ledge, Talus. Areas of shallow soils and exposed bedrock at ledges and crests, or the extremely rocky land of scree and talus slopes, present harsh environments because of generally more extreme dryness. Two types of crest, ledge and talus environments will be considered: carbonate, and non-carbonate. In the case of non-carbonate crests, infertility of soils makes for an even harsher crest environment.

The term “old growth,” conjures images of ancient, majestic, massive trees and

their magnificent vaulted canopies through which beams and shafts of sun form light pools nurturing wildflowers and greens, while north tree faces grow thick with lichen and mosses carpet gnarled roots. This is really just one type of old growth; the slight forms of the small, weather worn cedars that cling to cliff-top crests and ledges, or struggle to grow in the rocky environment of their talus slopes may be as ancient as the great trees of the mesophytic lowland. These environments may in many cases been overlooked by the axes and saws of the nineteenth century lumber craze that devastated the forests of the northeast. They are especially important to dendrochronologists looking to reconstruct weather and climate histories, as well as histories of geological events like volcanic eruptions (Ballie 2000). These climate histories could be modeled geographically as well, with water levels, fluvial depositions and running courses, and other seasonal characteristics like ice and snow, autumn foliage all depicted in their intuitive significant colors.

Trees of crest and ledge environments may resemble an old field environment, but the trees are generally much older and "generally stunted although medium-size (e.g., 6 m [20 ft] tall) trees occur on pockets of deeper soil between ridges" (Kiviat and Stevens 2005:201). Dead or damaged trees may also be present; all trees are generally below thirty centimeters diameter at breast height.

Non-carbonate crests are situated on non-carbonate bedrock. Those on granite, gneiss, schist or quartzite bedrocks are typically characterized by red oak, chestnut oak, red maple and pitch pine, while paper birch, pignut hickory, white ash, hop-hornbeam shadbush, pin cherry, striped maple, mountain maple, American mountain ash, white pine, and eastern red cedar may all be present. On shale and sandstone bedrocks, basswood, sugar maple, white ash, hackberry, chestnut oak and American beech are typical. Shrubs include scrub oak, low blueberries, huckleberries, choke-berries and occasionally bear berry. Carbonate crests are situated on carbonate bedrock

like limestone, marble and some sandstones. Common trees include eastern red cedar, hackberry, basswood, white ash, maples, oaks, some shrubs include prickly-ash, bladdernut, roundleaf dogwood and black-haw.

Both carbonate and non-carbonate crests host wide varieties of significant plant and animal communities as well. Dry, shallow soils with rare cracks and depressions harboring precious organic matter and moisture provide a matrix of micro environments sustaining incredible diversity. Among the numerous species of modern (and possibly even historic) conservation concern found on non-carbonate crests are mountain spleenwort, walking fern, rock spikemoss, numerous sedges, milkweeds, eastern prickley-pear, downy arrowood, rock sandwort and whorled milkwort, bearberry, Torrey's mountain-mint, bear berry and stiff-leaf aster. Walking fern may also be found on carbonate crests, as well as purple cliffbrake, side-oats grama, yellow wild flax, hairy rock-cress, yellow harlequin, blazing-star small-flowered crowfoot,and roundleaf dogwood (Kiviat and Stevens 2005).

Five-lined skink, eastern hognose snake, northern black racer, black rat snake, northern copperhead, timber rattlesnake and long-tailed salamander all inhabit calcareous or carbonate crest, ledge and talus environments. With the exception of the black racer and the long tailed salamander, all of these are also found in non-carbonate crest, ledge and talus environments, in addition to eastern box turtle, eastern fence lizard, worm snake, slimy salamander, marbled salamander and fowler's toad. Turkey vultures nest on non carbonate crests, and golden eagle, peregrine falcon, whip-poor-will, ravens, winter wrens, bluebird, thrush and many different warblers are also found thereon. Porcupine, fishers, bobcats, and other small mammals may make their homes or hunt there. Kiviat and Stevens do not list birds or mammals in carbonate crest, ledge and talus environments but many of the same bird species are likely (I have personally observed many, including peregrine falcon, raven, wren, turkey vulture,

bluebird, thrush and warblers).

Although carbonate crest, ledge and talus environments seem to be less abundant regionally, in the study area for this paper they appear to be well represented, as the limestone bedrock of the Helderberg Escarpment dominating the western extents of the study area. Outside the study area, in the Hudson Highlands and the Palisades of the Lenne Lenape, non-carbonate crest, ledge and talus dominate the lower Muhheakunnuk. One example of a non-carbonate crest within the study area can be found rising over Tassawassa[28] in the upper reaches of the Kinderhook creek tributaries (Figure 20). The long narrow uplifting cliff appears to support two narrow bogs or fens, while the remainder of the crest is covered in very channery, moderately acidic (pH=5), somewhat excessively drained soils. To the west, below, a crescent of acidic mesophytic forest follows the contour or the high place, and to the east, the swamps, marshes and waters of Lake Tassawassa are cradled by the moderately acidic organic soils of the intervale forest.

[28] This place name does not come from Dunn's land transfer appendices, but continues to be the name by which the lake is called on modern atlases and other road maps.

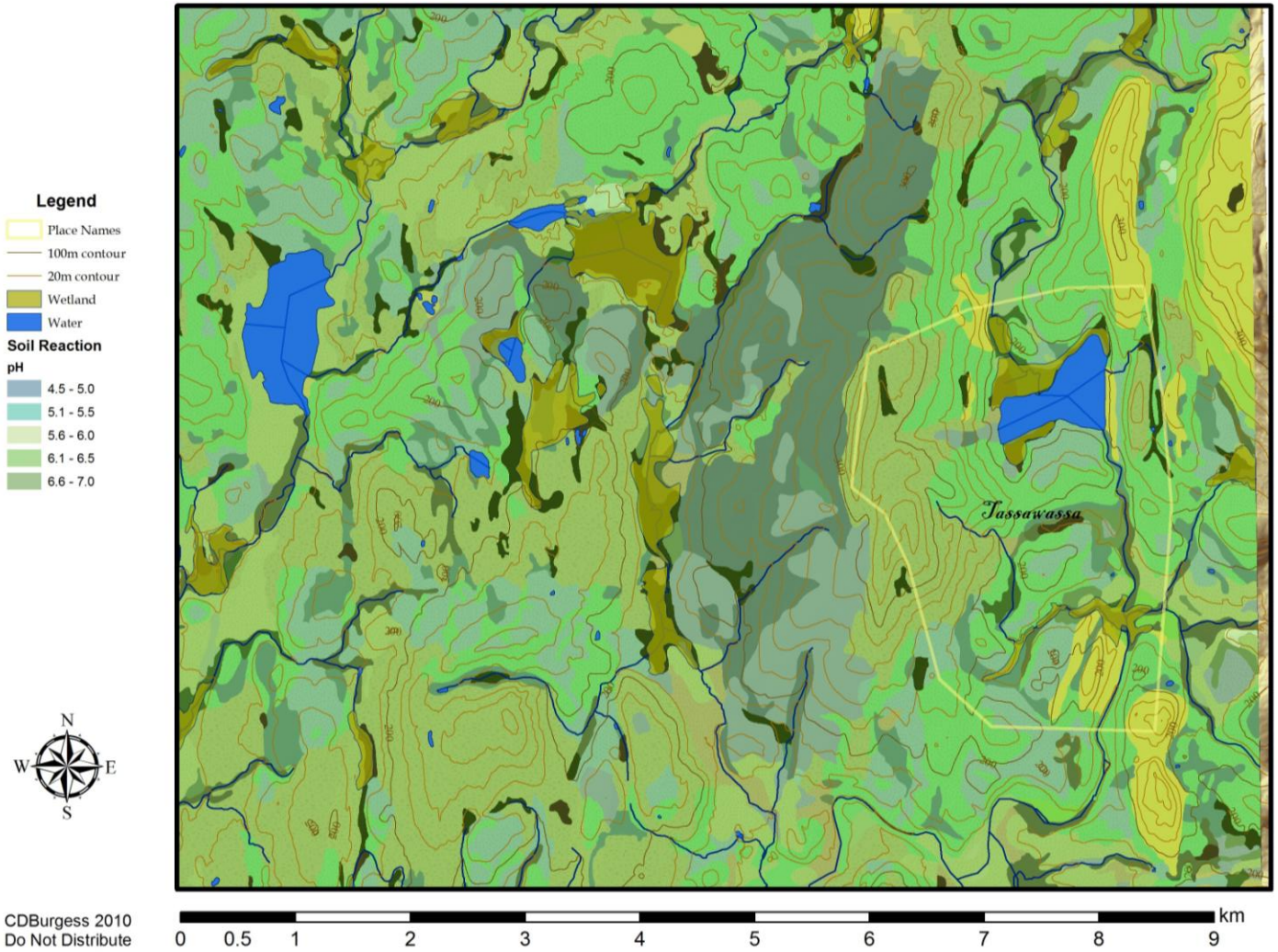


Figure 19: Tassawassa Lake and Ridge

Riparian Corridor. Riparian corridors consist of streambanks, floodplains and other areas directly adjoining streams. Their plant inhabitants are noted to resist flooding and ice damage like sycamore, silver maple, red maple, boxelder, elms, red ash, American hornbeam, alder, silky dogwood, multiflora rose, common buckthorn. Hackberry and oak may be found on higher banks or natural levees. In addition to hosting numerous vital plant communities, "Most fish and wildlife depend upon riparian habitat in one way or another for their survival" (Kiviat and Stevens 2005:169 citing Hubbard 1977). Kiviat and Stevens list green frog, wood turtle, northern water snake, eastern garter snake, Canada goose, wood duck, wild turkey, American woodcock, pileated woodpecker, red-bellied woodpecker, gray catbird, Carolina wren, yellow warbler, common yellowthroat, muskrat, mink, river otter and white-tailed deer as typical riparian fauna. It should be borne in mind that many of these animal species need combinations of habitats to support them, for example,

> Wood turtles require a combination of stream pools, undercut banks (or muskrat or beaver burrows), and riparian or floodplain meadows and woods.... Red-shouldered hawk is associated with extensive closed-canopy mature forest, often with large trees, and generally including swamps or riparian areas. American woodcock is a declining species that uses riparian habitats as well as wetlands and wet woods. (Kiviat and Stevens 2005:170)

Identifying riparian corridors on the maps is again somewhat interpretive; the twenty meter stream buffer **Edges** layer may serve as one rough approximation of riparian corridor. A more accurate approximation of the riparian corridor might be graspable by noting the soil polygons immediately adjacent to streams, which tend to follow the contours of streams and topography, while indicating changes in the nature of the riparian corridor, from rockier to siltier soils, or from somewhat poorly drained

mesophytic lowland soils to high well drained loamy streambanks.

Cool Ravine. Where the steep high rocky walls of bedrock flank the streams in deep ravines, a subtly cooler microclimate described as a cool ravine results. “Steep rocky ravines occur at many locations just above the mouths of Hudson River tributaries, because many tributaries drop steeply in the lowest 30-45+m (100-150+ft) of elevation before reaching the river. Other cool ravines occur farther inland” (Kiviat and Stevens 2005:175). Like crest, ledge and talus environments, the harsh terrain of cool ravines often shelters mature trees from loggers; there may be deceptively old growth-stunted trees present as well.

Mixtures of hardwoods and conifers often compose ravine forests, hemlocks are usually present. Striped maple, mountain maple, American yew, yellow birch, red-berried elder, fly honeysuckle, low blueberries and mountain laurel may be present as well. Moss and liverwort cover may also be extensive. Purple cliffbrake, walking fern, plantain sedge, fly honeysuckle, spikenard, American ginseng, and leatherwood are potential rare species that may be present.

Clay bluff or ravine. The narrow ridged, steep-sided stream-cut ravines and steep bluffs of clay soils, often along the side of the river, form a unique habitat as well. Sugar maple, American beech, chestnut oak, black oak, northern white cedar and flowering dogwood, tend to forest steep slopes; sandy patches and insides of ravines and stream mouths may contain hemlock groves. Osprey, bald eagle, Cooper's hawk, American kestrel, barred owl, eastern screech-owl, wrens, warblers, and sparrows, pileated woodpecker may all be found in and around clay bluffs and ravines.

In our study area, the widespread clay soils of Koxhackhung, Caniskek and Gawamick seem to be the most likely locations of clay ravines. On the east side of the river, from Pittanoock to Preeuwwennock and beyond along the Claverack Creek there may also be clay bluff and or ravines. Some targeted field visits would be in order to

confirm how and when the mapped characteristics represent clay bluffs and ravines.

Sand Plain or Barren. Nutrient-poor sand plains like those of the pine plains of Schenectady (Figure 21; elsewhere referred to as the Albany Pine Bush) are generally moderately well to somewhat excessively drained creating difficult growing conditions for plant life. Sand plains or barrens tend to be dominated by oak-pine forests or oak-heath shrubland with scattered oaks and pitch pine. Scrub oaks are common, with scattered pitch pine standing and reaching out over them. Giant pine-drops, false gromwell, clustered sedge, pink wintergreen and wild lupine may all be present. Sand plains are more susceptible to wild fires than most if not all other environments in the study area. These fires "may kill the tops of woody plants, but not the root crowns from which new shoots rapidly grow" (Kiviat and Stevens 2005: 213). These root crowns may provide another incredibly rich resource for dendrochronologists to apply their trade.

Streams, wetlands, vernal pools and patches of mesophytic forest are all possible within these environments. Wetlands within sand barrens are generally acidic, "and range from red maple-highbush blueberry swamp to open sphagnum bogs" (Kiviat and Stevens 2005: 213). Red maple swamps with primarily highbush blueberry understories may also feature tupelo and/or sassafras. Peat moss is also common; open peat moss bogs are likely to have present "cotton grass, sundews, pitcher-plant and *Carex* sedges, 70 species of which have been reported from the Albany Pine Bush" (Kiviat and Stevens 2005: 213).

Eastern spadefoot toad, fowler's toad, wood frog and eastern hognose snake are all species of conservation concern found in pine barrens. Recently, numerous fisher sightings and even attacks on people have been reported in the pine bush.

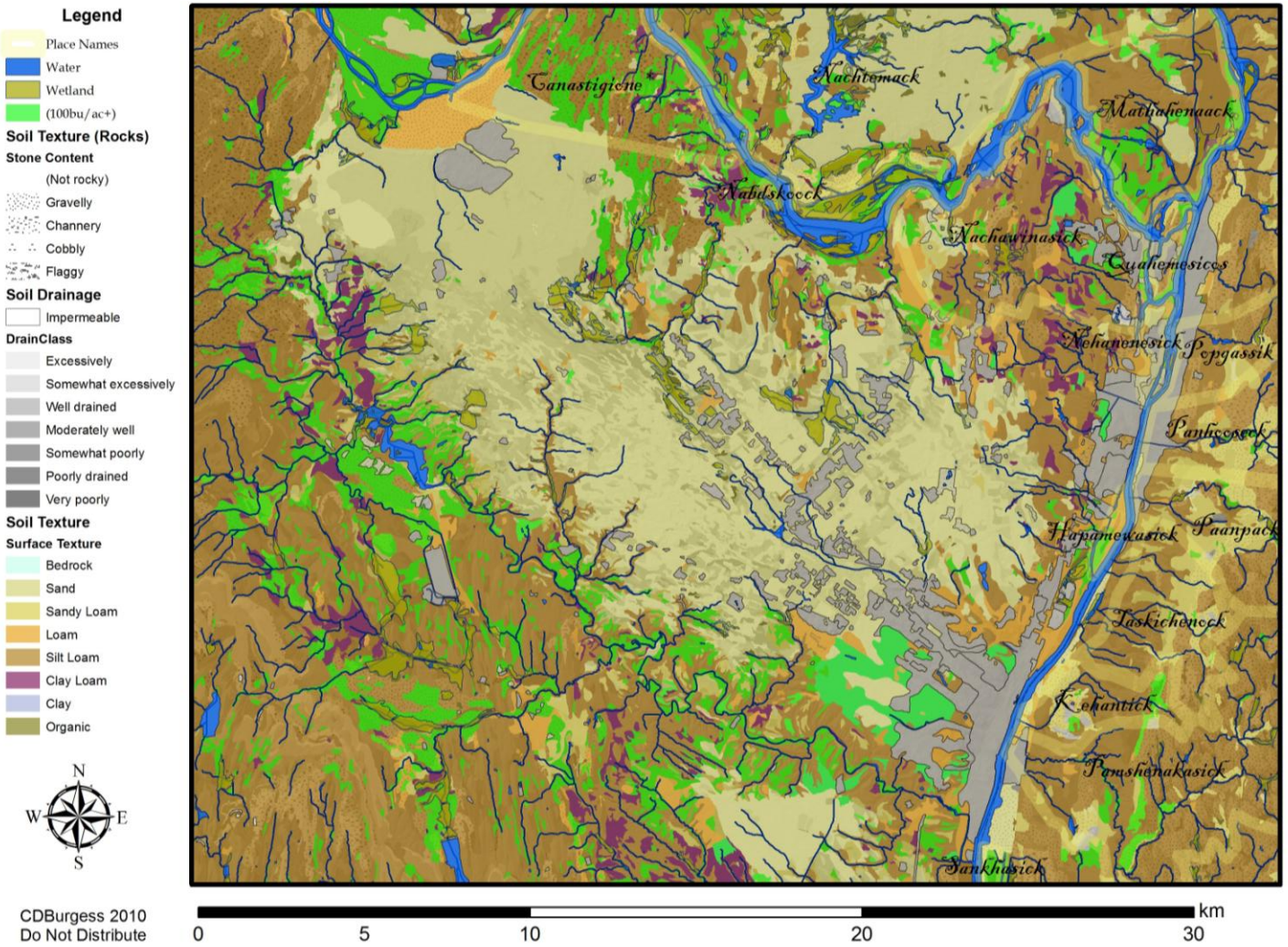


Figure 20: The Pine Plains of Schenectady

Land Management

Complicating our interpretation of the maps are the practices by which Mohican people managed the land. Patches of “wild” edibles were encouraged by eliminating competitors, and by leaving the best behind to reproduce. This practice had probably been carrying on since long before the ancestors of the Mohicans reached Muhheakunnuk; in fact the plentiful grain mentioned by Aupaumut in the quote at the beginning of this paper may have been *Chenopodium sp.* cultivated by the Mohicans' predecessors in the valley. Nut tree groves were encouraged by removing other trees that may otherwise crowd out or impede the valuable mast trees. Kurt Jordan's discussion of the logic of dispersed settlement in the eighteenth century Seneca New Ganechstage complex demonstrates how complex and far reaching Seneca alterations to the landscape really were (2008). This discussion can, with some modifications, be seen as equally applicable to the Mohican case. Brumbach and Bender's (2002) review of changing subsistence practices in the upper Hudson Valley can also help to give context to our interpretations. As this project continues to move forward, these resources should be brought to bear on the maps, more explicitly altering the ways in which habitats are depicted.

Controlled burns would have massively altered the understory in a way that would be almost- if not completely- unencountered by modern Hudson Valley ecologists. Adriaen Von der Donck, quoted at length below, describes the practice, and its “grand and sublime appearance” (1968:21), thus:

> The Indians have a yearly custom (which some of our Christians have also adopted) of burning the woods, plains and meadows in the fall of the year, when the leaves have fallen, and when the grass and vegetable substances are dry. Those places which are passed over are fired in the spring in April. This practice

is named by us and the Indians, “bush-burning,” which is done for several reasons: First, to render hunting easier, as the bush and vegetable growth renders the walking difficult for the hunter, and the crackling of the dry substances betrays him and frightens away the game. Secondly, to thin out and clear the woods of all dead substances and grass, which grow better the ensuing spring. Thirdly, to circumscribe and enclose the game within the lines of the fire, when it is more easily taken, and also, because the game is more easily tracked over the burned parts of the woods.

The bush burning presents a grand and sublime appearance. On seeing it from without, we would imagine that not only the dry leaves, vegetables and limbs would be burnt, but that the whole woods would be consumed where the fire passes, for it frequently spreads and rages with such violence, that it is awful to behold; and when the fire approaches houses, gardens, and wooden enclosures, then great care and vigilance are necessary for their preservation, for I have seen several houses which have recently been destroyed, before the owners were apprized [*sic.*] of their danger.

Notwithstanding the apparent danger of the entire destruction of the woodlands by the burning, still the green trees do not suffer. The outside bark is scorched three or four feet high, which does them no injury, for the trees are not killed. It however sometimes happens that in the thick pine woods, wherein the fallen trees lie across each other, and have become dry, that the blaze ascends and strikes the tops of the trees, setting the same on fire,

> which is immediately increased by the resinous knots and leaves, which promote the blaze, and is passed by the wind from tree to tree, by which the entire tops of the trees are sometimes burnt off, while the bodies remain standing. Frequently great injuries are done by such fires, but the burning down of entire woods never happens. I have seen many instances of wood-burning in the colony of Rensselaerwyck, where there is much pine wood. Those fires appear grand at night from the passing vessels in the river, when the woods are burning on both sides of the same. Then we can see a great distance by the light of the blazing trees, the flames being driven by the wind, and fed by the tops of the trees. But the dead and dying trees remain burning in their standing positions, which appear sublime and beautiful when seen at a distance. (1968:20-22)

In a few paragraphs, Von der Donck richly evokes what must have been an incredibly salient part of life along Muhheakunnuk. It is the stuff of childhood memories, vivid and few, and the annual or semi-annual burns must have been major considerations in settlement arrangement and subsistence practice.

If we were able to model the spread of wildfires through the landscape, we could predict the distributions of cleared forests and those places spared from the blaze, where the thick and tangled undergrowth would have provided vital havens for deer (Cronon 1983). Numerous other animals and plants would have shared their haven, both during the burn and year round. Fruits, thorns and berries would have hugged their edges where bears browsed, coyote hid and hunted and rabbits burrowed deep while songbirds nested amidst their leaves. Nearby in the great, high canopies of the fire-cleared forest, owls would have watched for movement, and squirrels could

have run for miles without a need to touch the ground. Where the higher-arching members of the overstory cleared their canopy, sun would reach their leaves and boughs, crows would have circled guarding fledgling nest and hawks would have soar, watching sunny spaces and the edges the of forests, watersides and fields.

Just as they are today, the goings-on of humans would have been of great interest to many of the forest's creatures. Bears browsing some remote field-edge might have taken a chance at a Mohican trash pit; raccoons and fishers might have dared to do the same. Mohican practices for and traditions of disposing of any parts of animals trapped or hunted which may have gone unused for whatever reason should be explored. These (like all) practices have both spiritual and more worldly roots and functions; practices carried out simply because they are the 'right way' of doing things might also, for example serve the function of keeping potentially dangerous animals like bears, wolves, cougars and coyotes at a safe distance from human habitation. Mohican settlements might be more susceptible to perturbation by such animals because of their purported lack of nucleation and fortification. We should bear this in mind as we attempt to understand the logic of Mohican settlement patterns in the context of their places of habitation.

A systematic analysis of the spread of Mohican controlled burns will be forthcoming, but until such work is completed we need to be somewhat imaginative in our interpretations. When we consider a piece of predicted woodland we should carefully consider the logistics of controlled burns and potential factors influencing effects on the woodland under consideration, including whether and how it is shielded by waterways, wetland and sharp changes in elevation. How exactly would wetland features shield the land and vegetation, and what would be the results in the seasons following the burn? Would the area shielded (and therefore overgrown) correspond to the **Wetland Edges** or would it be even smaller than the **Wetland** feature itself, as the

fires travel even above the standing water crossing the reeds and swamp grass? We should also look for and note key places where fire breaks may have been dug or cleared; presumably there are particular places where a minimal investment of labor might protect large areas of significant land.

If we consider the large piece of unnamed woodland between Paskeocq and Caniskek/Gawamick (it follows the modern Hans Vosen Kill, see Figure 22), we can see how a good hot fire lit just north of the confluence of the Catskill and Kaaterskill would spread north in between the two north-south reaching creeks between Paskeocq and Gawamick. Reaching the east-flowing portion of the easternmost of the two creeks, near the western extremity of Caniskek, the fire would follow the creek upstream and uphill to Stichtekook where, hemmed in by streams and wetlands, it would finally burn out. In the aftermath of blaze, most of what remained in the land lying below Stichtekook probably resembled Mature Mesophytic Lowland Forest: forests rooted in the deep, medium-moisture ("mesophytic") lowland soils that helped to produce the large mature trees that so amazed visitors from Europe. The network of ponds and wetlands surrounding Stichtekook would have provided solace to the game seeking to escape the inferno. If we imagine similar fires lit at the mouths of Maquamsasick, Pachquayak and Assiskowachkok, we can see how at the headwaters of each of these lie networks of wetlands which would have provided the same protection to wildlife. This would have made for broad, open forests with high canopies where tracking and shooting game would have been easy. Unburnt lines, like those of Caniskek and Paskeoq would have formed natural fences that would hem deer in and guide their browsing towards the hunters' arrows. These fences could have been encouraged by Mohican land managers, and may have been comprised of aggressive species like the buckthorn whose mangled, impassible branches plague modern landowners in the same area.

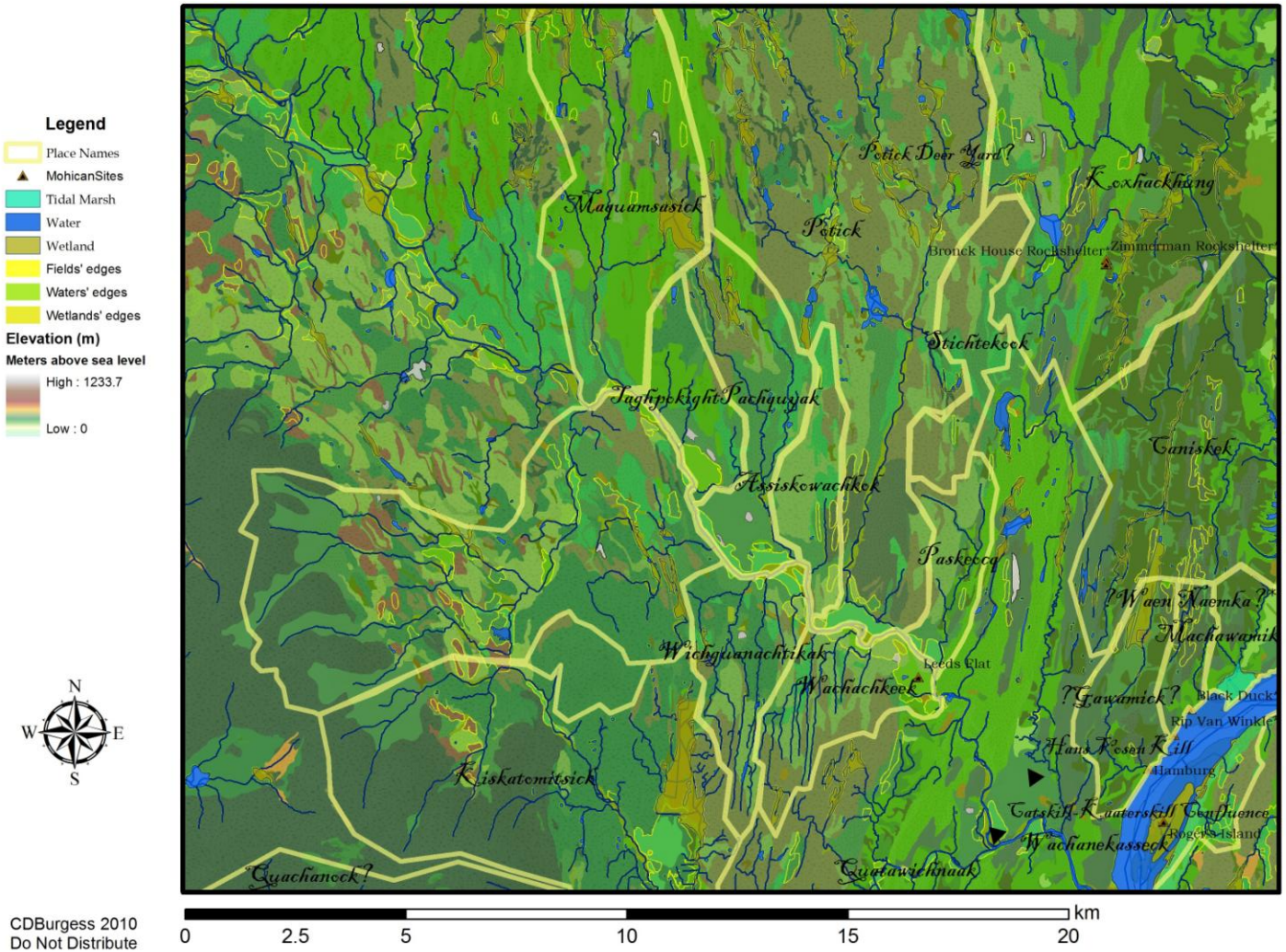


Figure 21: Caniskek-Paskoecq (Caskill-Kaaterskill confluence in southeast corner)

Conclusion

This thesis has shown how a landscape-based approach, in this case taking advantage of the tools provided in GIS, can enrich our understanding of a people's relationships with their environment and the plant, animal, and human neighbors who comprise it. Chapters One and Two set the stage for our inquiry into those relations by illuminating the archaeological record of Muhheakunnuk with the oral historical record of the Mohican arrival thereto, demonstrating the place of the Mohican among their kith and kin in all four directions, and their place in time at their arrival and departure. Chapter Three showed how to assemble and manipulate the GIS data necessary for this type of habitat prediction and environmental reconstruction so that scholars working on projects beyond the Mohican Valley may use and modify this procedure as they see fit. In Chapter Four, a regrettably small and yet still unwieldy sample of significant plant materials were discussed in relation to their uses, archaeological and historical contexts, and habitat requirements. Finally, in Chapter Five, the habitats of Muhheakunnuk were discussed as manifested on the predictive maps.

In Sankhasick we saw what great amounts of maize could be yielded from even a small area, and also how large some areas of highly productive maize land are. The abundant productivity of Muhheakunnuk was further magnified in the Chapter Five discussion of cropland, in which it became evident that even the relatively low intensity Mohican three sisters agriculture could provide substantially for the one million modern inhabitants of the seven counties in the study area, using only the most productive fraction of the available maize land.

In Machtequack, we saw how the ebb and flow of the Mohican River created a complex matrix of habitats for the sustenance of the Mohicans and their neighbors, the

mollusks, fishes, fowl, and four legged ones, and the many green growing things that flavored Mohican meals, complementing the three sisters with vegetables and meat. In Amissohaendiek we saw non-tidal wetlands that provided a separate set of complements to the same, and considered the ways that marshes, swamps and bogs may be reflected on the maps.

Broadening the scale we saw how different forest compositions were indicated by different combinations of soil acidity, texture, drainage and organic matter. This took us from the Mature Mesophytic Forests that lined the banks of Muhheakunnuk, to the rocky woods of Potick, to the Pine Plains of Schenectady. Narrowing back in, we considered how a controlled burn lit at the confluence of the Catskill and Kaaterskill Creeks would spread upward between Caniskek and Paskeocq, ultimately burning out in Stichtekook. Finally, we also considered the implications for wildlife and hunting in the aftermath of the blaze.

The most striking shortcoming of the project in its current manifestation is the lack of an adequate means of field-checking predictions. Because of the massive deforestation that occurred in the study area during the eighteenth and especially nineteenth centuries, I fear that on the ground field checks would be of limited utility. Despite this deforestation, though, there may yet be places that have remained largely undisturbed, particularly places that are largely inaccessible or considered unuseful by modern standards. These may include rugged terrains like ravines and cliff edges, poorly drained wetland areas, and areas of exceedingly shallow soils. However, these will only enable the testing of a limited range of habitat types. As such, the scant archaeological record and the historical record have served to substitute. The historical record could be mined much more deeply for rich descriptions of specific places, then these could be compared to the corresponding locations on the maps.

Because of the scope of this paper, much of the discussion has been carried out

on at a relatively broad scale, with the exception of some of the pointed habitat illustrations mentioned above. As archaeologists continue to work within the study area, they may benefit from the maps produced herein by considering their site or sites within the matrix of resources in which they are immersed, as presented in the GIS. Archaeologists focusing on a specific site may be able to use the maps to help guide and interpret their excavation. In this study area, this may help in our search for the elusive Mohican settlement pattern.

One of the reasons I was inspired to approach the landscape in this way was due to the work Karim-Aly Kassam has carried out in indigenous communities in Wainwright, Alaska (Kassam 2009) and on the Kola Penninsula in northwestern Russia (Robinson & Kassam 1998). In both of these situations indigenous land use maps were created which, in the case of the former powerfully strengthened the Inupiaq land claim, and in the case of the latter helped to prevent a devastating gold mine from destroying priceless Sami reindeer habitat (Kassam, personal communication, 2009). As I understand it, in the case of the Sami this was an un-looked-for blessing of the work. Similarly I hope that this research will benefit the modern descendants of the Mohicans who are my subjects in ways that I do not yet understand. If nothing else, I hope that it can be used to increase their own understanding of the ancestral landscape just as it increases that of scholars. Moreover, we may find that it helps to bring the Mohican story to life for modern visitors to their Valley. It may also make a valuable contribution for conservation, giving a new dimension to conservationists' understanding of the landscapes they work to conserve. Just as archaeologists are encouraged in this work to expand their perception of the site to include the surrounding landscape, so too will conservationists' perceptions of the properties they watch over be expanded, as these properties are placed in their larger spatial and temporal context. Organizations like the Open Space Institute, who

have already done so much to conserve significant places in the Mohican Valley (like the Papscanee Island Preserve on Sankhasick), and the Nature Conservancy, working in partnership with the descendant community, municipalities at the state, county and local level, and land owners could all benefit from the understanding gained by placing these sites in the broader context of Mohican practical knowledge- of the Mohican phroenesis.

The recognition that the entire modern population of the study area could be fed by farming only some four percent of the land in the study area using low impact three sisters agriculture carries powerful implications for- indeed, a powerful indictment against- modern society. The question is obvious: if we have the potential to feed ourselves- rich and poor- off the land outside our very doors, why is it that we are burning fossil fuels in a practice proven destructive to the earth we call home all to ship massive amounts of food across the country and around the world to feed our local populations? The answer of course, is that someone very rich is making a great deal of money off the process.

The global wars fought for oil sovereignty, and the heart rending devastation being wrought in the Gulf of Mexico as I write, are all carried on to sustain a lifestyle that is absurd and superfluous. While unemployment skyrockets, and people go hungry in the streets of Albany, Schenectady and Troy, much of the most fertile farmland in the area either sits fallow, is black-topped and built-on by the reckless hands of shortsighted commercial and residential developers, or is meticulously maintained as golf courses for the sport of the wealthy. At the dawn of the third millennium, it is now more than ever apparent that we must settle our hearts to abandon ways of life which can only be carried on at the expense of our neighbors and our planet, and seek a new way to make real progress. In the Mohican Valley, the Mohican way offers a simple subsistence technology far superior to the modern

American approach, and if we care to humble ourselves and accept it, it could be an incredible blessing to both the modern inhabitants of the valley, and their neighbors around the world.

Moving forward

At the outset of this project, it was my intention to bring specificity to the generalizations that often characterize discussions of Mohican resource use, and to provide a backdrop on which to discuss the larger questions of spirituality, social interaction, and political economy. I hope that I have succeeded. At the same time, I am disappointed that I was not able to more deeply engage these questions. Because of the limited scope of this project, much of the most interesting analysis has unfortunately been left to the future manifestations of the work. Some of the questions I plan to address in forthcoming work are briefly considered and discussed below.

Spirituality

How did the Mohican people relate spiritually to their land and resources? To me, one of the most fascinating works of anthropology to date has been Keith Basso's *Wisdom Sits in Places* (2000), because it changed the way I look at the landscapes I pass through, changed the way I consider them and interpret them and their names. As a lifetime inhabitant of the highlands west of the Mohican Valley, I long to know the old names, their significations and their stories. In a way, I think that part of the lack of rootedness many young people feel today stems from want of a connection to the ancient landscape. To be able to repeat the words of the ancestors just as they were first said, just where they were first said, and to be flooded with the stories of the events that happened there, and the lessons learned there from. This is why I was so intent upon including as many Mohican place names as I could, embarrassed though I am that I have no understanding of their true significations. Lacking Mohican names, I included Mohawk names if possible (Tionwendendahow and Dionoendogeha, for

example, are apparently Mohawk[29] in origin). Further expansion of the place name project could be a great step towards understanding the Mohicans' spiritual relationships to the land, and I expect that exploring these place names in relation to the mapped habitats discussed in this thesis will be even more illuminating. By adding folklore to the mix- particularly placed stories like *The Spirit Bride of Tassawassa*, *The Legend of Usamacinta*, *The Legend of Diamond Rock* and the story of Ben Pie- I believe the picture will be come even richer (Broderick 2005). Though there will undoubtedly be a fair amount of untangling of nineteenth century Euro-American romanticism to be done, this will in itself probably prove enlightening.

Other stories, like that related by Dunn (1994) describing the origin of both snowshoes and of the deer sacrifice ritual will further add to our understanding of Mohican relations to their animal neighbors. Heckewelder (1876 [1819]) and Tantaquidgeon (1973) are further untapped resources for understanding Mohican folklore and spirituality.

Social Interaction and Political Economy

In addition and indeed complementary to further explorations of the spiritual nature of Mohican life, it is my hope that the stage is now set for further examination of Mohican social relations in and beyond the Mohican Valley. One obvious question is, were there resource inequalities, and if so, how were these negotiated? Did they manifest themselves in the form of social inequalities, or were they sorted out without leaving anyone the less privileged? Were there localities that we would predict to have been particularly influential due to their resource advantages? If so, do our predictions play out in the historical and archaeological records, and in what form?

---

[29] These lands, like Saratoga (here labeled by its Mohican name Amissohaendiek) were sold to the Europeans by Mohawks after their former Mohican owners had moved east, and therefore the land transactions record their Mohawk names. In some cases, because the land was theirs in former times, Mohicans were also paid in these transactions with Mohawks (Dunn 1994).

Sassaman (2004) discusses numerous causes of social inequality in hunter-gatherer societies, among which two main threads appear. Though Sassaman is more concerned with the symbolic causes, he discusses economic causes in great detail. I see no reason to exclude either from consideration. The most prolific proponent of purely economic causes is Hayden (1995), whom Sassaman summarizes extensively. Hayden's approach is "decidedly economic" (Sassaman 2004:249), dismissing "essentially all sociohistorical and ideological factors," while it "privileges environmental potential and the human capacity to exploit it as determinant variables" (*ibid.*:251). Moreover, "Hayden's perspective on the evolution of complexity assumes a panhuman pyschological foundation of 'materialist practicality and self interest'" (*ibid.*:251). These flaws of environmental determinism and rational self interest must be viewed critically when discussing Hayden's contribution.

Hayden is primarily concerned with how "aggrandizers" control surplus. Sassaman lists a number of the strategies detailed by Hayden, including marriages, ritual, warfare, exchange alliances, and competitive feasts (*ibid.*:249). I see no reason to necessarily associate these five institutions with surplus control, but they themselves can certainly be seen as sources of social power. Moreover, despite Hayden's vogue adherence to the notions of "materialist practicality and self interest," power over the aforementioned institutions is not necessarily a nefarious, manipulative diadem. A certain degree of leadership might be necessary to temper the passions of the impetuous youth- in both marriage and warfare. A particular connection to a partner in extra regional trade might be fouled by the misstep of someone without a diplomatic personality. Whatever the case, all five of these sources of power appear to have the potential to come together strongly at Cohoes, the mingling place of the Mohawk and Mohican Rivers (Figure 1).

According to Paul Huey, "The area below Cohoes Falls was the nearest point

on the Hudson River from which the Indians of the Mohawk Valley could obtain anadromous fish species such as American shad, sea-run alewives, blueback herrings, striped bass, and shortnose sturgeon" (2002:15). These anadromous fish run in massive numbers in the spring. This means that the spring fish runs may have been a time when the Mohawk and Mohican seasonal rounds came together, meeting at Cohoes.

Hetty Jo Brumbach has analyzed "Iroquoian" and "Algonkian" pottery types using samples from Mohawk and Mohican sites, and has noted that the two are essentially indistinguishable (1975). Because women traditionally appear to have been primarily responsible for pottery production and decoration, Brumbach has further suggested that the similarity in design may indicate Mohawk-Mohican intermarriage (personal communication, 2006). Mohawk-Mohican intermarriage clearly occurred post-contact (Dunn 1994). The union of the seasonal cycles of the two tribes will have provided an ideal opportunity for marriages to be arranged.

Such a coming together of people would also have been a great occasion for exchange. Arriving in Mohican territory, protocol would likely have required that the Mohawk offer gifts- perhaps the exotic hematite, Adirondack anorthosite, or elk skins and teeth. At the same time, Mohicans from upriver would have brought the rare red Mettawee Slate that was historically prized among the Seneca (Jordan 2008), while Mohicans from down river would likely have brought green chert from Koxhackhung, marine shell wampum from the coast and jaspers from Pennsylvania. People from both nations may also have carried other perishable items- dyed skins, tobacco, beaded bands and bags, artfully woven and died baskets- for marriage gifts and trade.

Just as the Mohawk may have been obligated to offer gifts, so the Mohican would have likely been obligated to offer hospitality, and an occasion like the spring fish runs would have offered a sufficient abundance of food that any leftover winter

stores not required for planting could have been brought to the table to augment the fresh fish for an annual feast. Dried sumac and blueberries would have been rehydrated for fresh juices, and spring greens would probably have been collected in preparation. As fish dried on racks, fires would have been lit, news would have been exchanged, pipes passed and old stories retold.

The event would also have provided an opportunity for old grievances to be aired and for disputes to be settled before these developed into larger conflicts. Indeed such a fruitful seasonal moment might be enough to discourage warfare from developing, as both nations valued that which the other had to offer, shared traditions, and shared families. In order to maintain the ties that gave richness to both Mohican and Mohawk life, maintenance of peaceful relations was essential. Without peace, trade- and all of the wealth of cultural exchange that goes along with it- would be impossible.

Further archaeological inquiries to recognize the footprint of the feasting events described above are in order here. My impression of the archaeological record as it currently stands is that much of the excavation that has been done in the Cohoes area has involved the exhumation of human remains, often accompanied by rare or exotic materials. In addition to these, stray finds have yielded some rare materials like red slate points (Huey 2002).

It also seems likely that such grand events would have found their way into the historical record as well. Though I am not currently aware of any records of spring visits by Europeans prior to the establishment of Fort Nassau (precursor to Fort Orange) these may exist. If they make no mention of a significant event at Cohoes, the scenario described would seem less likely. However it is possible that after the construction of Fort Nassau, Mohican-Mohawk relations were so dramatically altered by the tumult of the swift accelerating fur trade that the Cohoes events ceased to

continue, never set down in the historical record.

These events and the relationships they indicate are intuitive on many levels. In studies of indigenous communities in the Pamir mountains of Afghanistan and Tajikistan, Kassam (2010) has shown how communities occupying different niches within overlapping ecological zones support one another and contribute to resilience all while maintaining distinct cultural identities- this is an example of niche complementarity. Turner et al. (2003) have also discussed niche complementarity among modern indigenous communities in Canada. Kassam's discussion of the work of Turner et al. paints a similar scenario to that suggested for Cohoes:

> these groups not only traded food items such as dried fish or berries and manufactured products such as baskets, but they also exchanged knowledge and ideas. Their cultural distinctiveness was retained during trade and facilitated the exchange. They discussed fishing, hunting, canoe-making, and basket-making techniques. As a result of these consistent, long-term exchanges, the relations between these groups have become institutionalized. Thus, communities from different ecological habitats and lifestyles mutually support and facilitate each other's survival. Their contact is not just trade in widgets, but exchange of ideas and strategies that facilitate flexibility and resilience in the context of unanticipated change and significant socio-economic stress. (Kassam 2010:13)

As the stress of the Little Ice Age struck the northeast, maintaining these ties and continuing the associated exchange of ideas would have been even more essential. It may have strengthened those bonds, or even been the impetus that first brought the Mohawk back into close relations with the Mohican. These bonds appear to have

survived until the European arrival and the onset of the fur trade drastically altered subsistence strategies, and both ecological and inter-cultural relations. This alteration may be characterized as a shift from niche complementarity to niche competition, as access to beaver pelts and the burgeoning global market temporarily became the paramount essential resources for both Mohawk and Mohican people. Though their importance would not last long, the results of that jarring reconfiguration of priorities have persisted to this day.

In one place-anchored event at Cohoes, marriages, exchange alliances, feasts, and the mitigation of warfare all potentially came together. In this case, Hayden's "aggrandizer" appears to be a place, rather than a rationally self-interested person. It is the place that inspired the meetings and all that went with them, and who controlled the place may have to some degree controlled these, the sources of power. The Mohican burials that shroud the area would have clearly established Mohican ownership over the place, but within the Mohican nation itself how was power distributed? If it was distributed differentially, what was its source, and how was it manifested?

On one level, the place itself must be seen as a source of power, though again I hesitate to use the word because of the dictatorial connotations it invokes; this power need not have been centralized, and the Mohican political system should be examined more closely to come to a better understanding of how it likely manifested. That being said, because of all Cohoes offered as an extra-local political and economic center, whomever controlled Cohoes may have also controlled marriage, warfare, trade and feasting. If a leader did not carry out his obligation to provide hospitality to the western visitors, trade relations would suffer, marriages would not be forthcoming, and warfare may even ensue. A leader who failed in such a way- disrupting the relations that provided peace, wealth, husbands and wives- would not likely last long!

While it seems likely that when such a tradition began it came together somewhat organically, over the years it could quickly build into an event with established protocols for which it was necessary to mobilize surplus in the way that Hayden describes. However in this case, it is the mobilization of the surplus that leads to control over marriage, war, trade and feasting, as opposed to the other sources empowering the "aggrandizer" to take control of surplus.

Whatever the case about cause and effect (indeed the relationship appears to be recursive) there certainly appears to have been surplus, as demonstrated in the discussion of cropland in Chapter Three. In fact, as that discussion has demonstrated, it appears that there was so much surplus that it seems unlikely that any one individual could have legitimately claimed an exclusive right to mobilize it. At the end of the winter, it may have been a boon to be rid of the excess in order to free the space for next year's harvest and prevent rotting.

Aside from these more social and economic factors, ritual has clearly been recognized as one of the primary sources of power- and by extension social stratification- in numerous societies. Emerson and Pauketat (2002), recognizing the differential distribution of ritually oriented artifacts in Cahokia proper as compared to in the outskirts of Mississippian society, have suggested that ritual served an integral role in the emergence of Cahokia. In particular, they have recognized that pigment minerals like hematite and galena, though widely available as a raw material throughout the area, were limited to the Cahokia proper in their distribution as grave goods. Moreover, Pauketat has found that "during the height of Cahokian consolidation, 'more galena was available to less people'" while during its decline "'more people shared less galena'" (*ibid.*:112, quoting Pauketat [1994:155-158]). Emerson and Pauketat suggest that added meaning was applied "through a ritual laying-on-of-the-hands" and that "The right to wear and display the colors and

symbols of Cahokia may have been a prized status marker, as the right to such social markers were among historic tribes" (*ibid.*:113-114).

Cahokia appears to be situated in such a place that these minerals are widely distributed across the landscape, but must be "blessed" by Cahokian elites in order to fully sacralize them prior to their redistribution. Preliminary analysis of mineral distributions in the Mohican area (undertaken as part of a complementary project initially intended to be included with this thesis, but ultimately set aside for a later time) have shown that Cohoes, the juncture of the Mohawk and Mohican rivers, offers a different scenario, in which these pigment resources have a limited distribution, but find their way into Mohican life through the crossroads at Cohoes. Feldspar, pyrite, mica and hornblende have been recovered in excavations at the Waterford site in the Cohoes locality (Hartgen 1996). These minerals were apparently only available from the Saratoga locality and beyond in the Adirondacks, and so their natural channel into the Mohican world would be through Cohoes. Hematite was apparently only available from Mohawk country, and thus primarily through the trade that centered at Cohoes, and the calcareous soils required to grow wild indigo are (aside from atop the Helderberg Escarpment) most abundant in the Cohoes area. If the correlation between control of pigments and ritual power holds true in Cahokia, a similar phenomenon may have been occurring in Cohoes at the time the Europeans began to arrive.

Wild indigo is useful as more than just a dye; according to Gladys Tantaquidgeon (1972) the roots of wild indigo were used to make a healing lotion for cuts and bruises. Many other medicinal plants also thrive in calcareous environments like that in the Cohoes locality, including essential remedies for snakebites (black cohosh) and for menstrual discomfort and ease of childbearing (blue cohosh). Other plant pigments also had healing qualities; berries of pokeweed, for example, produce a blue stain that the Connecticut Mohegan used for painting baskets. The berries were

also used as a poultice for sore breasts. Among the Delaware, medicinal knowledge is less pan-cultural than it is proprietary, handed down orally and given in dreams (Tantaquidgeon 1972). As such the knowledge of how to provide relief for the more dramatic of discomforts, like rattlesnake bites, childbirth and open wounds could certainly be a compelling source of power. When these healing practices- salves, washes and poultices- are considered in the context of their associated pigments (which may or may not have been further enhanced with minerals like mica, pyrite, or hematite) one sees a colorful picture of how healing practices may have affected Mohican daily life.

The fact that all of these factors appear to have convened at Cohoes is an exciting insight. Interestingly, in addition to the pigments mentioned by Emerson and Pauketat, sacred plants, quartz crystals, “goddess” figurines, and decorated pots are all listed as artifacts recovered in the Cahokian ritual context. Though no goddess figurines have been recovered at Cohoes, in addition to the plants and pigments already discussed, the symbolic value of the nearby quartz-crystal encrusted hill of Diamond Rock may be considered a correlate to the quartz crystals noted in Cahokia. Further inquiry is also in order into the orange limonite iron-coated pottery recovered at the Waterford site that puzzled the site report's authors (Hartgen 1996). I would suggest that this coating may be the result of adding mordant to a batch of dye in the pot. Mordants are minerals that are added to plant dyes in order to make the dye more vibrant and more color fast. In fact, it may be that the brilliant colors Von der Donck (1968) so admired in the quote in Chapter Four, above, were achieved by mordanting. Another possibility, suggested by Maeve Kane (personal communication, 2010) is that existing minerals in the water used for the dye bath may have effectively acted as mordant. Though I am currently not aware of any such mineral water in the direct vicinity of Cohoes, the Old Iron Springs twenty miles northwest in Ballston Spa are

famous for their iron content. The Saratoga Springs are also famous for their mineral content, particularly for sulfur, though I understand that there are complex combinations of minerals contained in those famed healing waters.

One final piece of mystery comes from the numerous historical maps that mention Monemine's Castle on Peebles Island, the large island at the Mohawk-Hudson Confluence. While in light of the preceding speculation it seems appropriate for such a castle (or palisaded stronghold) to have existed, no such remains have been found (Dunn 1994, Huey 2002).

This is the same Monemin who tragically fell during the 1626 battle in the first of the Mohican-Mohawk wars in which Fort Orange's Commander Van Krieckebeeck took part. It may be that Monemin's death signaled the end of the era of Cohoes' major significance in Mohican-Mohawk relations, as the attentions of those near and far shifted to Fort Orange and the European goods that had become symbols of power and prestige. One might even suggest that by eliminating Monemin, Van Krieckebeeck knew the stage would be set for a new era of European dominance in the Mohican Valley, leading him to surreptitiously orchestrate the going out of an undermanned Mohican war party, while alerting the Mohawk as to the expected route, time and day of attack, and numbers. The few unwitting Dutchmen who died in the rout would be a small price to pay for eliminating the hapless middlemen, while still ostensibly suffering a loss that gave the betrayal the face of brotherhood. Whatever the case with regard to the conspiracy, Cohoes had fallen, and the memory of Gaaschtinick was sullied by bloodshed until the burial of the Lenape hatchet again rewrote its meaning. Soon after, in 1630 a delegation of Mohicans would travel to New Amsterdam (modern New York City) where they formally sold the land extending from Cohoes to the stream now known as Norman's Kill to Kiliaen Van Rensselaer, the first Patroon of Rensselaerwyck (Dunn 1994). Today the Normanskill's Mohawk name, Tawasentha,

“the Vale of Willows” (or if I may poetically interpret, “the Mourning Veil”) still adorns a small park in the township ironically called “Guilderland,” named so affectionately for the *guilder*, the Dutchman's money, so beloved by so many men. *This very place...*

Climbing blue stone rows from the Lower Bear to the Upper Bear trail toward the “Indian Ladder” at what is now called Thacher State Park, Muhheakunnuk sprawls. Across Tawasentha, Schenectada, Nachtemack, Sankhasick, distant Schaaghtikook,Wayantaro, Tachkanik... clouds and blue sky trace sunshine and shade upon the land. Through and across forests, fields and marshlands, distant fires, and the pale blue hint of the last descent to the river, many trails wind their way, connecting distant fires one to another, and to all the life between. In places like this, where the ancient layered stones bear silent testament to the sacredness of this land, it is easy to feel, for a moment, the way it felt a thousand years ago to stand at this very spot, the way it felt to climb up.

The great forests ancient and beloved arched their branches over cliffs of flint and stone and down high narrow hemlock ridges, paths rutted deep by hoof and paw and padded leather. Rivers ran and crawled through gully, flat and fall and fish ran tides upstream and circled pools and lakes each in their season. The tidal marshes had their ebb and flow as well, where turtles sunned on sun-cured logs and cranes watched over, and so as well inland, where beavers tended swamps and muskrats stalked. But in between the streams and larger rivers, and all along the inflows of the sea, where land was clear and dry enough and pleasant, people built their shelter, set their fires, and helped things grow, each in their own place and way.

The story of the land of Muhheakunnuk, the great waters, ever in motion, ebbing or flowing, and of the Muhhekunneyuk, the people of those waters has been deemed too distant, too fleeting, or too impressionless to be told. But this is not so:

this story is within our grasp. When approached pluralistically, drawing on the offerings of many disciplines, the story becomes more legible. It is written on the land in dirt and water, and recorded in the memories of our ancestors and their descendants. It is the story of a place called Muhheakunnuk and of the many places therein. It is the story of the way that Muhhekunneyuk related to Muhheakunnuk and all her tributaries, their flat land, marsh land and high land, and all the infinite diversity between.

The real story is in the land itself; it is reflected in the maps that struggle to depict that land. As Keith Basso's (2000) western Apache informants instruct us, we must learn to drink from all these places; it is by this that wisdom is achieved. By understanding how these different places were used and the traditions associated with their use, we can move closer to understanding the otherwise puzzling record of apparent cultural change in the place called Muhheakunnuk, and among the nation of the same name.

All people of all nations have traditions of interaction with the Creator of the heavens and the earth and of the depths of the water and the heights of hill and high mountain, of green growing things, creatures on four legs and creatures flying, and of man- regardless of whether we recognize these traditions of interaction as such. By interacting with the creation we interact with the Creator, and while it is those traditions of interaction with the Creator and the spirit world that are of paramount importance to the understanding of who a people are, it is the places and ways that people lived upon which this work has focused. It is my hope that, like a finger pointing at the moon, illuminating these mundane places and the earthly ways they have been walked will light our understanding of the greater questions, questions of Creator over creation, of Spirit over dirt and ash.

To tend the land meant different things to those ancient stewards, and ways of life have given way time and again since then, from family farms to factories, and

each rewrote the land then faded with disuse. Now again we poise to take a step, to write a chapter, to live a way of life, and may this work contribute insight to that step. The land has changed, but there is much that yet remains. These same cliff-side trails we walk, they walked. These same streams flow swift in spring and slow as summer stretches long; these mountains dwarf our houses, steer our roads, and catch and cradle snow and rain. And in between them these great waters are constantly in motion, either ebbing or flowing, like the waters in the tales of old.

BIBLIOGRAPHY

Baillie, Michael G. L. (1999) *Exodus to Arthur: Catastrophic Encounters with Comets.* Batsford, London.

Basso, Keith H. (2000) *Wisdom Sits in Places*. University of Mexico Press, Albuquerque, NM.

Bradley, James W. (2007) *Before Albany: An Archaeology of Native-Dutch Relations in the Capital Region 1600-1664*. NYSM Bulletin 509, Albany, NY.

Bradley, James W. (2009) Unpublished notes in possession of the author.

Bragdon, Kathleen (1996) *Indian Tribes of Southern New England.* University of Oklahoma Press, Norman, OK.

Brasser, Ted J. (1974) *Riding on the Frontier's Crest: Mahican Indian Culture and Culture Change*. National Museums of Canada; Ethnology Division, Paper No. 13. Ottawa.

Brasser, Ted J. (1978) "Mahican" in *Handbook of North American Indians - Northeast.* Bruce Trigger, ed. Smithsonian Institution; Washington, DC. 198-212.

Brewer, Floyd (2001) "The Goes/Van Derzee Farm Site, Albany County, Bethlehem, New York." *The Bulletin: Journal of the New York State Archaeological Association*. no. 117. 36-48.

Brockman, C. Frank (1968) *Trees of North America*. Golden Press, New York, NY.

Broderick, Warren (2005) "New York State's Mohicans in Literature." In *The Challenge: An Algonquian Peoples Seminar*. Shirley Dunn, ed. NYSM Bulletin 506, Albany, NY. 103-122.

Brooks, Lisa (2008) *The Common Pot: The Recovery of Native Space in the Northeast*. University of Minnesota Press, Minneapolis.

Brumbach, Hetty Jo (1975) “'Iroquoian' Ceramics in 'Algonkian' Territory” *Northeast Anthropology*. SUNY. Albany, NY. 17-28.

Brumbach, Hetty Jo (2002) “Woodland Period Settlement and Subsistence Change in the Upper Hudson River Valley” in *Northeast Subsistence-settlement Change A.D. 700-1300*. John Hart, Christina Reith, eds. NYSM Bulletin 496, Albany, NY.

Chilton, Elizabeth (2005) “Farming and Social Complexity in New England: A.D. 1000-1600.” In *North American Archaeology*, edited by Timothy Pauketat and Diana Loren. Blackwell Press, Studies in Global Archaeology Series; Oxford. 138-160.

Cronon, William, 1983. *Changes in the Land: Indians, Colonists, and the Ecology of New England.* Hill and Wang: New York, NY.

Drooker, Penelope Ballard (2004) *Perishable Material Culture in the Northeast*. NYSM Bulletin 500, Albany, NY.

Dunn, Shirley W. (1994) *The Mohicans and Their Land: 1609 - 1730*. Purple Mountain Press: Fleischman’s, NY.

Dunn, Shirley W. (2000) *The Mohican World: 1680 – 1750*. Purple Mountain Press: Fleischman’s, NY.

Emerson, Thomas E. and Timothy R. Pauketat (2002) “Embodying Power and Resistance at Cahokia” in *The Dynamics of Power* O'Donovan, Maria, ed. Center for Archaeological Investigations, Occasional Paper No. 30. Southern Illinois University. Carbondale, IL

Esper, Jan, Edward R. Cook, Fritz H. Schweingruber (2002) “Low-Frequency Signals in Long Tree-Ring Chronologies for Reconstructing Past Temperature Variability.” *Science*. New Series, Vol. 295, No. 5563. 2250-2253.

Foster, Steven and James A. Duke (2000) *Medicinal Plants and Herbs of Eastern and*

Central North America, 2nd Edition. Houghton Mifflin Company; Boston, MA.

Funk, Robert E. and William A. Ritchie (1973) *Aboriginal Settlement Patterns in the Northeast.* New York State Museum and Science Services. Albany, NY.

Funk, Robert E. (1976) *Recent Contributions to Hudson Valley Prehistory*. New York State Museum Memoir 22. Albany, NY.

Funk, Robert E. (1978) "Post-Pleistocene Adaptations." in *Handbook of North American Indians - Northeast.* Bruce Trigger, ed. Smithsonian Institution; Washington, DC. 16-27.

Hart, John and Hetty Jo Brumbach (2003) "Death of Owasco," *American Antiquity*. v68, i4: pp737-752.

Hart, John and Christina B. Reith (2002) *Northeast Subsistence-settlement Change A.D. 700-1300*. NYSM Bulletin 496. Albany, NY.

Hartgen Archaeological Associates, Inc. (1983) *Mechanicville Road (209) Site: Results of Mitigation Procedures*. HAA. Troy, NY.

Hartgen Archaeological Associates, Inc. (1996) *Archaeological Investigations for the Waterford CSO Abatement Project*. HAA. Troy, NY.

Hartgen Archaeological Associates, Inc. (2002) *On the Outside Looking in: Four Centuries of Change at 625 Broadway, Archeology at the DEC Headquarters, 625 Broadway, Albany, New York.* HAA, Troy, NY.

Heckewelder, John (1867[1819]) *History, Manners, and Customs of The Indian Nations Who Once Inhabited Pennsylvania and the Neighbouring States*. The Historical Society of Pennsylvania, Lippincotts Press, Philadelphia, PA.

Hubbard, J.P. (1977) "Importance of riparian ecosystems: Biotic considerations." In R.R. Johnson and D.A. Jones, eds. *Importance, Preservation and Management of Riparian Habitat: A Symposium.* USDA Forest Service General Technical Report RM-43.

Holland, John D. (2004) "Lithic Types and Varieties of New York State" *The Bulletin: Journal of the New*. (2002) "An Archaeological and Documentary History of Peebles Island State Park, Waterford, N.Y." New York Office of Parks, Recreation and Historic Preservation. Peebles Island. Waterford, NY.

Huey, Paul R. and Joseph E. McEvoy (1977) *Staats House, May 2, 1977: Preliminary Report on Archeological Findings*. (Unpublished report).

Huey, Paul R., Lois M. Feister and Joseph E. McEvoy (1977) "Archaeological Investigations in the Vicinity of "Fort Crailo" During Sewer Line Construction Under Riverside Avenue in Rensselaer, New York." *The Bulletin.* New York State Archaeological Association. Vol 69. 19-41.

Huey, Paul R. (1988) *Aspects of continuity and change in colonial Dutch material culture at Fort Orange, 1624-1664.* Ph.D. dissertation, University of Pennsylvania, United States -- Pennsylvania.

Huey, Paul R. (2002) "An Archaeological and Documentary History of Peebles Island State Park, Waterford, N.Y." New York Office of Parks, Recreation and Historic Preservation. Peebles Island. Waterford, NY.

Hutchens, Alma R. (1991) *Indian Herbalogy of North America*. Shambhalla, Boston, MA.

Jordan, Kurt A. (2008) *The Seneca Restoration, 1715-1754*. University Press of Florida. Gainesville, FL.

Kassam, Karim-Aly (2009) *Biocultural Diversity and Indigenous Ways of Knowing: Human Ecology in the Arctic*. University of Calgary Press/Arctic Institute of North America: Calgary.

Kassam, Karim-Aly (2010) "Pluralism, Resilience, and the Ecology of Survival: Case Studies from the Pamir Mountains of Afghanistan." *Ecology and Society* 15(2)c 8 [online] URL: http://www.ecologyandsociety.org/vol15/iss2/art8/

Kirk, Matthew (2005) *Archeological Investigations Luykas Van Alen House Drainage Improvement.* Hartgen Archeological Associates, Inc. Albany, NY.

Kiviat, Erik & Gretchen Stevens (2005) *Biodiversity Assessment Manual*. Hudsonia, Ltd. Albany, NY.

La Porta (1996) "Lithostratigraphy as a predictive tool for prehistoric quarry investigations: Examples from the Dutchess Quarry site, Orange County, NY." *A Golden Chronograph for Robert E. Funk.* Lidner, Chris and Edward V. Curtin, eds. Occasional Publications in Northeastern Anthropology No. 15. 73-83.

Largy, Tonya B., Lucianne Lavin, Marina E. Mozzi, and Kathleen Furgerson (1999) "Corncobs and Buttercups: Plant Remains from the Goldkrest Site" in *Current Northeast Paleoethnobotany*, John P. Hart, ed. NYSM Bulletin No. 494. SUNY. Albany, NY.

Lavin, L. (1996) "Goldkrest Site: An Undisturbed Multi-Component Woodland Site in the Heart of Mahikan Territory". *Journal of Middle Atlantic Archaeology*. V12, Bethlehem, CT.

Mt. Pleasant, Jane (2006) "The Science behind the Three Sisters Mound System: An Agronomic Assessment of an Indigenous Agricultural System in the Northeast." in *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*. Edited by John Staller, Robert Tykot and Bruce Benz. Academic Press; Burlington, MA. 529-537

Peterson, Roger Tory & Margaret McKenny (1968) *A Field Guide to Wildflowers*. Houghton Mifflin Company; Boston, MA.

Peterson, Lee (1978) *A Field Guide to Edible Wild Plants*. Houghton Mifflin Company; Boston, MA.

Ritchie, William A. (1944) *The Pre-Iroquoian Occupations of New York State*. Rochester Museum and Science Center; Rochester, NY.

Ritchie, William A. (1958) *An Introduction to Hudson Valley Prehistory*. New York State Museum and Science Service; Bulletin Number 367. Albany, NY.

Ritchie, William A. (1965) *The Archaeology of New York State.* The Natural History Press: Garden City, NY.

Ritchie, William A. (1997) *A Typology and Nomenclature of New York Projectile Points*. New York State Museum Bulletin 384. Albany, NY.

Robinson, Michael P. & Karim-Aly S. Kassam (1998) *Sami Potatoes: Living with Reindeer and Perestroika*. Bayeux Arts, Inc. Calgary, Canada.

Sassaman (2004) "Complex Hunter-Gatherers in Evolution and History: A North American Perspective" *Journal of Archaeological Research*, v.12(3).

Snow, Dean (1995) "Migration in Prehistory: The Northern Iroquoian Case" *American Antiquity*, Vol. 60, No. 1, 59-79.

Tantaquidgeon, Gladys (1972) *Folk Medicine of the Delaware and Related Algonkian Indians*, The Pennsylvania Historical and Museum Commission Anthropological Series Number 3, Harrisburg, PA.

Tull, Delena (1987) *A Practical Guide to Edible & Useful Plants, Including Recipes, Harmful Plants, Natural Dyes & Textile Fibers*. Texas Monthly Press, Austin, Texas.

Turner, N., I. Davidson-Hunt, and M. O'Flaherty (2003) "Living on the edge: ecological and cultural edges as sources of diversity for social-ecological resilience." *Human Ecology* 31(3):439-461.

Van Der Donck, Adriaen (1968) *A Brief Description of New Netherlands*. Thomas F. O'Donnell, ed. Syracuse University Press, Syracuse, NY.

Watts, May Theilgaard (1998) *Tree Finder: A Manual for Identification of Trees by*

their Leaves (Eastern US). Nature Study Guild. Rochester, NY.

Weinman, Paul L. and Thomas P. Weinman (1971) "The Rip Van Winkle Site" in *Pennsylvania Archaeologist*. Vol. 41 (1-2). 53-60.

Weinman, Paul L. and Thomas P. Weinman (1974) "Rip Van Winkle No. 2 Site" in *The Bulletin.* New York State Archaeological Association. Vol 62. 27-29.

Weinman, Paul L and Thomas P. Weinman (1977) "Two Middle Hudson Valley Sites" in *The Bulletin*. New York State Archaeological Association. Vol 70. 27-29.

White, Richard (1991) *The Middle Ground: Indians, Empires, and Republics in the Great Lakes Region, 1650-1815.* New York: Cambridge University Press.

Wilkins, David and Tsianina Lomawaima (2001) *Uneven Ground: American Indian Sovereignty and Federal Law.* Norman: University of Oklahoma Press.